

Remarks on the mortality among the troops serving in the United Kingdom from consumption / by Robert Lawson.

Contributors

Lawson, Robert.
Royal College of Physicians of Edinburgh

Publication/Creation

London : Harrison, 1887.

Persistent URL

<https://wellcomecollection.org/works/cs9mf2wf>

Provider

Royal College of Physicians Edinburgh

License and attribution

This material has been provided by This material has been provided by the Royal College of Physicians of Edinburgh. The original may be consulted at the Royal College of Physicians of Edinburgh. where the originals may be consulted.

This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.



Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
<https://wellcomecollection.org>



REMARKS *on the* MORTALITY *among the* TROOPS SERVING *in the*
UNITED KINGDOM *from* CONSUMPTION.

By ROBERT LAWSON, ESQ., LL.D., *Inspector-General of Hospitals.*

[Read before the Statistical Society, 18th January, 1887. SIR RAWSON
W. RAWSON, K.C.M.G., C.B., a Past President, in the Chair.]

THE mortality in the Army from diseases of the lungs, chiefly consumption, has long attracted attention, but it was not until the statistical reports on the health of the troops and those of the Registrar-General for the civil population of England and Wales were published, that the materials became available for even an approximate estimate of its relative amount. In the first report on the mortality among the troops in the United Kingdom, drawn up by the late Sir A. Tulloch, which appeared in 1839, it was estimated that the ratio per 1,000 of deaths among the civil population was only half that among the troops; and in the report for the period 1837-46, prepared by Sir A. Tulloch and Dr. Balfour, and published in 1853, the following appears on p. 32 with reference thereto:—

“The preceding results would seem to justify the inference
“that there must be some peculiarity in the condition of the
“soldier, or connected with his profession, to which civilians are
“not exposed. What influence aggregation in masses, crowded
“barracks, night duty, and exposure on guard, may exercise, we are
“unable to determine; but the subject is one deserving careful
“investigation.”

During the thirty years which have elapsed since this was written, various authors have given their attention to the subject, and have advanced theories regarding it which they considered borne out by the facts at their disposal. The additional information which has accumulated, with this efflux of time, may now be employed to test how far the more prominent of these theories represent the efficient causes of the greater prevalence of the disease among the troops.

In prosecuting this inquiry it is obvious the first step is to ascertain the frequency of death from consumption among the adult population in civil life, at the military ages, with its fluctuations at different periods. These facts, collated with corresponding facts for the troops for the same periods, will show how far the variations among the latter may be referred to a different incidence of the disease on the country at large, and how far they are referable to influences to which soldiers are exposed and which do not affect the civil population.

The Statistical reports for the troops in the United Kingdom, up to 1836, are based chiefly on the sickness among the cavalry, and embrace too small a number to be of any value in this inquiry. Those for the ten years 1837-46 include all the corps at home, except Artillery and Engineers, and specify the ages of those serving. No detailed report was published for the years 1847-58, but from 1859 onwards they have appeared regularly, the last being for 1884, and these embrace the whole of the troops in the United Kingdom. To avoid accidental irregularities the facts from these reports have been arranged here in five-yearly groups, commencing with 1860, so that there are five quinquennials available. To compare with the first group, 1837-46, there are the Registrar-General's reports from 1838 to 1842, in which the deaths from consumption are given for males and females separately, but not for the different ages. Though embracing but half the number of years, the latter show the frequency of consumption in civil life at that time, and the middle date, 1840, approximates that of the military returns, 1841-42, sufficiently to admit of a fair comparison between them after the necessary steps have been taken to apportion the deaths to the different ages. From 1860 onwards the deaths from consumption at the different ages are given in the Registrar-General's returns, and these have merely been grouped for the same years as the military returns, and the ratio per 1,000 of mortality obtained for each period of life. To ascertain the mean population at each period of life for these groups respectively, the ratio per 1,000 of deaths from all causes, together with the actual number of deaths for the period, were obtained from the Registrar-General's returns for each year in the group, and the means being taken the corresponding population was calculated. The results may not be strictly accurate, but in employing them to arrive at the ratios per 1,000 for the smaller number of deaths from consumption, the possible error will not be sensible in the second place of decimals. In apportioning the deaths from consumption from 1838 to 1842 to the different periods of life, it was assumed they would bear to the total deaths from that disease in these years the same ratio they

exhibited during 1848-52, when they were given for the three periods 15—, 25—, 35—45. On making the calculation, 6,434, 6,307, and 4,688 were obtained for these ages respectively. As it was required, however, to distribute the first sum, 6,434, between the periods 15—, 20—, and it was found from the supplement to the thirty-fourth annual report of the Registrar-General that between 1851 and 1860 the deaths for 15— were 39·5 per cent., and for 20— 60·5 per cent. of their sum, 2,541 was set down for the former age, and 3,893 for the latter, as appears in Table II at the end.

Since 1836 the Army Returns have undergone considerable change, both in form and in nomenclature of diseases. It is necessary to describe these, and to indicate the methods which have been adopted to arrive at a series of results for the whole period, that may be fairly comparable with each other; and as many of the men who contract consumption in the service leave it before their complaint terminates, the numbers so discharged must be taken into consideration as well as the deaths, when estimating its frequency in the Army. The names of diseases in use before 1836 were continued up to 1847, and under these the great majority of consumptive diseases are recorded as *phthisis pulmonalis*; a number of cases classed as chronic catarrh terminated fatally, and as it was found on post-mortem examination that most of these presented the lesions of consumption, all deaths so returned have been included with those from *phthisis* in what follows. On the other hand, a small number of fatal cases from *hæmoptysis*, or spitting of blood, a portion of which no doubt were due to *phthisis*, have been omitted, and they may be held as balancing the excess of deaths from chronic catarrh not due to *phthisis*, but which could not be separated by the returns from those in which that disease was developed. The number discharged for consumption from 1837 to 1846 is not mentioned in the report, but an approximate estimate of it may be formed from the following data: excluding the Life Guards (for which the admissions to hospital are not given), there were 2,697 admissions for *phthisis* during the ten years; deducting one-tenth of these for men who came under treatment for this disease more than once, the actual cases of consumption would amount to 2,427, and of that number 2,027 died in the service, leaving 400, equal to a fifth of the deaths, as those discharged with this complaint in various stages of advancement. As to the progress of the disease, subsequent to discharge, there is a short notice at p. 43 of the report, stating that of 305 soldiers pensioned for consumption and spitting of blood, whose lives had been traced, 187 died in the course of sixteen years. Assuming that half those pensioned, or 153, died from the diseases in

question, the remaining 34 deaths would be sufficient to allow for the mortality among the survivors from all other causes during the sixteen years; it is probable therefore that no serious error will be committed if it be assumed that one half of those discharged for consumption ultimately succumbed to that disease. The aggregate strength of the troops during the ten years was 266,680, among whom there were 2,274 deaths from phthisis and chronic catarrh, or 8·53 per 1,000; and if to this be added one-tenth (half of one-fifth) for the deaths of men discharged the service, 9·38 is obtained as the annual ratio per 1,000 of deaths from consumption arising in the army at that time.

In 1859 the Army Returns underwent great modification. Weekly returns were substituted for the monthly previously in use, and the nomenclature and classification of diseases assimilated to those employed by the Registrar-General at the time. These returns were received from all the arms of the service on duty in the United Kingdom, and a summary of them was given in the second page of the annual report, in which the strength under observation was taken as the sum of those given in the different weekly returns divided by the number of weeks in the year. The admissions to the sick list, the discharges, and deaths, are given for the classes and orders only, and as there were always a number of deaths of men absent from their corps or on detached duty, these were shown in the summary, and employed with the others in calculating the annual ratio per 1,000 of mortality. As it became apparent, however, that the number of men on detached duty who did not appear in the weekly returns was considerable, the total strength serving at home, received from the Adjutant-General, has been given in the summary from 1870 onwards, and the ratio of mortality was calculated from this, while the ratios for the admissions to, and discharges from, hospital were obtained from the strength in the weekly returns. Invaliding, unless in rare instances, takes place under the cognizance of medical officers, and men leaving the service in this way are accounted for in the annual reports, though the class or order of disease only for which they were discharged is in most cases given; the ratios per 1,000 of these, like those for the deaths, should be calculated on the total strength.

In addition however to the summary just alluded to, there are minor statements, referring to particular classes or orders of disease, in the reports, giving further details, and from 1859 up to 1873, in the appendix, an abstract showing the deaths for every disease by itself in corps which had served the whole year at home; for the purpose of distinction this will be referred to as Abstract A in what follows. The abstracts from 1863 to 1873

embrace the numbers discharged as well. As the aggregate strength, of which these abstracts show the deaths and discharges, amounts to from 79 to 86 per cent. of the total force at home during the corresponding periods, it has been assumed that when the total deaths or numbers discharged were given for the order or class only, those due to phthisis and hæmoptysis would bear the same ratio to the whole as they did in Abstract A, and this relation has been made use of accordingly to arrive at the results set forth in Table I hereto annexed so far as it was available.

Table I contains, in the first series of columns, the aggregate strength from which the details in Abstract A were obtained, together with the deaths from phthisis and hæmoptysis in that portion of the home force each year from 1860 to 1873, and the number discharged for those affections from 1863 to 1873. In the second series of columns the average strength serving at home each year is taken from the Adjutant-General's returns from 1861 to 1884; the strength given for 1860 is that for the troops together with the embodied militia mentioned in the medical sanitary report for that year; the number of the latter is not specified, but the total is allowed to stand as representing approximately the average strength of the troops of the line at home, the Adjutant-General's returns published not including 1860. Up to 1868 inclusive the deaths from phthisis and hæmoptysis for the whole force at home were placed in one group with those from other tubercular affections; to separate the latter, a number proportionate to those in the same group for the same year in Abstract A was subtracted from the total for the groups, leaving the figures in the table. In 1869 the nomenclature of the College of Physicians, then recently issued, was adopted in the military returns, and the deaths from tubercular affections for the whole service at home were included with others in the constitutional class. The deaths from phthisis and hæmoptysis were obtained from this by reducing it in the ratio of the deaths from the constitutional class to those from phthisis and hæmoptysis for the corresponding years in Abstract A, giving the results in the table up to 1873 inclusive. In 1874 this abstract ceased to appear, and the form of the return underwent other changes; the deaths from phthisis were still included in the constitutional class, both in the general summary for the whole force, and in another dealing with most of the stations; a subordinate return to the latter, however, giving the ratio per 1,000 of the deaths from the tubercular order, permitted of their numbers being calculated, and their ratio to the whole order being ascertained, and so afforded the means of separating the deaths from the tubercular order for the total force. The Abstract A from 1870 to 1873 showed 769 deaths from the tubercular order, of which 760 were

from phthisis and hæmoptysis, and 9 only, or one eighty-fifth of the whole, from other diseases; by deducting this fraction from the sum for the tubercular order, the remainder gives the deaths from consumption. The results for 1874 and 1875 were obtained by this process. In 1876 there was another change of form in the medical returns, which however simplified them considerably. The deaths from phthisis were still included in the constitutional class in the general summary, but an analytic table was subjoined which showed the portion of the class due to the tubercular order; and taking one eighty-fifth from the latter, the deaths attributable to consumption were obtained. In 1879 the general abstract was expanded somewhat, and the tubercular order inserted by itself, so that it was merely necessary to deduct the fraction representing the affections other than phthisis and hæmoptysis it embodied. The actual number of deaths from phthisis alone specified in the returns for the five years 1880-84 was 807; but as this does not include those from hæmoptysis and other forms closely allied to phthisis, such as acute miliary tuberculosis, previously embraced under phthisis, the numbers are allowed to remain as they appear in Table I, as affording a more exact basis of comparison with those for preceding periods.

As to men discharged, those disposed of in this way for phthisis and hæmoptysis were included with the other affections usually grouped under the term tubercular from 1860 to 1868, and from 1869, with the change of form in the return, their order was incorporated with the others forming the constitutional class till 1876. From 1879 they have again been shown in the tubercular order. Abstract A gave in detail the diseases for which men were discharged, in 1863 for the first time, and this continued until 1873, after which that form of return was discontinued. The numbers shown as discharged in the first series of columns in Table I are taken directly from Abstract A, except those from 1860 to 1862. To obtain these it was assumed that the men who left the service in these years for phthisis and hæmoptysis would bear the same ratio to the tubercular order as was given by the numbers in Abstract A for 1863-64, in which, with a total of 1,037 for the order, 879 were for phthisis and hæmoptysis, and 158 for other forms of disease; consequently $\frac{1}{6}\frac{1}{6}$ was subtracted from the total for the tubercular diseases for each year, leaving the results in the table. In the second series of columns in Table I the discharges for 1860-62 have been taken the same as in the first series; there may have been a few more, but as the medical reports do not show these, and no error of consequence will arise from their omission, the others have been allowed to stand; from 1863 to 1868 inclusive the totals in the tubercular order, for the

troops serving at home, have been corrected by subtracting each year a number proportional to the non-phthysical cases in the order in Abstract A for the year. From 1869 to 1873 the ratio of the discharges for phthisis and hæmoptysis to those for the constitutional class each year, in Abstract A, was employed to separate these affections from the others in the constitutional class for the whole service for the same year, and the mean ratio for the years 1870-73, 1,601:2,833, was employed for the following three years 1874-76, for which no other correction was available. The reports for 1877-78 do not give the classes or orders of disease for which men were discharged; in these years the numbers in Table I were obtained from the Army Medical Department. From 1879 onwards the discharges for phthisis and hæmoptysis were included in the tubercular order; as 1,722 men were discharged for affections in this order in the four years 1870-73, of whom 1,601 had phthisis and hæmoptysis, and 121, or $\frac{1}{14.2}$ of the whole, other affections, a deduction to this amount has been made from the numbers in the medical report to obtain those in Table I.

In the Registrar-General's reports phthisis is included in the tubercular order of constitutional diseases, and the other diseases of the lungs, embracing the ordinary inflammatory affections, bronchitis, pneumonia, and pleuritis, with some others, form the respiratory diseases, an order of the class of local diseases. Since the commencement of these reports there has been considerable variation in the relative numbers of deaths attributed to phthisis, and the affections of the respiratory order respectively, and doubts have arisen as to how far these were due to actual alteration in the frequency and fatality of the different diseases, or merely to a change of distribution proceeding from a more minute and correct diagnosis. This question had attracted the attention of the late Dr. Farr, and in his letter to the Registrar-General, in the report for 1862 (pp. 186—8), he showed that in the fifteen years 1843 to 1862 phthisis had diminished sensibly, and though pneumonia had varied little in frequency, bronchitis had increased 50 per cent.; phthisis was most frequent from 15 to 55 years of age, while the great majority of the deaths from respiratory diseases were in children under 5 years of age, and in adults above 55, and the increase in those from bronchitis were almost confined to these periods. From these facts Dr. Farr concluded that the increase of bronchitis "is not due to confusion of nomenclature," and he puts the question, "what has led to the recent increase of mortality from inflammation of the air passages and the air cells of the lungs?" Dr. Longstaff, in his paper "On the recent decline in the English death-rate in connection with the causes of death, based on a comparison of the average mortality of 1876-80 with that of 1861-70," read before this

Society in March, 1884, and published in vol. xlvii of this *Journal*, directs attention to the fact that phthisis had diminished between the ages 5 and 35 to an extent varying from 15 to 28 per cent., whereas *at all these ages the mortality from diseases of the lungs remained comparatively stationary* (p. 226); and for other reasons detailed elsewhere, he inferred that substantially the diagnosis of phthisis from bronchitis corresponds with nature. Again, Dr. Ogle, in his letter to the Registrar-General, on the mortality in the registration districts of England and Wales during the ten years 1871-80, in the Supplement to the 45th annual report (at p. xiv), expresses his belief that the opinion that the apparent diminution of phthisis was due simply to a transference from one heading to another, while the mortality really underwent little change, was probably to some extent true; still, as the registered mortality from phthisis fell at every one of the successive age periods, the registered mortality from diseases of the respiratory organs remained practically unaltered between 5 and 26 years of age, and only rose among children under 5 and among persons over 25, this can hardly be supposed to be the explanation of the whole matter. Dr. Ogle, adds, "how much of the fall in the registered mortality from phthisis was real, and how much was really due to transference, it is impossible to say; but it must be noted that the mortality ascribed to other forms of tuberculosis, with the exception of hydrocephalus, showed no decline."

As the military returns dealt with in this paper embrace data, both anterior, and subsequent to, those referred to in the three communications just noticed, it is necessary to trace the course of phthisis among the civil male population at military ages for a corresponding period. The details are given in Table II in the Appendix for the ages 15—, 20—, 25—, 35—45; the ratios of deaths per 1,000 living at each age for the successive quinquennials mentioned are the following:—

Periods.	Ratio per 1,000 Living.				
	15—	20—	25—	35—45.	15—45.
1838-41.....	3·30	5·45	5·45	5·45	4·97
'50-54.....	2·44	4·12	4·06	4·02	3·71
'55-59.....	2·30	3·95	3·94	3·95	3·58
'60-64.....	2·33	3·93	3·96	3·99	3·60
'65-69.....	2·12	4·06	4·22	4·28	3·73
'70-74.....	1·85	3·43	4·01	4·23	3·47
'75-79.....	1·66	3·05	3·67	4·19	3·23
'80-84.....	1·41	2·54	3·24	3·73	2·81

From this table it appears that phthisis was considerably more

Serving in the United Kingdom from Consumption.

prevalent from 1838 to 1842 than from 1850 to 1854; that in the next quinquenniad it fell a little, and remained practically at the same rate the following one, and, in each of these two, the ratio per 1,000 of deaths was nearly the same in each age-period from 20 to 45, while that at 15 was very close to three-fifths of that at 20. A change is apparent in 1865-69; above 35 the mortality increased considerably, and from 25 to nearly the same extent; there was an increase also from 20, but to a less extent, while at 15 there was an actual decrease. In 1870-74 the high ratio above 35 was continued, but at all previous ages there was a marked decrease of the death-rate. In 1875-79 the rate above 35 began to decline, while the fall continued at the other ages; and finally, in 1880-84 there was a still further fall in the death-rate at all the ages in the table. The marked decrease in the death-rate from phthisis from 1838-42 to 1850-54, while the relative mortality at 15 remained unaltered, shows a general amelioration in the social condition of the population during the interval; but the rise in the rate at ages above 25 in 1865-69, while at 20— the rise was evidently checked, and at 15— there was a sensible decrease, indicates that, with an active cause favouring an increase of mortality, there were other factors in operation with a contrary tendency, the action of which was first apparent among the young, but ultimately became obvious at every age in the table. From the numbers given by the Registrar-General at page lxx of his report for 1870, and in subsequent ones, it appears that the population of England and Wales was distributed between the chief towns, and small towns and country parishes, in the following proportions per cent. :—

	1851.	1861.	1871.	1881.
Chief towns	51·1	54·5	56·9	59·5
Small towns and country	48·9	45·5	43·1	40·5

and as it is well ascertained that residence in towns leads to a much greater mortality from phthisis and respiratory diseases than country life, the gradually increasing excess of the inhabitants in towns must actually have led to an augmented death-rate from these diseases, unless the injurious factors in urban life, which favour their origin, were kept in check by sanitary measures, and improvement in the social condition of the mass of the population. The reduction of the death-rate in recent years seems mainly attributable to hygienic measures, and these have no doubt influenced the occurrence of phthisis as well as other diseases. At the same time the medical treatment of phthisis also has been

more successful than formerly in prolonging life, if not actually in curing the disease in a very large portion of cases. The beneficial operation of these ameliorations would naturally be looked for among the younger part of the population at first, and as it became more diffused its influence would gradually become apparent at more advanced ages, as the table shows it to have done.

The question of how far the reduction of phthisis was referable to transference of deaths from under that head to those for the inflammatory affections of the lungs, was also examined for males of the different ages, for the same period, but to save space the details have not been given here. As regards those between 15 and 45 however—during which period about 65 per cent. of the total deaths from phthisis among males take place, while about 11 per cent. only of the deaths from diseases of the lungs then occur—some notice is necessary. The inflammatory affections include bronchitis, pleuritis, pneumonia, and congestion of lungs; their numbers at the different ages, and in the successive quinqueniads, are given in Table III in the appendix. The following are the results:—

Periods.	Ratio per 1,000 Living.				
	15—	20—	25—	35—45.	15—45.
1838-42.....	0·18	0·29	0·39	0·63	0·38
'50-54.....	0·25	0·41	0·56	1·04	0·58
'55-59.....	0·26	0·44	0·62	1·17	0·66
'60-64.....	0·27	0·46	0·65	1·34	0·70
'65-69.....	0·26	0·45	0·75	1·44	0·75
'70-74.....	0·29	0·45	0·80	1·66	0·84
'75-79.....	0·31	0·52	0·90	1·88	0·94
'80-84.....	0·31	0·49	0·83	1·77	0·88

From these figures it is obvious, the mortality from the inflammatory affections of the lungs, at the ages 15— and 20— was low, and the increase in the successive periods moderate; at 25—, with a higher initial rate, the subsequent increase was greater, and at 35—45 both were still higher. All reached their maximum in 1875-79, and in 1880-84 they showed a distinct reduction except at 15—.

Comparing the ratios in this table with those for the corresponding ages and periods in the previous one, it is found that the reductions in the death-rate from phthisis at 15— and 20— far exceed the increases of the inflammatory affections. At 25—, the reduction of phthisis from 1838-42 to 1855-59 was largely in excess of the increase of the inflammatory affections; in the next two quinqueniads both forms of disease increased, phthisis con-

siderably more than the other; but a fall then commenced, which, in 1875-79 amounted to 0.55, while the ratio for inflammatory diseases had risen 0.15 only. Between 35 and 45, after the great reduction from 1838-42 to 1850-54, phthisis increased during the next four quinquennials by 0.33, the inflammatory affections rising in the same period 0.49, and in 1875-79 there was a further rise in the latter of 0.22, while phthisis declined 0.11. In 1880-84 there was a marked fall in the mortality from the inflammatory affections at all the ages except 15—, accompanied by a much greater fall from phthisis at all the life periods in the table. Taking a general view of these fluctuations, it appears there was a great fall in the mortality from phthisis from 1838-42 to 1855-59; it then showed a tendency to rise, and in 1865-69, reached its highest point since 1842 at the different ages in the table except 15—; in 1870-74 the ratios again declined in a marked manner at all except the most advanced age, in which the decline commenced in the following quinquenniad, and this fall has continued to the last quinquenniad in the table. Accompanying these changes the inflammatory affections of the lungs had presented a pretty regular increase at each age from 1838-42 to 1875-79. In 1865-69, when the phthisis mortality rose, the increase at the age-periods from 20 to 35—45 exceeded the corresponding increase of the inflammatory affections, but when the former was decreasing, the diminution was much larger than the accompanying increase of the inflammatory affections, until in 1880-84 both forms of disease declined together. The obvious inference from these circumstances is that the reduction in the rate of phthisis was not due to transference of deaths from that disease to the inflammatory affections of the lungs.

On proceeding to compare the mortality from phthisis in the army with that among the male population, it must be borne in mind that the numbers under observation, at each age, differ very much from what is found in civil life, and to obtain a proper basis for comparison it is necessary to multiply the strength of the troops (in thousands and fractions thereof), by the ratio per 1,000 of deaths from phthisis among the civil population, of the same age for the corresponding years. The sums of these products for the different age-periods give the number of deaths that would have occurred among males in civil life similarly distributed as to age; but as the ages of those who die in the Army are not given in the returns, these must be treated as a single group, and the death-rate obtained for the whole force. These results are worked out in Table IV for the decade 1837-46, and for the five quinquennials 1860 to 1884. In Table I the deaths from phthisis are given; in the first part of the table the results are for corps

which had passed the whole year at home; these extend from 1860 to 1873; the second part includes all corps which passed any part of the year at home, the strength is the mean of that for the several months of the year, and includes men on detached duty who did not appear in the first part; the deaths are those of all men borne on strength who died during the year, whether with their corps or detached; and it will be seen on reference to the table that the ratios per 1,000 calculated on these different data agree as closely as could have been expected. The men discharged are slightly more numerous in the second than in the first part of the table, and their ratios being calculated from the whole strength, including detached men, are evidently lower than those in the first part where these were omitted.

As many of the men who are discharged for phthisis contracted in the service die of that disease soon afterwards, the numbers so dying should be added to those whose complaints terminated fatally while serving, in order to show how far phthisis is more common among soldiers than in civil life. Unfortunately however there is little information available on this point; allusion was made, at p. 3 to an inquiry into the subsequent history of 305 men pensioned for phthisis and hæmoptysis, of whom 187 had died in sixteen years; allowing half of them or 153 to have died from these affections within a few years after their discharge, the remaining 34 deaths would allow of a very high mortality among the other 152 for sixteen years. In the statistical and sanitary report for the army for 1860, it is mentioned at page 22 that of 57 men discharged from the Foot Guards (apparently in 1860) for tubercular diseases, and whose history could be traced, 15 had been awarded temporary pensions which had ceased at different periods prior to 1st September, 1861, leaving 43 who could be followed up to that date; of these 10 died in 1860, and 14 in 1861, or 24 deaths among 43 individuals, rather more than one half. From these data it seems probable that about a half of the men who leave the service with phthisis or hæmoptysis die of these diseases within a few years of their discharge, and no very serious error will be committed if this conclusion be adopted. Proceeding on this assumption, the following table shows the ratio per 1,000 of deaths which would have occurred among troops serving in this country, calculated at the rate prevailing among the civil male population of corresponding ages, as given in Table IV, and also the actual ratio per 1,000 of deaths, and a half of those discharged, from the second part of Table I.

Periods.	Phthisis in Army at Civil Rates.	Phthisis Observed.		
		Deaths.	Half of Discharges.	Total Deaths.
1837-46.....	5.09	8.53	0.85	9.38
'60-64.....	3.63	3.07	2.70	5.77
'65-69.....	3.81	2.57	2.26	4.83
'70-74.....	3.39	2.43	2.21	4.64
'75-79.....	3.21	2.45	2.22	4.67
'80-84.....	2.70	1.92	1.71	3.63

The first column in this table shows how phthisis would have diminished from the early to the later dates at the ratios observed in civil life, and the ratios per 1,000 differ very little from those among the male population for the same periods, as may be seen by comparing them with Table II. The rise in 1865-69 was caused by an actual advance of the ratios in civil life during the quinquenniad, applied to a higher mean age among the troops than in any of the preceding or following periods, as may be seen in Table IV. The deaths and numbers discharged in 1837-46 were accounted for at the commencement of the paper; they indicate that at that time cases of consumption were retained in the service in the great majority of instances until they terminated fatally. Since 1860 men labouring under this disease have been discharged in much larger numbers after their complaint became manifest, and the actual mortality in the service has been reduced below that in the first column, but, of course, by merely transferring the deaths which occurred subsequently from the army to the civil population; the deaths in the last column, which include the latter, show that, at every period mentioned, service in the army was attended by greater mortality from phthisis than would have been met with among men of the same age exposed to the ordinary causes of that disease in civil life. The decrease in the first column was from 5.09 per 1,000 in 1837-46, to 2.70 in 1880-84, or 47 per cent., while the actual mortality was from 9.38 in the former period, to 3.63 in the latter, or 61 per cent.; or starting from 1860-64, from which there is a continuous record in both columns, the reduction was from 3.63 to 2.70 per 1,000, or 28 per cent., as from the estimated death-rate of 5.77 to 3.63, or 37 per cent., showing in either instance that some progress had been made in reducing the excessive rate formerly met with in the service. When the various

steps by which that diminished rate has been attained are examined, it appears that they did not pursue a parallel course with the changes at civil rates; thus from 3·63 in 1860-64 the ratio rose to 3·81 in 1865-69, and fell again to 3·21 in 1875-79, and to 2·70 in 1880-84; while the estimated mortality, which was 5·77 in 1860-64, fell to 4·83 in 1865-69, to 4·64 in 1870-74, remaining practically at the same rate in the next quinquenniad, and ultimately reaching 3·63 in 1880-84; and it is obvious these reductions were not accidental, as they were divided proportionally between the deaths which took place in the service, and those estimated as taking place after discharge. They indicate the operation of some factor among the troops in 1865-69, and 1880-84, that did not apply, or only partially applied, to persons in civil life at the corresponding periods.

In comparing the rates of mortality in the army from phthisis before 1846 with those after 1860, two points require to be borne in mind and allowed for. The first is that at the former period the troops were quartered in buildings mostly situated in, or in the immediate vicinity of large towns, and were in consequence exposed to the causes of disease affecting urban populations; while by the establishment of the camps at Aldershot, Shorncliffe, Colchester, and the Curragh, country localities, in 1855, a material portion of them exchanged these for the healthier surroundings of rural districts, and so lowered the general death-rate materially. Thus in the quinquenniad 1860-64 the strength and deaths from phthisis were:—

	Aggregate Strength	Deaths from Phthisis.	Ratio per 1,000.
In United Kingdom	435,874	1,337	3·07
„ camps.....	116,019	217	1·87
Remainder of United Kingdom	319,855	1,120	3·50

So that, as compared with 1837-46, the death-rate per 1,000 should be 3·50 instead of 3·07 in 1860-64. The other point is still more important; as mentioned above, the deaths from consumption in the service from 1837 to 1846 were 8·53 per 1,000, and a number equal to one-fifth of that was discharged, of which one half died. From 1860 onwards men affected with phthisis were discharged at an earlier stage of the complaint, and relatively in much larger numbers, so that the deaths in the service were only 3·07, while those discharged amounted to 5·40, of whom it is estimated one half died subsequently of the disease. The following comparison will render the effect of the later practice in reducing the mortality clear:—

	1837-41.	1860-64.
Ratio per 1000 of cases of phthisis....	10'24	8'47
Of these died in the service	8'53	3'07
" after discharge	0'85	2'70
Total	9'38	5'77
Leaving recoveries.....	0'86	2'70
Equal to	$\frac{1}{12}$ th of whole	$\frac{1}{3}$ rd of whole very nearly

Had the cases been retained in the service in the latter period as in the former, it is probable the survivors instead of being nearly one-third of the original cases, might not have amounted to one-sixth or one-eighth of them, or even less, and the deaths of course would have been augmented to a corresponding extent. By Table I, 2,354 men were discharged for phthisis from 1860 to 1864; and assuming that these took place at the camps and in the remainder of the home force in the same proportion as the deaths, there would have been 382 for the former and 1,972 for the latter, or in the ratios of 3'29 and 6'16 respectively. With the ratio of deaths already stated this gives the cases of phthisis for 1860-64, comparable with 1837-46, as $3'50 + 6'16$, or 8'66 per 1,000; and if one-eighth be allowed for those that may have ultimately recovered, a mortality of 7'58 is obtained over the same base and under similar conditions in 1860-64 as in 1837-46, showing a reduction of the rate between these periods of 1'80 per 1,000 instead of 3'60, as in the table, while 1'81, the other half of the decrease in the estimated rate, is mainly referable to residence in the country, and to altered arrangements as to discharge from the service.

In a very able essay on the nature and varieties of destructive lung disease, included under the terms pulmonary consumption, as seen among soldiers, which gained the Alexander Prize in 1872, the author, Surgeon-Major F. H. Welch, then Assistant Professor of Pathology at Netley—a position which afforded the greatest facilities for investigating the question—gave the result of his observations as follows (omitting fractions):—

	Per Cent.
Consumption originating in bronchitis and pneumonia	74
" " with syphilitic taint	10
" due to syphilis or tubercle	11
" originating from pyæmia, embolism, dysentery, } and diabetes	5
	—
	100
	—

("Army Medical and Statistical Report," 1872, p. 287.)

Mr. Welch subsequently refers to vitiated barrack atmosphere,

without or with constriction of chest, as being intimately concerned in the production of the cases in the first group (*ibid.*, p. 357).

The following observations, by the late Dr. Parkes, express the general opinion as to the cause of the high rate of mortality from phthisis in the army: "The now well known fact of the great prevalence of phthisis in most of the European Armies (French, Prussian, Russian, Belgian, and English) can scarcely be accounted for in any other way than by supposing the vitiated atmosphere of the barrack room to be chiefly in fault. This is the conclusion to which the Sanitary Commissioners for the Army came in their celebrated report. And if we must also attribute some influence to the pressure of ill-made accoutrements, and to the great prevalence of syphilis, still it can hardly be doubted that the chief cause of phthisis among soldiers has to be sought somewhere else, when we see that with very different duties, a varied amount of syphilis, and altered diet, a great amount of phthisis has prevailed in the most varied stations of the army and in the most beautiful climates, in Gibraltar, Malta, Ionia, Jamaica, Trinidad, Bermuda, &c. (see history of those stations), in all which places the only common condition was the vitiated atmosphere which our barrack room system everywhere produced. And as if to clench the argument, there has been of late years a most decided decline in phthisical cases in these stations, while the circumstance which has notably changed in the time has been the condition of the air."—("Practical Hygiene," 4th edition, p. 116, 1873. Two editions have since appeared, the last in 1883; in this the above extract still remains.) With the evidence now available the validity of this opinion may be fairly tested.

In October, 1857, Lord Panmure, then secretary for war, appointed a Commission under the presidency of the late Lord Herbert to examine and report on the condition of the barracks and hospitals in the United Kingdom, and to recommend such alterations as they deemed requisite for their sanitary improvement. This Commission reported on these seriatim, indicating the changes in arrangement, ventilation, and occupation they recommended for each. The first report was for the London district, and was dated 8th June, 1858; Portsmouth and Chatham districts were reported on in July, and Woolwich, Maidstone, Manchester, and the South-eastern District in October. Reports on Plymouth and Devonport, the Cork and Curragh districts, Limerick, Exeter, and Bristol followed in February, 1859. Ten reports on other stations were sent in in 1859, five in 1860, and two in 1861. In their general report, dated April, 1861, the Commission gave a return of 162 barracks, containing 5,339 rooms, which were told off for the

occupation of 75,801 men ; on the basis of 600 cubic feet for each man, they recommended the numbers accommodated in these should be reduced to 53,806. In another return the Commissioners show that in 82 of these barracks, told off for 42,589 men, there were "no means of ventilation provided;" in 78 others, told off for 32,541 men, "the means of ventilation were deficient, or defective "in principle and inefficient in operation;" and in one, and portions of two others, accommodating 618 men, "the means of "ventilation provided were correct in principle, and tolerably "efficient in action." Up to 1830, therefore, 56 per cent. of the permanent barrack accommodation in the United Kingdom was without special means of ventilation ; in 43 per cent. of it these had been provided to a varying extent, but in the opinion of the Commissioners to a very inefficient one, and in only 1 per cent., and this in recent buildings, were they at all adequate to provide a change of air sufficient to secure the health of the inmates. To effect the proposed alterations a sum of 45,000*l.* was included in the Army estimates for 1859, and a further sum of 50,000*l.* in those for 1860. It would thus be May or June, 1859, before the alterations were commenced, and their influence on the frequency of phthisis in 1859 could scarcely be appreciable. The improved means of ventilation were introduced very generally in 1862, though the reduction of the number of occupants had not been effected to the extent recommended at that date.

Reverting now to the remarks on the decrease of mortality from phthisis from 1837-46 to 1860-64, it appears that in permanent barracks (excluding camps) a fall of 1·80 per 1,000 occurred in twenty years before the improved ventilation was introduced, while from 1860-64 to 1875-79, a period of fifteen years after its introduction, the fall was 1·10 per 1,000 only, and this was not a progressive reduction, becoming apparent as the increased ventilation took effect, for the ratios for 1863 and 1864 were both higher than that for 1860. The ratios for the single years in the quinquenniad, however, are rather irregular, but when taken for 1860-61, and 1862-63, these fluctuations disappear, and, with that for 1864, and 1865, the first year of the next quinquenniad, they stand as follows :—

	1860-61.	1862-63.	1864.	1865.
Ratio per 1,000	5·80	5·83	5·56	4·84

So that the rates per 1,000 of deaths in 1864, the third year after the improved ventilation had been in operation, was but 0·24 under that for 1860-61, while the fall in 1865 was 0·72 or three times

greater, and the mean for the whole quinquenniad was 4·83. There was a further decrease of 0·19 in the next quinquenniad, and the ratio remained the same the following one. These facts do not support the inference that the improved ventilation had any marked influence on the mortality from phthisis, while they indicate the operation of another factor in 1865, under which the death-rate remained practically the same for the following fourteen years. No one doubts that adequate ventilation exerts a beneficial influence on the health, but the facts just stated show that the reduction in the mortality in the army from phthisis since 1846 must have been due in the main to other causes, and that the effect of the improved ventilation on it has been much overrated. The fall in the mortality of 1·04 per 1,000 from 1875-79 to 1880-84 has not been included in that connected with the preceding period, as the ventilation had been almost completed by 1862, and the death-rate from phthisis in the three following quinquenniads had remained practically the same; the cause for the abrupt reduction in 1880-84 must therefore be sought for elsewhere.

That men in the army suffer more from phthisis than if they had remained in civil life is unquestionable, and this is intimately connected with their customs and occupation. When a civilian is about to undergo any considerable exertion he takes off part of his clothing, and when the work is over he replaces the garments he had previously removed, and thus obviates the chance of a chill. A soldier, on the contrary, has to undergo his chief exertion not only in his complete dress, but, until late years, with impervious belts over his chest and back, and often with a knapsack as well, which offer additional impediments to the full escape of the cutaneous exhalations; when dismissed from parade he commonly removes his accoutrements, and very often his coatee as well, and follows his avocations with nothing but a shirt over the chest and back, which is often soaked with perspiration, thus exposing himself to a chill, and if he have any disposition to weakness of the lungs, renders it active by frequent repetition of this practice. Formerly, when linen or calico shirts only were worn, the evil effects of this proceeding was frequent; when they became manifest medical officers were accustomed to recommend the individual to use flannel under the usual shirt, but the mischief had already taken place, and this was but a palliative. There was a very general feeling among experienced medical officers fifty to sixty years ago, that it would be advantageous to substitute flannel for linen shirts, and one regiment, the 85th, actually wore these; but the health of this corps was not thought so very different from that of others in which linen only was worn as to render it advisable to sanction the general substitution of flannel. Estimates

of disease in those days, however, were quantitative rather than qualitative, a large mortality attracting attention, while the particular diseases which caused it received less consideration, and the material the 85th had in wear being a heavy one, much nearer a light blanket in texture than the shirts in use at present, there were practical difficulties in the way of its adoption which no longer apply. The employment of flannel shirts in place of linen or calico became frequent during the Crimean war, and the experience then gained led to their occasional use in the army since; and at last, in 1864, their employment received official sanction, a measure which has materially reduced the chances of a chill following the exposure so frequently occurring. It is to this substitution of flannel for linen or calico shirts in 1864, that the great reduction of the death-rate from phthisis in 1865 and subsequently is mainly attributable.

Another article of dress which influenced the soldier's health was his trousers. Up to 1823 these were of woollen material, but that year white trousers were introduced for summer wear, and for warm climates. These of course had to be washed frequently and were often put on while damp, and seldom with any under clothing, thus offering another chance of chill, which was by no means inoperative; these continued in use until 1846, when a light woollen material was substituted for the linen, which did not require such frequent washing, and which afforded the wearer greater protection from a chill during the ordinary cool weather in summer. Since that date a light woollen material has continued to be employed for summer wear in this country, and in most of our colonies, instead of linen, much to the soldier's comfort and benefit. The medical returns for the home service do not extend back far enough to enable the influence of these changes on the progress of consumption to be traced, but those for the foreign stations of the army do, and the result is a very striking one. Table V at the end gives the deaths from phthisis and chronic catarrh (under the heading of phthisis) for the Mediterranean, American, and West Indian stations, for the Cape of Good Hope, and for Mauritius and Ceylon for 1817-24, before the full introduction of white linen trousers, and for 1825-30, and 1831-36, after that event; corresponding facts are given for the Mediterranean and American stations for 1837-46, for which only the returns were published. The figures for the Cape for this period were extracted from the records in the principal medical officer's office there by myself. Neither the deaths of invalids from phthisis after leaving the station, nor the numbers ultimately discharged, are available up to 1836. The deaths of invalids from phthisis on the passage, and at home, are given for 1837-46, but not the numbers ultimately

discharged from the service; these have not been included in the table, as they would have marred the comparison with the previous periods. From 1859 to 1873, under the altered nomenclature, phthisis and hæmoptysis are included under the term phthisis, and as the more detailed form of the published returns showed the deaths on the passage, and at home until ultimate disposal, and the numbers actually discharged for these diseases, the former are included with the deaths on the station, and their numbers and those of men discharged are given in Table V for these years. Corresponding facts for the period 1879-84 have been added to bring up the information to the latest date.

Up to 1824 a considerable number of men were discharged from the service, partly on reduction of establishment, partly for disability; the figures in the reports include both these in the same sum without any explanatory remark; from 1825 the numbers from each station discharged from the service for medical reasons are given, and the classes of disease for which they were invalided are specified, phthisis being included among the pulmonary affections. As the deaths from phthisis on the stations were materially influenced by the fluctuations in the amount of invaliding from pulmonary affections, these have been inserted in Table V for the periods from 1825 to 1846.

The following statement shows the ratios per 1,000 of deaths from phthisis on the station, in the undermentioned groups of colonies up to 1846, as far as available, and of the total deaths and half the numbers discharged for that disease after 1859, as given in table V :—

Stations.	1817-24.	1825-30.	1831-36.	1837-46.	1859-73.	1879-84.
Mediterranean	3·22	2·86	5·11	4·20	3·29	2·18
American	3·67	5·11	5·98	4·69	3·20	2·78
West Indian.....	7·33	6·71	8·60	—	3·42	2·14
Cape of Good Hope } and Natal	2·27	1·86	2·84	2·48	3·09	1·35
Mauritius and Ceylon	2·81	2·47	4·68	—	3·80	3·20

The ratios per 1,000 discharged the service for pulmonary affections from these stations from 1825 to 1846, as far as recorded, were as under :—

Stations.	1825-30.	1831-36.	1837-46.
Mediterranean	5·25	1·94	4·71
American	4·19	4·08	4·69
West Indian	3·21	2·30	—
Cape and Natal	2·74	1·61	—
Mauritius and Ceylon	1·80	1·80	—

How far the mortality from phthisis on the stations previous to 1824 was influenced by men labouring under that disease in its earlier stages being sent home and discharged the service, it is impossible to say, but the fall of the ratios of deaths in 1825-30 at the Mediterranean and West Indian Stations, and the Cape, at all of which the invaliding for pulmonary affections was high, and its marked rise at these stations from 1831 to 1836, when the pulmonary affections sent home were largely reduced, seems to indicate the occurrence of such a vicarious influence; while at the American stations, where there was little alteration in the frequency of discharge for pulmonary affections from 1825-30 to 1831-36, there was a very marked rise of mortality from phthisis in the first of these periods, which increased still more in the following one, this does not seem to have been in operation.

The ratio of mortality from phthisis on the station diminished sensibly in the period 1837-46, both in the Mediterranean, American, and Cape stations. Unfortunately there are no details in the statistical reports for the interval between 1847 and 1859, after the linen trousers ceased to be worn, but, from information from the source already mentioned, it appears that at the Cape, with an aggregate strength of 72,357, there were only 126 deaths from phthisis, or 1.74 per 1,000, showing that even in that healthy climate the change to woollen material was followed by a decided reduction of the death-rate. The remarkable approximation of the death-rate from phthisis at the different stations from 1859 to 1873 could scarcely have been anticipated from the earlier experience, and the ratios though including the deaths up to the date of discharge, and half the men discharged, are, in the case of the American and Mediterranean stations, actually less than those for 1837-46, which embraced neither. It may be mentioned that the ratio of deaths merely for the Cape for 1859-73, though including several on the passage and at home, was 1.76 per 1,000 only, or practically the same as for the previous thirteen years.

The reduction of mortality from phthisis in 1880-84 differs from that in any previous quinquenniad in its amount, in being experienced in the Army as well as in civil life, and in being accompanied in both by a very marked diminution in the mortality from all causes. The following results, from Table II, show the progressive alteration in the ratio of deaths from all causes, and from phthisis, among the males aged 15 to 45 in England and Wales, in the successive quinquenniads, and the percentages of the former due to phthisis:—

Periods.	Ratios per 1,000.		Percentage of Total Mortality Due to Phthisis.
	All Causes.	Phthisis.	
1838-42	9·86	4·97	50·4
'50-54	9·73	3·71	38·1
'55-59	9·28	3·58	38·6
'60-64	9·45	3·60	38·1
'65-69	9·98	3·73	37·4
'70-74	9·74	3·47	35·6
'75-79	9·00	3·23	35·9
'80-84	8·11	2·81	34·6

From this table it is obvious that in 1838-42 phthisis was not only more frequent than in any subsequent quinquenniad, but produced a larger percentage of the general mortality. From 1850-54 to 1865-69 the ratio of deaths from all causes did not vary much, and that for phthisis fluctuated but slightly, this disease for the twenty years causing about the same percentage of the death-rate from all causes. In 1870-74 the general death-rate commenced to fall, and in the next two quinquenniads this continued, and became more pronounced; the ratio of phthisis diminished now more rapidly, so that while in 1865-69, with a death-rate from all causes of 9·98 per 1,000, 3·73 or 37·4 per cent. of it was due to phthisis, in 1880-84, with a ratio of 8·11 per 1,000 from all causes, 2·81 or 34·6 per cent. of it only was attributable to phthisis. Though some of this improvement is without doubt due to improved medical treatment, yet accompanied as the reduction of phthisis has been by mortality from all causes, both must in the main be referred to amelioration of the social condition of the general population and their surroundings, caused by the more general adoption of sanitary measures since 1870.

In forming a comparative statement to the above for that portion of the Army serving in the United Kingdom, it is necessary to include the deaths of men discharged for phthisis with those from all causes which occurred before discharge, to bring them up to the numbers really attributable to service in the army. This has been done in Table VI in the appendix. The results are given in the following abstract, which shows the ratios per 1,000 of deaths from all causes among the troops in the United Kingdom, including those from phthisis after discharge, with the estimated ratio of deaths from phthisis, and the percentage of total mortality due to phthisis at the different periods mentioned. A column, the

data for which are given in Tables II and IV, has been added to show what the deaths from all causes would have amounted to with the varying ages of those serving at the rates among the civil population :—

Periods.	Ratios per 1,000. All Causes among Troops. Military Ages. Civil Rates.	Ratios per 1,000.		Per Cent. of Total Mortality due to Phthisis.
		Total Deaths attributable to Service.	Deaths, Phthisis, Estimated.	
1837-46.....	9·61	17·95	9·38	52·3
'60-64.....	8·76	11·60	5·77	49·7
'65-69.....	9·41	10·96	4·83	44·1
'70-74.....	9·05	10·72	4·64	43·3
'74-79.....	8·54	10·00	4·67	46·7
'80-84.....	7·25	8·29	3·63	43·8

Owing to the varying distribution of ages in the army, the ratios of mortality from all causes, in the first column, deviate very much from those in civil life, though calculated at the same rates for each age. Taking 25 as the dividing point, the ages of the troops in the successive periods were :—

	Under 25.	Above 25.
	Per cent.	Per cent.
In 1837-46.....	52·0	48·0
„ '60-64.....	56·5	43·5
„ '65-69.....	44·2	55·8
„ '70-74.....	50·3	49·7
„ '75-79.....	53·9	46·1
„ '80-84.....	57·0	43·0

Thus, with one exception, more than half the troops were under 25 years of age. In two periods, 1860-64 and 1880-84, the excess under 25 was about identical, 57 per cent. being under that age, and 43 above it; in the exceptional case, 1865-69, the proportion was reversed, 44 per cent. only being under 25, and 56 above that age.

Though the mortality among the troops in 1837-48 was almost double that among males in civil life between 15 and 45, the percentage of it caused by phthisis was nearly the same; and, in 1860-64, though the total deaths among the troops were only about two-thirds of those in the previous period, the percentage due to phthisis was but little altered. In the quinquenniad 1865-69, when the mortality from all causes in civil life, and that from phthisis, reached their highest point since 1850, there was a marked decrease in the former among the troops, and a still greater one in the ratio

of phthisis, which then constituted 44·1 per cent. of the total mortality instead of 49·7 as it had done the previous quinquenniad; and, with a rapidly declining mortality from all causes in subsequent periods, the percentage due to phthisis has continued to fluctuate about the same point.

Had the mortality from all causes, and from phthisis, in 1860-64, and in 1865-69, been proportional to those derived from the age distribution of the troops in these periods with the rates for the same in civil life, they would have been in the ratio of 8·76 to 9·41, instead of being almost exactly the reverse. As has been explained fully above, a new factor came into operation in 1864 which not only neutralised the influence of the advance of age in the next five years on the mortality from all causes, but actually effected a considerable reduction of it, and at the same time in the percentage of phthisis embraced in that mortality. Since 1869 the mortality from all causes according to the military ages and civil rates has fallen at an accelerated ratio until the difference between the last two quinquenniads was 1·31 per 1,000; in the service the total mortality has pursued a similar course, the ratio being sensibly higher, but the difference between those for 1875-79 and 1880-84 being 1·71, and phthisis constituting about the same percentage of the whole as the 1865-69.

The course of phthisis at the colonial stations of the army since 1859 as given above, merits notice before closing this paper. I endeavoured to form a table for these similar to Table VI, comparing the results for the period 1859-73 with that for the United Kingdom from 1860-74, and the period 1879-84 for the former with 1880-84 for the latter; but on going into the matter, it appeared that while in the Mediterranean and American stations, and at Mauritius and Ceylon, there was a decided reduction of deaths from all causes as well as from phthisis in the second period, in the West Indian, owing to epidemics, the total mortality in the second period exceeded that in the first by 42 per cent., and at the Cape, in consequence of the extensive field operations since 1879, the ratio of deaths from all causes, even after excluding those killed in action, was 84 per cent. greater than from 1859-73, yet in each instance there was a very marked reduction of the mortality from phthisis in the second period. Inferences drawn from such discrepant materials would be very unsatisfactory, but a comparison between the actual ratios of mortality from phthisis as derived from Table V, without reference to the deaths from all causes, will afford both interesting and useful information. Thus the ratio per 1,000 of deaths from phthisis—

	In First Period.	In Second Period.	Percentage of Reduction.
Was among troops in United Kingdom.....	5·07	3·63	28·4
" on the foreign stations, } specified in Table V	3·28	2·08	36·6

So that with a considerably lower rate for the foreign stations from 1859 to 1873 than in the United Kingdom in the corresponding period, the reduction for the foreign stations in 1879-84 was 36·6 of the previous ratio as against 28·4 of that in the United Kingdom. These facts justify the inference that the influences which led to the striking diminution among both the civil population and the troops in the United Kingdom, from 1880 to 1884, must have been active also in those colonies where the troops were quartered. It is sufficient on this occasion to have brought out this circumstance clearly, leaving it for future investigation to indicate in detail what these beneficial influences are.

APPENDIX.

TABLE I.—Strength, and Deaths from Phthisis and Hæmoptysis, and Numbers Discharged for these Affections, among the Troops Serving in the United Kingdom; 1st, as given in Abstract I of the Medical and Statistical Reports, embracing Corps which had been at Home the Whole Year only; and 2nd, the Average Strength at Home during the Year, from the Adjutant-General's Returns, with the Total Loss by Death and Discharges from these Affections from the Medical and Statistical Reports.

Years.	Strength, Deaths, and Discharges for Phthisis and Hæmoptysis as given in Abstract A Medical and Statistical Reports.			Strength from Adjutant-General's Returns, with Total Deaths and Numbers Discharged, for Phthisis and Hæmoptysis, from Medical and Statistical Reports.		
	Strength.	Died.	Discharged.	Strength.	Died.	Discharged.
1860	83,386	322	351	97,703	332	351
'61	81,500	276	624	93,470	290	624
'62	76,029	239	491	85,398	281	491
'63	70,819	179	435	80,908	223	439
'64	63,153	161	444	78,395	211	449
Sums	374,884	1,177	2,345	435,874	1,337	2,354
Ratios per 1,000.	—	3·14	6·26	—	3·07	5·40
1865	62,911	123	421	80,045	174	426
'66	59,758	147	366	79,654	201	372
'67	62,901	183	325	83,131	236	330
'68	68,350	187	283	84,979	237	296
'69	68,962	175	412	81,542	206	422
Sums	322,882	815	1,807	409,351	1,054	1,846
Ratios per 1,000.	—	2·52	5·60	—	2·57	4·51
1870	70,131	200	428	84,848	253	436
'71	87,142	194	371	100,877	231	393
'72	85,722	196	423	99,307	231	443
'73	77,530	170	379	95,767	211	394
'74	—	—	—	93,114	224	429
Sums	320,525	760	1,601	473,913	1,150	2,095
Ratios per 1,000.	—	2·37	5·00	—	2·43	4·42
1875	} No return			92,802	252	379
'76				92,781	263	390
'77				97,610	220	473
'78				105,006	192	507
'79				84,380	232	350
Sums	—	—	—	472,579	1,159	2,099
Ratios per 1,000.	—	—	—	—	2·45	4·44
1880	} No return			87,843	172	339
'81				87,992	195	320
'82				90,075	178	341
'83				85,960	146	277
'84				86,013	149	218
Sums	—	—	—	437,883	840	1,495
Ratios per 1,000.	—	—	—	—	1·92	3·41

TABLE II.—Mean Annual Deaths from all Causes, and from Phthisis and Hæmoptysis, among Male Population in England and Wales for the Ages 15—45, for the Periods mentioned, with their Ratios per 1,000 Living at each Age, and the Percentage of Deaths from Phthisis to those from all Causes.

Period.	Ages.	Mean Annual Numbers Living.	Mean Annual Deaths.		Ratios per 1,000.		Percentage of Phthisis on all Causes.
			All Causes.	Phthisis and Hæmoptysis	All Causes.	Phthisis and Hæmoptysis	
1838-42 ...	{ 15— ...	770,304	5,577	2,541	7·24	3·30	45·6
	{ 20— ...	714,775	6,676	3,893	9·34	5·45	58·4
	{ 25— ...	1,158,266	11,490	6,307	9·92	5·45	54·9
	{ 35—45 ...	860,493	10,825	4,688	12·58	5·45	43·3
Sums and ratios.....		3,503,838	34,568	17,429	9·86	4·97	50·4
1850-54 ...	{ 15— ...	885,174	6,090	2,164	6·88	2·44	35·5
	{ 20— ...	803,407	7,311	3,310	9·10	4·12	45·3
	{ 25— ...	1,328,586	12,967	5,397	9·76	4·06	41·6
	{ 35—45 ...	1,026,266	12,972	4,122	12·64	4·02	31·8
Sums and ratios.....		4,043,433	39,340	14,993	9·73	3·71	38·1
1855-59 ...	{ 15— ...	942,546	6,070	2,168	6·54	2·30	35·2
	{ 20— ...	839,252	7,184	3,317	8·56	3·95	46·1
	{ 25— ...	1,371,459	12,782	5,406	9·32	3·94	42·3
	{ 35—45 ...	1,092,484	13,372	4,311	12·24	3·95	32·3
Sums and ratios.....		4,245,741	39,408	15,202	9·28	3·58	38·6
1860-64 ...	{ 15— ...	975,791	6,167	2,271	6·32	2·33	36·9
	{ 20— ...	870,165	7,379	3,419	8·48	3·93	46·5
	{ 25— ...	1,422,881	13,432	5,631	9·44	3·96	41·9
	{ 35—45 ...	1,152,415	14,797	4,598	12·84	3·99	31·1
Sums and ratios.....		4,421,252	41,775	15,919	9·45	3·60	38·1
1865-69 ...	{ 15— ...	1,033,443	6,304	2,186	6·10	2·12	34·8
	{ 20— ...	881,733	7,830	3,579	8·54	4·06	47·5
	{ 25— ...	1,512,427	15,457	6,384	10·22	4·22	41·3
	{ 35—45 ...	1,196,098	16,554	5,117	13·84	4·28	30·9
Sums and ratios.....		4,623,701	46,145	17,266	9·98	3·73	37·4
1870-74 ...	{ 15— ...	1,111,632	6,403	2,055	5·76	1·85	32·1
	{ 20— ...	975,676	7,942	3,346	8·14	3·43	42·1
	{ 25— ...	1,616,796	16,362	6,487	10·12	4·01	39·6
	{ 35—45 ...	1,256,857	17,596	5,322	14·00	4·23	30·2
Sums and ratios.....		4,960,961	48,303	17,210	9·74	3·47	35·6
1875-79 ...	{ 15— ...	1,192,886	6,036	1,981	5·06	1·66	32·8
	{ 20— ...	1,044,034	7,350	3,180	7·04	3·05	43·3
	{ 25— ...	1,725,714	15,704	6,330	9·10	3·67	40·3
	{ 35—45 ...	1,342,662	18,663	5,622	13·90	4·19	30·1
Sums and ratios.....		5,305,296	47,753	17,113	9·00	3·23	35·9
1880-84 ...	{ 15— ...	1,285,662	5,914	1,818	4·60	1·41	30·7
	{ 20— ...	1,125,165	6,841	2,853	6·08	2·54	41·8
	{ 25— ...	1,850,736	15,102	5,995	8·16	3·24	39·7
	{ 35—45 ...	1,440,674	18,383	5,378	12·76	3·73	29·2
Sums and ratios.....		5,702,237	46,240	16,044	8·11	2·81	34·6

TABLE III.—Mean Annual Deaths from Bronchitis, Pleurisy, Pneumonia, and Congestion of Lungs among Male Population in England and Wales of the Ages 15—45, for the Periods mentioned, with their Ratios per 1,000 Living at each Age.

Period.	Ages.	Mean Annual Deaths.				Ratios per 1,000 Living.				Sums of Preceding Four Columns per 1,000 Living.	Phthisis per 1,000 Living.
		Bronchitis.	Pleurisy.	Pneumonia.	Congestion of Lungs.	Bronchitis.	Pleurisy.	Pneumonia.	Congestion of Lungs.		
1838-42	15—	7	16	116	—	0·01	0·02	0·15	—	0·18	3·30
	20—	11	24	174	—	0·02	0·03	0·24	—	0·29	5·45
	25—	32	48	368	—	0·03	0·04	0·32	—	0·39	5·45
	35—45	58	53	427	—	0·07	0·06	0·50	—	0·63	5·45
Sums and ratios } per 1,000.....		108	141	1,085	—	0·03	0·04	0·31	—	0·38	4·97
1850-54	15—	49	20	151	—	0·06	0·02	0·17	—	0·25	2·44
	20—	83	34	214	—	0·10	0·04	0·27	—	0·41	4·12
	25—	235	65	442	—	0·18	0·05	0·33	—	0·56	4·06
	35—45	450	77	533	—	0·44	0·08	0·52	—	1·04	4·02
Sums and ratios } per 1,000.....		817	196	1,340	—	0·20	0·05	0·33	—	0·58	3·71
1855-59	15—	58	21	157	13	0·06	0·02	0·17	0·01	0·26	2·30
	20—	99	35	221	13	0·12	0·04	0·26	0·02	0·44	3·95
	25—	292	62	450	35	0·21	0·05	0·33	0·03	0·62	3·94
	35—45	591	73	555	51	0·54	0·07	0·51	0·05	1·17	3·95
Sums and ratios } per 1,000.....		1,040	191	1,383	112	0·25	0·05	0·33	0·03	0·66	3·58
1860-64	15—	60	21	172	13	0·06	0·02	0·18	0·01	0·27	2·33
	20—	103	35	244	13	0·12	0·04	0·28	0·02	0·46	3·93
	25—	330	62	508	32	0·23	0·04	0·36	0·02	0·65	3·96
	35—45	745	78	668	50	0·65	0·07	0·58	0·04	1·34	3·99
Sums and ratios } per 1,000.....		1,238	196	1,592	108	0·28	0·04	0·36	0·02	0·70	3·60
1865-69	15—	60	22	165	19	0·06	0·02	0·16	0·02	0·26	2·12
	20—	93	29	245	23	0·11	0·03	0·28	0·03	0·45	4·06
	25—	384	76	597	58	0·26	0·05	0·40	0·04	0·75	4·22
	35—45	810	77	741	80	0·68	0·07	0·62	0·07	1·44	4·28
Sums and ratios } per 1,000.....		1,347	204	1,748	180	0·29	0·04	0·38	0·04	0·75	3·73
1870-74	15—	67	27	204	18	0·06	0·03	0·18	0·02	0·29	1·85
	20—	88	39	287	28	0·09	0·04	0·29	0·03	0·45	3·43
	25—	388	87	739	79	0·24	0·05	0·46	0·05	0·80	4·01
	35—45	942	89	954	103	0·75	0·07	0·76	0·08	1·66	4·23
Sums and ratios } per 1,000.....		1,485	242	2,184	228	0·30	0·05	0·44	0·05	0·84	3·47
1875-79	15—	66	34	241	20	0·06	0·03	0·20	0·02	0·31	1·66
	20—	103	46	375	23	0·10	0·04	0·36	0·02	0·52	3·05
	25—	406	98	944	83	0·24	0·06	0·55	0·05	0·90	3·67
	35—45	1,022	111	1,283	112	0·76	0·08	0·96	0·08	1·88	4·19
Sums and ratios } per 1,000.....		1,597	289	2,843	238	0·30	0·05	0·54	0·05	0·94	3·23
1880-84	15—	58	44	277	17	0·05	0·03	0·22	0·01	0·51	1·41
	20—	76	46	406	19	0·07	0·04	0·36	0·02	0·49	2·54
	25—	316	106	1,053	56	0·17	0·06	0·57	0·03	0·83	3·24
	35—45	860	119	1,475	95	0·60	0·08	1·02	0·07	1·77	3·73
Sums and ratios } per 1,000.....		1,310	315	3,211	187	0·23	0·06	0·56	0·03	0·88	2·81

TABLE IV.—Showing the Ages of the Troops serving in the United Kingdom for the periods mentioned, and the Deaths which would have occurred from Consumption among those at the rates prevailing among the Civil Male Population of the same Ages. The column headed 35— includes the very small number of men aged 45 and upwards remaining in the service.

Period.	Remarks.	Ages.				Sum of Ages.	Ages.	Total Strength	Rates per 1,000 for Consumption in Civil Male Population.	Corresponding Number for Troops.
		15—	20—	25—	35—					
1837 to 1846	Numbers specified in medical returns.....	44,144	92,503	89,394	36,680	262,721	15—	44,809	3.30	148
		44,809	93,897	90,741	37,233	266,680	20—	93,897	5.45	512
	The above corrected to total strength ... 266,680	44,809	93,897	90,741	37,233	266,680	25—	90,741	5.45	495
							35—	37,233	5.45	203
	Per 1,000.	168	352	340	140	1,000	Sums	266,680		1,358
							Ratio per 1,000 for Troops		5.09	
1860 to 1864	Numbers specified in medical returns.....	74,282	141,722	130,804	35,153	381,961	15—	84,767	2.33	197
		84,767	161,726	149,266	40,115	435,874	20—	161,726	3.93	635
	The above corrected to average strength in adjutant-general's returns 435,874	84,767	161,726	149,266	40,115	435,874	25—	149,266	3.96	591
							35—	40,115	3.99	160
	Per 1,000.	194	371	342	98	1,000	Sums	435,874		1,583
							Ratio per 1,000 for Troops		3.63	
1865 to 1869	Numbers specified in medical returns.....	59,188	87,413	148,753	36,111	331,465	15—	73,096	2.12	155
		73,096	107,953	183,706	44,596	409,351	20—	107,953	4.06	438
	The above corrected to average strength in adjutant-general's returns 409,351	73,096	107,953	183,706	44,596	409,351	25—	183,706	4.22	775
							35—	44,596	4.28	191
	Per 1,000.	178	264	449	109	1,000	Sums	409,351		1,559
							Ratio per 1,000 for Troops		3.81	
1870 to 1874	Numbers specified in medical returns.....	70,055	87,329	117,800	37,417	312,601	15—	106,206	1.85	196
		106,206	132,394	178,588	56,725	473,913	20—	132,394	3.43	454
	The above corrected to average strength in adjutant-general's returns 473,913	106,206	132,394	178,588	56,725	473,913	25—	178,588	4.01	716
							35—	56,725	4.28	243
	Per 1,000.	224	279	377	120	1,000	Sums	473,913		1,609
							Ratio per 1,000 for Troops		3.39	
1875 to 1879	Numbers given in adjutant - general's annual returns, corrected to average strength in same ...	77,818	171,907	173,724	85,130	472,579	15—	77,818	1.66	129
		77,818	171,907	173,724	85,130	472,579	20—	171,907	3.05	524
		77,818	171,907	173,724	85,130	472,579	25—	137,724	3.67	505
							35—	85,130	4.19	357
	Per 1,000.	165	364	291	180	1,000	Sums	472,579		1,515
							Ratio per 1,000 for Troops		3.21	
1880 to 1884	Numbers given in adjutant - general's annual returns, corrected to average strength in same ...	74,815	174,247	141,288	47,533	437,883	15—	74,815	1.41	105
		74,815	174,247	141,288	47,533	437,883	20—	174,247	2.54	443
		74,815	174,247	141,288	47,533	437,883	25—	141,288	3.24	458
							35—	47,533	3.73	177
	Per 1,000.	171	398	323	108	1,000	Sums	437,883		1,183
							Ratio per 1,000 for Troops		2.70	

TABLE V.—Strength, and Deaths from Phthisis, at undermentioned Stations, and Numbers Discharged from Service for Pulmonary Affections Contracted at them, from 1817 to 1846; also Deaths at the Station, on Passage Home, and in this Country from Phthisis, and the Numbers Discharged from Service for same Disease between 1859 and 1873, and 1879 and 1884.

Stations.	1817-24.			1825-30.			1831-36.			1837-46.			1859-73.			1879-84.		
	Aggre- gate Strength	Phthisis, Died on Station.	Pul- monary Affec- tions, Dis- charged Service.	Aggre- gate Strength	Phthisis, Died on Station.	Pul- monary Affec- tions, Dis- charged Service.	Aggre- gate Strength	Phthisis, Died on Station.	Pul- monary Affec- tions, Dis- charged Service.	Aggre- gate Strength	Phthisis, Died on Station.	Pul- monary Affec- tions, Dis- charged Service.	Aggre- gate Strength	Died.	Dis- charged Service.	Aggre- gate Strength	Died.	Dis- charged Service.
Gibraltar.....	20,214	47		20,894	65	120	19,161	126	35	33,131	124	170	72,843	89	318	27,450	27	47
Malta	15,774	70		12,320	35	77	12,732	65	48	21,172	107	97	80,111	183	269	27,973	40	60
Ionian Islands ..	26,763	85		23,775	63	102	19,753	74	17	26,201	107	112	21,128	27	61	—	—	—
Sums	62,751	202		56,989	163	299	51,648	265	100	80,504	388	379	174,082	249	648	55,423	67	107
Ratio per 1,000	—	3.22		—	2.86	5.25	—	5.11	1.94	—	4.20	4.71	—	1.48	3.72	—	1.21	1.93
Bermuda.....	2,854	14		3,742	25		5,125	42		11,224	67	50	21,219	43	72	9,948	11	21
Nova Scotia	18,766	77		14,138	66		13,538	76		26,866	144	124	27,703	40		10,009	15	38
Canada	28,742	94		18,993	97		16,635	93		90,456	392	429	97,156	149		—	—	—
Sums	50,362	185		36,783	188	154	35,298	211	144	128,486	603	603	146,078	282	471	19,957	26	59
Ratio per 1,000	—	3.67		—	5.11	4.19	—	5.98	4.08	—	4.69	4.69	—	1.59	3.22	—	1.30	2.95
Windward and } Leeward Is. } Jamaica	31,131 20,159	246 180		26,292 15,433	205 75	90 44	29,238 15,975	256 133	77 27	No } } No	return return	{ {	14,504 9,464	27 16	48 30	5,365 5,365	5	13
Sums	51,290	876		41,725	280	134	45,213	389	104				23,968	43	78	5,365	5	13
Ratio per 1,000	—	7.83		—	6.71	3.21	—	8.60	2.30				—	1.79	3.25	—	0.98	2.42
Cape of Good } Hope & Natal } Ratio per 1,000	11,033	25		10,222	19	28	8,089	23	13		67	—	56,929	100	151	38,703	27	50
	—	2.27		—	1.86	2.74	—	2.84	1.61		2.48	—	—	1.76	2.65	—	0.70	1.29
Mauritius	9,903	35		9,056	21	23	11,556	61	30		return	{	19,791	42	58	2,194	1	4
Ceylon	18,553	45		12,027	81	15	12,398	51	13		return	{	13,652	35	42	5,790	14	17
Sums	28,456	80		21,083	52	38	23,954	112	43		return	{	33,443	77	100	7,984	15	21
Ratio per 1,000	—	2.81		—	2.47	1.80	—	4.68	1.80		return	{	—	2.30	2.99	—	1.88	2.63

Not specified in Returns

TABLE VI.—Showing the Strength, Deaths from all Causes in the Service, and Half the Men Discharged with Phthisis among the Troops in the United Kingdom; also the Percentage of the Total Mortality due to Phthisis at the undermentioned Periods.

Periods.	Aggregate Strength.	Deaths in Service, all Causes.	Ratios per 1,000.				Percentage of Total Mortality due to Phthisis.
			All Causes in Service.	Half Men included discharged for Phthisis.	Total Deaths attributed to Service.	Estimated Deaths from Phthisis.	
1837-46	266,680	4,561	17.10	0.85	17.95	9.38	52.3
'60-64	435,874	3,881	8.90	2.70	11.60	5.77	49.7
'65-69	409,351	3,560	8.70	2.26	10.96	4.83	44.1
'70-74	473,913	4,034	8.51	2.21	10.72	4.64	43.3
'75-79	472,579	3,678	7.78	2.22	10.00	4.67	46.7
'80-84	437,883	2,880	6.58	1.71	8.29	3.63	43.8

DISCUSSION *on* DR. LAWSON'S PAPER.

THE CHAIRMAN (Sir Rawson W. Rawson, K.C.M.G., C.B.) said, that not very long ago a paper was read by Mr. Humphreys showing how the length of life among the civil population had increased during the last quinquennium, and he thought they were now very much indebted to Dr. Lawson for bringing out the fact that there had been a general decrease of the fatal influence of phthisis both in the civil population and the army. In the early period mentioned in the paper the disease appeared to have proved fatal in more than 2,000 cases out of 2,400. That was about 83 per cent., so that more than four-fifths proved fatal. A number of these were discharged, and more than half of them died from it in civil life. The evidence brought forward showed that not only in civil life but also in the army a very great improvement had taken place with regard to the treatment and incidence of the disease. A great part of this result had been brought about by better sanitary arrangements in the barracks and in the soldiers' clothing. When he was in the Barbados the barracks there were at one time occupied by two regiments and a wing, and it was proved that only about one regiment could be maintained there in health. On one occasion he went into an abandoned room and saw where the soldiers used to sleep in hammocks in double tiers. The room was only about 9 feet or 10 feet high, and yet the men had had to sleep in tiers one above the other. It was therefore no wonder that the mortality among them had been great.

Dr. LONGSTAFF said the subject was one of extreme intricacy and difficulty. Some time ago he was asked to write upon it, but on looking into the matter he came to the conclusion that the difficulties were altogether too great for him to deal with. He therefore respected the great courage of Dr. Lawson who had taken in hand such a gigantic business. He was not prepared to endorse all the deductions that had been drawn from the figures, mainly because he thought that the foundations upon which they were built were somewhat uncertain. To compare military with civil statistics was objectionable because of one inherent fallacy which ran throughout the whole of the figures. Civil statistics were only an approximation to accuracy; still, they applied to a very large population, and they were calculated by the whole aggregate mass of the medical practitioners of the country. Very different was it with regard to military statistics. The population they dealt with was small, was constantly being changed in sudden and remarkable ways, and above all was a selected population; while the statistics were calculated by a specially selected class of medical men, who probably had on the average a better knowledge of their patients than the ordinary medical practitioner of the country.

Dr. Lawson had not alluded to the method of recruiting. Until perhaps very recently the materials from which the army was drawn had not been a fair sample of the people of the country. In past times notoriously, and still to a great extent it was recruited from the lowest ranks of the population. Then, owing to the number of men voted by the House of Commons varying from year to year, the rigidity with which the medical officers rejected recruits varied considerably. Political and financial considerations led to a more strict selection at one time than at another, as also did the fluctuations in the state of the labour market and the excitement of impending war. Invaliding too, and selection of men for foreign service, varied at different times, and when there was a large number of the men at home they would probably have a higher average state of health than when there were fewer. Dr. Lawson took the men by ages, but as regarded the group 15—20, there were in the civil population more men of the age of 15 than of 16, and 16 more than 17, the fewest being 19; whereas in the army it was notoriously the reverse. He was pleased to find that Dr. Lawson bore out the substantial distinction in diagnosis between phthisis and inflammatory diseases of the lungs. The foundation for the allowance for the number of deaths of men discharged was very insufficient. It appeared to rest on following up the subsequent history of two small groups of pensioners. That was no doubt all that was available, but it was hardly fair to infer from the number of deaths of pensioners in 1860 that there would be the same proportion in 1870, and still less in 1880. If men were invalided in an early stage of the disease the mortality would be comparatively small, while if from political exigencies few were discharged, the mortality among that few would be comparatively large. It did not appear to him correct to compare the deaths of invalids during sixteen years after discharge with the total strength of five years. It did not appear, either, that the scale of discharges would be the same in town and in camp. *A priori* he should be disposed to consider that at Aldershot, where the men would have to do more rigorous duty than in a town, the medical officers would be more apt to discover their weakness. It was very disappointing that Dr. Lawson should be of opinion that the admirable suggestions of Lord Herbert's commission, and the important alterations that subsequently took place in the way in which troops were quartered, had very little effect on the mortality from phthisis. He was disposed to think that their influence had been considerable. In consequence of improved housing it had been found that the West Indies had become a very healthy station, instead of having consumption more prevalent there than anywhere else. Notwithstanding these criticisms, he fully appreciated the very great difficulties under which Dr. Lawson had laboured, and the great pains and care which he had bestowed on the subject.

Captain DOUGLAS GALTON, R.E., C.B., LL.D., &c., said he was not prepared to speak on the paper, as it was one which contained much matter, and which required much examination; and he had

only heard it read that evening; but he certainly was somewhat surprised at its very sweeping conclusions, that the sanitary improvements which were introduced into barracks in consequence of the efforts of Lord Herbert of Leigh, had not been so effectual in diminishing phthisis as they had commonly been considered to be. It was very difficult to trace exactly the particular results to be attributed to various sanitary improvements. It would be more conclusive if it were possible to select some particular class of soldiers who inhabited continuously particular barracks, such as the Guards, and observe the effects upon them. He thought, however, that they would never be able thoroughly to appreciate what was done by sanitary improvements until the Army Medical Department made a register of each barrack and barrack room separately, stating the diseases which occurred there; because, of course, a barrack had some rooms which were healthy and others which were unhealthy. They were all very much indebted to Dr. Lawson for the immense care and pains he had taken in preparing the paper. When it was carefully studied, some reply might possibly be made to it; but he had not had the opportunity of reading it before the meeting, and it was so very intricate that he would not like to make any detailed criticism upon it at the present time.

Deputy Surgeon-General MARSTON, M.D., said that if the deductions and propositions that Dr. Lawson had put forward were true, he had altogether abolished the *raison d'être* of the sanitary and statistical officers of the War Office; while if the propositions were false, the statistical part of the paper went to the wall. It was quite impossible offhand to criticise such a paper, bristling as it did with statistics and ratios. He took the following as very striking evidence of what sanitation in the army had accomplished. At the time of the Crimean War there was a great number of men at Chatham with a form of ophthalmia associated with granular lids, and in Gibraltar and Malta he saw the same thing; and he came to the conclusion that the eyelid of a soldier was an extremely delicate test of the hygienic condition in which he lived. It was hardly conceivable that flannel shirts should have any effect upon ophthalmia. This disease, which had in the past caused an enormous amount of inefficiency and invaliding, had been practically eradicated by increased space and ventilation in barracks. It occurred to him to mention too that in 1860 the ventilation of ironclads was extremely imperfect, and there was an outbreak of pulmonary disease on board the ironclads at Malta at that time that might well be accounted for in that way. In Afghanistan too he found that if the men lived in solid huts and hospitals which were overcrowded, they became peculiarly liable to pulmonary disease, so much so that they were better when living in the open air, though the climate was extremely cold. Medical officers even came to the conclusion that pneumonia was to a certain extent infectious, because healthy men who attended to their sick comrades were attacked by the disease out of all proportion to the others. His explanation was that the men

rendered themselves much more vulnerable by living in confined and heated atmospheres, and then going out and exposing themselves to the cold, rather than that the prevalence of the disease was attributable to infection. With regard to the influence of ventilation on epidemic diseases, he might mention a fact in connection with small pox. In Jamaica there had recently occurred 2,217 cases of small pox, divided between an urban population at Kingston and a rural population. In the former case the mortality was 17·5, and in the latter 7·3 per cent. of those attacked. The same effect was noticeable in the case of cholera. In a cantonment in Bengal the British troops were affected as a rule out of proportion to the native troops, who were much more spread out, and the officers were somewhere between the two; but when on service in the field all classes were equally affected; and if, as was done years ago, the native troops were conveyed up the Ganges and crowded together in flat bottomed boats, they died of cholera in a much greater proportion than British soldiers in cantonments. Even if the results were due only to the contagious nature of the disease, the nearer the units were to one another the greater the likelihood of any contagion spreading. The evils of overcrowding were in a geometrical ratio to the numbers breathing a common atmosphere under one roof; in other words, one man with 200 or 300 cubic feet of air would be in less danger than if he was one of fifty men with 500 or even 1,000 cubic feet each. Fifty years ago the statistical method was first applied to the army. The mortality was then 17 per 1,000, while in the Guards it was 20; at the present time it was about 5 per 1,000. He was aware that a great deal of hasty generalisation and exaggeration had been indulged in with regard to sanitation; but everybody knew that if people had better houses, air, food, and clothing, their health and strength improved, and their liability to disease diminished. Everything which favourably affected the environment of people was in reality sanitation, and a great deal had undoubtedly been done in that direction in the army.

Dr. W. H. LLOYD, R.N., said that in the navy the death-rate from phthisis had considerably gone down during the period referred to in the paper. Though of late years great changes had taken place with regard to ships, ventilation had, as far as possible under the circumstances, kept pace with them.

Dr. Walter DICKSON, R.N., expressed his admiration of the great industry shown by Inspector-General Lawson in his most valuable paper. He himself was connected with the navy for twenty-one years, and phthisis was then undoubtedly prevalent among seamen serving in England, but when they were at sea abroad, the fatality among them was very little as compared with the civil population of this country. Sailors had a great immunity from pulmonary diseases. He had had great experience of the tropics, and for many years he saw very little of phthisis, but in a civilian force of about 1,000 men in London of whom he had had charge for the last twenty-five years, the deaths from phthisis

averaged 4 per annum, or 33 per cent. of the whole mortality, and at the mean age of 41 years. In that service few of such cases were invalided. But in the army most consumptive patients were invalided at an early stage of their illness, to linger on for months or even years in workhouses and hospitals or in their families till the inevitable end. He therefore thought that the army and navy statistics of death from chronic disease were not to be relied upon. He had no doubt that phthisis had diminished a good deal from the greater care taken in recruiting. Thirty-four inches round the chest was a very high standard, and auscultation was probably more attended to. A great improvement had also taken place in the sanitary condition of the troops; their barracks, food, and clothing were all better than formerly; but more important still was the increased care and facility for occupying and improving their minds. Libraries and rational exercises and amusements contributed greatly to promote the health of the army, and ought to diminish the amount of phthisis just as similar improvements were likely to diminish it among the civil population. He was surprised that Dr. Lawson had omitted to refer to one subject with which he was perhaps more conversant than anyone else, namely, the diminution for a time at least of venereal diseases, which were a very important factor in developing phthisis among young soldiers. Those Contagious Diseases Acts with which Dr. Lawson was so well acquainted, had, he believed, had a considerable share in diminishing the amount of phthisis. Now that the Acts were abolished, it would be found that not only venereal diseases but also phthisis would increase in an astonishing way, both in the army and also among the civil population in those towns left unprotected. The treatment of those diseases even had a very lowering effect, and he was quite convinced that it tended to increase the risks of phthisis among the young men of whom the army was mainly composed, and many of whom had a hereditary predisposition to that most fatal of all diseases.

Mr. LAWSON (in reply) said that Captain Galton seemed to be under the impression that he objected to sanitary measures. He could quite understand that idea was reached in consequence of the frequent change of subjects in the paper interfering with the clear perception of each, but he agreed that ventilation was beneficial to health, and in several places he had pointed out that the recent reduction in the mortality from phthisis was to a large extent due to the better sanitary conditions. Still, though there was more attention paid to the ventilation for a certain period, very little alteration was observed till flannel shirts were adopted, and then there was an immediate change. Dr. Longstaff seemed to think that statistics with regard to the army could not be reliable because there were so many changes in the men, but those changes were taken into consideration, and if they were not to deal with them statistically, farewell to any advance whatever. Dr. Longstaff also seemed to think that there was now a great difference in regard to the strictness with which recruits were selected; but he (Mr. Lawson) had known the army for fifty years and had not seen

much change in the class of recruits. The numbers rejected had formed a pretty constant quantity whether the recruits were wanted or not. There might have been some slight changes, but not particularly great ones. Some misapprehension seemed to prevail with regard to invaliding. The men who were invalided for consumption had almost all been under treatment for some time, in most instances for months, by their medical officer, and afterwards they had to go before a board of medical men who examined them and decided on their case. Another point referred to was the uncertainty of the estimate of the number dying after being invalided for consumption. There were only two actual records that he (Mr. Lawson) could put his finger upon, but it should be remembered that if men suffering from confirmed consumption, with a variable amount of lung substance destroyed, were sent into civil life, the number of deaths among them must at all events be about equal to what was found among an equal number of people who contracted phthisis in civil life, and whose cases are equally advanced. Most medical men would agree that his estimate of one half dying under such circumstances was not beyond the reality. With regard to the enormous mortality in former years in the West Indies, there were other points besides ventilation to be taken into account. The men who went there had salt provisions five days a week; they were in places where a great deal of malarial fever prevailed, and from an examination he had made of the returns from 1817 to 1836 for the West Indies forty years ago (*"Edinburgh Medical and Surgical Journal,"* vol. lxxx), it was evident that salt provisions and frequent fever increased the deaths from consumption greatly. These conditions, together with the drinking of rum, to a large extent led to the enormous mortality, and had a much greater effect than the barracks. The barracks in Barbados to which Sir Rawson Rawson had alluded, were built about the beginning of the century, and were not equal to the other barracks since erected there; but men lived in them and enjoyed tolerably good health. They, however, indulged in rum instead of supper, and had to do a great amount of pack drill in the sun. These things combined with fever prepared the way for phthisis. So far from decrying sanitary measures, he was a strong supporter of them, but he differed from Captain Galton as to the degree of beneficial influence attributable to ventilation.

The CHAIRMAN said he was sure they would all join with him in thanking Dr. Lawson for his valuable paper, which had provoked so interesting and profitable a discussion.





