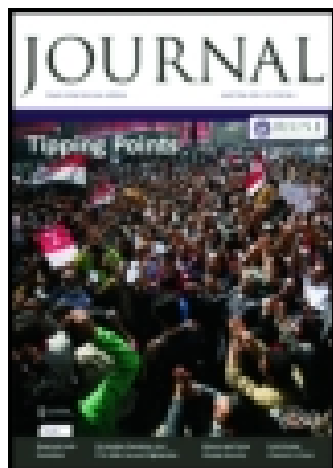


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The Principles of Military and Naval Hygiene Requisite for Practically Improving the Sanitary Condition of British Soldiers and Sailors at Home and Abroad

Dr. Bird F.R.G.S.

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And, to counteract the tendency of the modern rifle to retard the operations of a siege, it seems to be necessary—

1st. To collect in time of peace such plans and such reports as may be required in time of war.

2ndly. To provide in time of peace a sufficient supply of professional diggers, who may be available in time of war.

3rdly. To train these professional diggers to the use of screens and mantlets carefully adapted to conceal and protect them from rifle fire.

4thly. To provide a besieging army in future with far larger supplies of gabions and other entrenching materials than they have ever had before, and to depend less upon obtaining them at the scene of operations.

Wednesday, April 21st.

COLONEL THE HONOURABLE J. LINDSAY in the Chair.

THE PRINCIPLES OF MILITARY AND NAVAL HYGIENE
REQUISITE FOR PRACTICALLY IMPROVING THE
SANITARY CONDITION OF BRITISH SOLDIERS AND
SAILORS AT HOME AND ABROAD.

By DR. BIRD, F.R.G.S.

THE two former Lectures which I delivered in this Institution on the principles of medical geography—first, in their relation to climatic influence from the equator to the poles; and second, the practical application of those principles, or the measures necessary for neutralising hurtful agencies, among soldiers and seamen in all climates—had for their object a general review of the external and internal causes which maintain or injure the health of military and naval masses under all circumstances, but more especially in foreign climates. But just in proportion as each individual profession, apart from the general principles of hygiene, exerts a special influence on those who follow it, so the military and naval professions, of which the conditions are so various, present in this respect subjects of special interest, quite distinct from those of public hygiene, of which they are, however, only branches scientifically cultivated, in the lumi-

nous and laborious works of military medical authors, before public hygiene had even an acknowledged place or existence. "Public hygiene," says Dr. Levy, "a science born but yesterday, requires, like medical statistics, general facts, authentic figures, positive data, which, when compared, grouped, and elaborated by intellect, conducts to the discovery of the regulating laws of society. Private hygiene, limited to the body's organic structure, investigates the several parts of the human frame placed under the influence of modifying agents. Social hygiene embraces a class of men, a community, a nation—the whole human race. It is not satisfied with approximations, with which the other is often obliged to be content, in studying all the material, intellectual, and moral influences which affect the social body, not only with the object of its common preservation, but also for the end of improving our species in all their conditions of existence. It is doubtless far from possessing the materials necessary for settling all the questions which come within its domain, but statistics have worked it out, in the hands of the active and ingenious, by means of numerous documents that lie dead and scattered through collections and works little familiar to the generality of medical men, and by deductions of the highest importance they have made, and which cannot be contradicted by future researches. The fit time has then come for bringing together and arranging the results, in order to concisely sketch out a plan of social hygiene." But neither can social, military, nor naval hygiene be ever effectually worked-out, or efficiently applied for improving the health and condition of those classes whom they concern, without requisite executive authority and means being delegated to those who, by their intellectual acquaintance with sciences of which hygiene is but tributary, can rightly comprehend the sources of disease in various situations, or duly apply such knowledge for the removal of its preventible causes. The practical labours of the scavenger and engineer are merely means to an end in scientific hygiene, which, borrowing materials from anatomy, physiology, meteorology, and physics, assimilates them for the purposes of induction, and converges them to its sole end—the prevention of disease.

It is necessary that hygienic art, in order to be sound and efficient in application, should have its foundation on scientific sanitary

principles, well investigated, and not on vague and hap-hazard notions of the origin of disease and the causes of insalubrity. Both military and naval hygiene then, in their widest acceptation, while seeking to discover the sources of unhealthiness among soldiers and seamen, both at home and abroad, necessarily embrace in their investigations the geographico-meteorological agencies of tropical, temperate, and polar zone conditions, with the attendant circumstances of varied dietetic means, the state of the body's excreting organs, the operation of varied kinds of dress and effects of bathing, the moral and intellectual influences, the effects of active and sedentary employments, the physical results of exercise, and the generation of specific contagious or infectious diseases. It will at once be evident that to secure the proper investigation of such things, and to obtain the correct deduction of sanitary principles, a high position must be assigned to medicine in the sanitary councils of the Army and Navy, and to those capable of elaborating these principles, to whom also must be conceded authority necessary for carrying them into practical effect.

Hygiene, both in its theoretical and practical aspects, is all-important to mankind in their several relative positions; being not only the most valuable but main end of medical science, namely, the prevention of disease, and the diminution of mortality at all ages. But, under some of its numerous subdivisions, as the subjects of food proper for persons of different habits and ages, different climates and seasons, or different states of health, along with the influence of climate, seasons, and situation on age and disease, a scientific knowledge of hygiene and its principles has an all-important value and utility, in the executive departments of curative as well as preventive medicine. Yet no one would dream of withholding from the practical physician any portion of his therapeutic authority and means necessary for the due administration of his scientific skill; while every day's experience shows us, that, both in this country and abroad, and more particularly in the departments of the Army, the elaboration of scientific principles of hygiene is left to the medical profession, while the executive department of prevention is almost exclusively confided to laymen, who must necessarily be only partially, if at all, familiar with the recondite

principles of scientific hygiene. The evils of such a system, or the entire subordination of medical officers to the military and civil elements, and the entire negation of medical counsel, have been frequently manifest in the executive departments of our own Army; but they are yet more striking in the details of Dr. Scriver's *Medico-Chirurgical History of the French Campaign in the Crimea*. Here the sanitary condition and mortality of the French army, of which more than ten from twenty thousand soldiers, admitted for typhus, died during the months of January, February, and March, 1856, may well entitle us to ask why should this mortality have happened among the soldiers of a nation whose medical officers, as a body, have written on hygiene, in all its subdivisions, more elaborately and well than those of any other nations of Europe; and are, perhaps, more thoroughly acquainted than we are with its scientific principles? Typhus affected nine-tenths of all the patients who passed through the field hospitals, and nine-tenths of the mortality occurred from typhus alone. The stifling condition of the places where the sick were first treated was frightful; the sick were much overcrowded, and destitute of everything necessary for their comfort, in the huts, tents, and transports; there were no trained attendants, and such as were supplied were inadequate to the performance of duties imposed on them. The medical officers were insufficient in number for the duties that devolved on them, and being, as we learn from other sources than Dr. Scriver's History, both overworked and unsupported, looked on helplessly with all their knowledge in carrying out sanitary protection against preventible disease. And why should this be so? Mainly, we believe, because the medical officers of the French army had not at their disposal sufficient executive means for maintaining the sanitary condition of the soldiers, and because their position was such as could not enforce obedience to their orders, under a bad system of medico-military organisation, that strictly confines their duties and authority to the curative part of their profession, while they are subordinate, in all that concerns the art of prevention, to the Civil Department of the Army, the "Intendance Militaire."

These observations have for their object to place before you the mischief of separating sanitary science from sanitary art, in the organisation of health executive departments, where either ignorance

of the science of life and of health, or, what must be equally disastrous in result, knowledge without executive means to guard against hurtful agencies, must end in wasteful expenditure of the lives of our soldiers, both at home and abroad. Conviction of this truth brings me to the main subject of this lecture, namely—that the principles of military and naval hygiene, comprehensively investigated and satisfactorily reduced to proof by the numerical method, wherein statistical figures become exponents of results, are the only sure means of practically improving the sanitary condition of our soldiers and sailors, both at home and abroad. Selected, as our army departments are, from the picked and healthy part of the community, we might expect that, if ever sanitary science had favourable materials to work with for the prevention of disease, it would surely find them existing in the army; and that here, apart from the casualties of the battle-field and transition to foreign climates, we would naturally find a minimum of mortality. How different from this, however, are the results lately developed in the highly interesting and instructive Report of the Commissioners appointed to conduct an inquiry into the sanitary condition of the British Army. We are here made familiar with the fact, that the mortality of our soldiers at home is double that of civil life, and that the ratio of mortality among the Guards is only equalled by that of those who follow “the most unhealthy of town occupations.” Some of our great army surgeons were long ago familiar with this truth—that the unhealthiness of men in the army exceeds that of the civil population. The high ratio of military mortality, however, is not peculiar to the British Army alone. The causes that produce such results, and are complicated in operation, are not quite so obvious as the result; but the Commissioners endeavour to arrive at a knowledge of them by grouping together certain statistical data, from which deductions are made.* Some of these may be well called in

* The Sanitary Commissioners, reasoning on the causes of Military Mortality, have given too little attention to the aggregation of circumstances and employments which make up the excess of military mortality; and by assuming, like Archimedes, a point on which to stand, or certain hypothetical comparisons, as between the “night duty” of the Police and the Guards, without sufficiently testing the soundness of their comparison, by allowing for the greater number discharged and invalided in the former corps, and the longer retention by the

question, I think, as resting on insufficient data; while other concurrent sources of disease and mortality, as change from native climates and habits, overgrown stature, irksome weight of the accoutrements, unsuitable nature of the clothing to neutralise the influence of climate and season, the want of proper means of bathing, and still more the unvaried nature of the diet, are but partially considered, and not yet reduced to the strict investigation of the numerical method. The varied morbid elements of the economy, which are engendered by inattention to, and neglect of, such things, should never be lost sight of in any system of investigation to trace the causes of military mortality; as the real and practical end of hygiene is to modify original or acquired constitutional actions, and to neutralise hurtful agencies. The real conservative power of each individual constitution is indicated by the facility with which the organism adapts itself to the influence of new agencies and circumstances; and the degrees of physical energy, with which it is capable of resisting the causes of disease, mark the greater or less perfection of its formation, and the proportion of its vitality. It is here that the interference of hygiene enables the body to accommodate itself to changed conditions, and to resist morbid influences.

The secret agencies, both internal and external, which exercise a fatal influence over the health of our soldiers are many and complicated, and can only be ascertained by physiological investigations into the condition of the bodies acted on, aided by a comprehensive and searching application of the numerical method, to supply the exponent statistical figures and results. It is in no caviling spirit of complaint, therefore, that I notice these deficiencies and want of completeness in the Report of the Sanitary Commissioners on the British Army, to whose intelligence and practical labours both the army and the country are deeply indebted. The Commissioners trace the main causes of disease to—night duty; want of exercise and suitable employment; intemperate and debauched habits; crowding and inefficient ventilation; and nuisances from sewerage of barracks. Among these causes of mortality, prominence is given, and justly, to the last. The cubic breathing-space allowed by the engineer department for each man in barracks is from 400 to 500

latter of chronic cases of disease on their muster-rolls, have arrived at some very startling conclusions in their Report.

feet; but in many of our English barracks even the minimum quantity is not secured. I have already in a former lecture pointed out that Tregold, on Ventilation, deems 600 feet necessary for the preservation of health, and that 800 should be adopted as a minimum for temperate climates, and 1,000 for that of tropical ones.

In contending for the introduction of sound principles of hygiene into our military establishments, it is but justice to some of the regimental commanders, and also the health department of such regiments, to notice, that, in some of the unsparing remarks made on those who are assumed to possess means of prevention, a knowledge of the laws of mortality, applicable to the stature, habits, and profession of soldiers, has been entirely overlooked. But, in estimating the ratio that military mortality bears to that of the civil population, it would be only justice to take into consideration all the inseparable conditions of soldiers which determine their mortality. The statements of the low ratio of military health, in connection with intemperance, imperfect sewerage, and ill-ventilated barracks, are certainly somewhat overstated, when other unsalutary professional agencies have been scarcely noticed or taken into account. The aggregation of circumstances and employments makes up the general excess of professional mortality: and here it is a just remark of Mr. Neison, on Vital Statistics, that disparity of professional health is more attributable to the sedentary nature of employments, than to the peculiar local influences on health, that are within the scope of public sanitary measures. The military profession in all countries, as Dr. Levy remarks, augments the mortality, and lessens the average of life. The soldier's sudden disruption, on enlistment, from all his former habits; his separation from all the former influences of locality, climate, and associations; with dietetic restriction to unvaried forms of diet, and want of daily bodily exercise, exert a fatal power in impairing his health. Just in proportion, too, as his stature, weight, and bodily vigour may have been better or worse developed in the place of his nativity, according to the greater or less amount of pure air, nourishment, and comfort obtainable, so will the absence of all these exert a proportionably fatal influence; and those originally most healthy become, under altered conditions, very susceptible of disease. Mr. Neison, in his contributions to

Vital Statistics, states the expectation of rural over city life, from the ages of 20 to 40, as being from one-ninth to one-tenth greater. It is not generally men of the largest stature, or those endowed with most muscular powers, who are the most healthy or the longest lived: and in reference to the high ratio of mortality in the Guards, 20·4* per 1,000, this element has scarcely obtained proper consideration. Mean stature and weight may be taken as that which is generally associated with most bodily vigour. Dr. Levy, in his valuable and scientific treatise on public and private hygiene, remarks, that average stature is coincident with a generally healthy constitution, and *vice versa*. The picked men of the Engineers, Artillery, Sappers and Miners, of the French army, are nearly one-tenth larger in stature than those of the Infantry of the Line. Those select corps are not only less sickly, but have a smaller proportion of death, than the Infantry: and it is impossible, says Professor Levy, to look along the Lines without being struck with the difference of these two classes of troops. The very tall men, or Grenadiers, are, however, much less vigorous than the short thick-set men of the Light Cavalry, Chasseurs, and Voltigeurs.

That the military profession augments the rate of mortality, and in direct ratio to the average mortality of the civil populations of France and England, may be seen by reference to Table III. The rate of mortality, per 1,000, among the civil population of England, is less than that of the Continental States generally. The average rate of English mortality among civilians of the army-age, according to the Registrar-General's Report, is 9·2 per 100, and in the country alone 7·2. General Tulloch has taken the average somewhat higher than this: but, on comparing the civil mortality of England and France, this bears a striking relative proportion to the mortality of the English and French armies, indicating that the military mortality of both is relatively dependent on the peculiar influences of military life. It is important to know, however, that causes of professional unhealthiness can be lessened, by securing for those subject

* This ratio of mortality is the average of all ages, from 20 to 40, given in Sir Alexander Tulloch's Second Return, Appendix LXI. being the results from 1st April, 1837, to 31st March, 1847; but in Appendix LV. prepared from the War-office Returns, from 1st April, 1839, to 31st March, 1851, the mortality of the Guards is only 19·5; but from 1826 to 1836, or 11 years, the average of Cavalry and Dragoon was only 9·57, and of Line Infantry 11·0 per 1,000.

to their influence greater degrees of comfort from good diet, suitable clothing, means of cleanliness, airy apartments, and regular exercise.

I have thus briefly touched on some of the peculiar circumstances which render military service, at home, unpropitious to health: and though much may yet be done to improve the condition of the soldier, to render him less susceptible of attacks from zymotic diseases, and lessen the rate of his mortality, by judicious application of sound principles of hygiene, I am not sanguine enough to believe that this rate can ever be brought so low as that of civil life, or of the Navy; in which branch of the service there ought to be no endemic sources of disease; the hygienic arrangements are so improved, and the rate of mortality brought so low, as to leave scarcely anything to be desired or hoped for, as long as the now-applied principles of naval hygiene are continued and maintained. I concur, however, in opinion with the Sanitary Commissioners, that the present rate of mortality in the Army is not unavoidable, and that the proper application of sanitary science, to the condition of troops at home, may be followed, though not to the same extent, by similar satisfactory results as have followed their application abroad.

On the subject of applying hygienic principles for improving the sanitary condition of soldiers abroad, whether in peace or in war, I have yet a few observations to offer additional to those made in my last year's lecture, and since printed in the Journal of the United Service Institution.

The population of every country, and also of every district, bears unmistakeable impressions of the places inhabited, and of the customary climate and seasons; things not unknown to Hippocrates, who observes, "that where the weather is most changeable, and the difference between one season and another is greatest, there the habits, customs, and natures of the people will be found most at variance." Such differences seem connected with differences of physiological condition, as pointed out in my first lecture on the geography of disease; and are inseparably associated with a higher or lower rate of mortality according to the local circumstances of soil, mephitic marshes, less or greater elevation and latitude, drainage, diet, and modes of living, or social and moral habits. In tropical and warm climates the average of human life, under equal circumstances; is short; but in northern elevated countries it is greater.

Insular maritime climates possess the conservative influence of the more elevated and cold northern ones. M. Moreau de Jonnes gives the following table, quoted by Dr. Levy, respecting the average mortality according to latitude:—

From	0° to 20° of latitude,	1 death to 26 of the population.
„	20° to 40° „	1 „ 35.5 „
„	40° to 60° „	1 „ 43.2 „
„	60° to 70° „	1 „ 50 „

In France, also, the difference in the average mortality of its southern and northern provinces, which is as 1 in 33 of the population to 1 in 44, shows the immense influence which climate exercises in the distribution of mortality, independent of the original physiological conditions of various races.

I endeavoured to explain in my former lecture the action of hot climates on the body of the newly-arrived European, and its physiological results. These may be stated briefly to be, 1. the elevated temperature of the body; 2. the depressed rhythm of the circulation and respiration; 3. the dilatation of both solids and fluids; 4. debility of the digestive power, and of the locomotive organs, external and internal; 5. superabundant exudation of perspiration, and concurrent concentration of other secretions; 6. congestion of blood in the liver and spleen; 7. nervous irritability, followed by greater or less degrees of pallor and bloodlessness.

Changes in the physiological condition of European constitutions, marked as these are under transition from temperate to tropical climates, must of course be followed by a corresponding increase of military sickness and mortality, more particularly in times of war, when, from the overcrowded and ill-ventilated state of the transports, improper or salt diet on shipboard, the exposure and privations incident to predisposed and unacclimated masses in new localities, multiply the foci of disease, and exalt the rate of mortality. In every country the native races are more healthy than recently-arrived strangers, whose constitutions, before acquiring adaptation to differences of latitude, climate, and locality, necessarily undergo certain physiological changes that become main causes of disease and mortality among troops recently removed to new climates. But, when the transference of masses is accompanied by inattention to their diet and want of ventilation on shipboard, the ratio of sickness

and mortality becomes greatly increased. Our own military medical histories of expeditions and wars, from 1795 to 1810, supply us with many illustrations of these truths; and Dr. Scriver, in his *History of the French Army in the Crimea*, recognises over-crowding, and the want of comfort for the troops on shipboard, as no small element of their future sickness and mortality.

Intemperance and debauchery aggravate the evils of transference in all climates; but the causes of increased mortality in hot climates, and among men between the ages of 20 and 40, are not to be sought for solely in dissipated habits, but in noxious influences of locality and climate.

Assistant-Surgeon Balfour, of the Madras Army, justly observes, that if individual imprudence, and not climatorial influence, caused the increased ratio of mortality in India, how is it that the best-paid, best-lodged, most abstemious and temperate of Indian residents, the members of the civil service, present a high rate of mortality? While the average mortality in England from 1801 to 1832 was only 9·1 per 1,000—

The Madras Civilians lost 23·8 per 1,000.			
The Bengal	„	25·1	„
The Bombay	„	31·7	„

The increased mortality of English civilians, officers, and soldiers in India and our colonial possessions, indicates that climatorial influences are at work there which are detrimental to health and longevity. Some of these results, and similar ones among our more temperate French neighbours, are presented to you in Table V. The average increased military mortality of hot climates, compared to that at home, may be stated as 4 to 1. A diminution of this mortality may be effected by suitable food and drink, improved dress and lodgings, increased facilities for bathing, and regular exercise. But, as the causes which exercise so fatal an influence on life are climatorial, all are incapable of removing the great disparity that must still exist between the ratio of mortality at the equator and the 70th degree of north latitude.

From the Statistical Reports on the Health of the Navy, we learn the important truth, that, under a well-administered system or physical and moral sanitary management, sea-life has a general healthful influence. The remarkably small rate of mortality in the

Navy, even within the Tropics, compared with the Army, may, as General Tulloch concludes, be partly attributable to the facilities for invaliding sailors and sending away cases of protracted illness or of doubtful recovery, and to the comparatively short duration of the seaman's service. But we are still presented with the fact that the sailor's pursuits are relatively more salubrious than those of the soldier, and that under the same climatorial influences, apart from terrestrial agencies and those of locality, the relative annual ratio of mortality of the latter compared with the former was as 69·8 to 17·3 per 1,000. The mortality of the Navy from 1830 to 1836, and throughout every region of the globe, was only 11·8 per 1,000 of the force annually, while thirty years ago the mortality was 31 per 1,000. The diminution is justly attributed to abundant nutritious food, wholesome palatable water, personal cleanliness, comfortable clothing, reduced allowance of spirits, afternoon meal of tea, small monthly payments of money, provision for mental improvement and recreation, and better built ships with better capacity for ventilation. These happy results may be well thought a source of proud satisfaction to the health department of our Navy, whose hygienic arrangements and medical skill have enabled it to accomplish so much.

But, though all may concede the necessity that young medical officers, both in the Army and Navy, should be familiar with those principles of military and naval hygiene that qualify them for the task of preventing as well as curing disease, many differ in opinion as to the best manner of conveying the requisite information on these all-important subjects. We have no properly organised system in our medical schools for teaching the scientific rules and precepts relating to social hygiene, or the preservation of the public health, and to the means best adapted to the removal or diminution of the fatal influence of numerous causes of disease; yet few will deny that a well-established course of instruction there, on the theory and practice of preservative medicine, is as necessary for training good practical medical men, as the present system of teaching solely the curative part of medicine and surgery.

Admitting that good medical military and naval officers can only be formed in military and naval hospitals, or from practice in the midst of fleets and armies, still such a course of instruction on social hygiene, taught in our medical schools, would perfect and prepare

those destined for the Army and Navy for storing their minds with the more specific and useful knowledge of their duties, which they might afterwards obtain at military and naval hospitals. Such a practical training for either a military or naval career requires the assistance of military and naval medical guide-books, such as supplied to the medical officers of the French army and navy. These treat of the organisation and duties of the medical officers, and the means of preserving the health of soldiers and seamen. They are still desiderata for the medical departments of our Army and Navy; and, though we have had a wide field of observation and experience in various quarters of the globe, this country can claim but a small share of that military medical literature of which our French neighbours may be justly proud.

But while the disastrous events which have of late riveted the world's attention to India, and given rise to the necessity of accumulating in that country military masses of unacclimated Europeans, it is at least matter of congratulation, if not of triumph, for the progressive appreciation of sanitary knowledge among military commanders, that no fearfully destructive epidemic diseases have been allowed, either through ignorance or neglect, to exaggerate the other inseparable evils of war. Though these disasters have necessarily interrupted our intercourse with Indian medical contributors to the subject of military epidemic diseases within the tropics, it is, at the same time, incumbent on me to here notice, that, amidst all the marching, hardships, and exposure experienced by our troops there, no considerable outbreak of epidemic cholera has yet appeared among the newly-arrived regiments from Europe. How different were the results among our soldiers and seamen sent to the West Indies at the commencement of the last war, when, after predisposition to disease in ill-ventilated transports, and the influence of improper diet, drink, and want of personal cleanliness, both were allowed to perish from fevers and dysenteries of the most deadly type, brought into destructive action by ill-selected sites of encampment and unsuitable clothing, with bad barrack and hospital accommodation. Under skilful attention to the diet and drink, the dress and bathing, the barrack and hospital accommodation of our soldiers and seamen, the terrors of sojourn may be partly done away, and the chances of epidemic outbreaks greatly lessened.

In conclusion of this all-important subject of sanitary principles and sanitary practice, I would offer a few practical suggestions:—

1st. That, in conformity with the recommendation of the Army Sanitary Commissioners, medical officers should be consulted, and due attention paid to their sanitary recommendations, in all that concerns the dieting, clothing, barrack or hospital accommodation, encampment, and exercise of troops.

2nd. That a knowledge of sanitary science, and certificates of attendance in the medical schools on a complete course of social hygiene or preventive medicine, should be made imperative on all who are candidates for the medical services of the Army and Navy and East India Company.

3rd. That further specific teaching of military and naval hygiene, with instruction on military surgery and tropical medicine, should be carried out at great military and naval hospitals by well-instructed professors, or men of practical experience in these subjects.

4th. That manuals of sanitary science, and works on the principles of military and naval hygiene, be prepared and made available for the use of army and navy medical officers.

APPENDIX.

TABLE I.

The RATIO of ANNUAL MORTALITY out of 1,000 PERSONS living in different COUNTRIES.

Between Age.	Sweden, 1776-95.	Belgium, 1829.	England and Wales, 1818-24.
0 and 5	85.0	65.8	45.6
5 „ 10	13.6	8.7	6.5
10 „ 15	6.2	5.4	5.3
15 „ 20	7.0	6.6	7.6
20 „ 30	8.9	9.1	10.1
30 „ 40	11.6	10.6	12.1
40 „ 50	16.1	13.6	14.8
50 „ 60	23.9	21.7	20.8
60 „ 70	49.3	38.5	40.2
70 „ 80	104.1	90.9	94.9
80 „ 90	197.4	178.8	212.7
90 „ 100	151.3	304.7	367.8
	26.8	22.7	20.3

TABLE II.

PER-CENTAGE of MORTALITY from the AGE of 21 to 31 YEARS in
ENGLAND and FRANCE,

Ages.	Both Sexes.	Both Sexes.
	England and Wales (Carlisle Milne).	France (Duvillard).
21	·815	1·219
22	·845	1·262
23	·876	1·303
24	·908	1·342
25	·936	1·379
26	·960	1·416
27	·981	1·451
28	·998	1·484
29	1·011	1·517
30	1·023	1·549
31	1·036	1·580
32	1·049	1·611
33	1·063	1·642
34	1·078	1·673
35	1·095	1·705

TABLE III.

MORTALITY of the ENGLISH, FRENCH, and PRUSSIAN ARMIES compared
with the AVERAGE MORTALITY of the CIVIL POPULATION of the
same AGE as SOLDIERS in ENGLAND, FRANCE, and PRUSSIA.

	Mortality per 1000.	Mean Ratio of Mortality.	Authorities for the Statements.
Civil Population of England in Town and Country	9·2	8·45	Report of the English Sa- nitary Commission.
Do. Country alone	7·7		
Civil Population of France in least Healthy Districts	12·52	11·25	Dr. Michel Levy, Tome 2nd, p. 789.
Do. in more Healthy	10·		
Civil Population of Berlin	10·	10·	M. Baudin.
English Army at Home	17·5	14·52	English Sanitary Com- mission.
Do. Officers	12·		
French Army in France	12·4	15·10	
Do. Officers	10·8		
Do. Soldiers alone	22·3		
Prussian Army, 1821-30	11·7	11·7	M. Baudin.

TABLE IV.

COMPARATIVE MORTALITY of the ENGLISH, FRENCH, and PRUSSIAN
ARMIES in their several DEPARTMENTS.

Departments of Service.	Mortality per 1000.
ENGLISH:	
Household Cavalry	11
Dragoon Guards and	13·3
Infantry of the Line	18·7
Foot Guards	20·4
FRENCH:	
Army in France	19·4
Officers	10·8
Soldiers alone	22·3
PRUSSIAN:	
Cavalry	9
Artillery	10
Infantry	12·9

TABLE V.

MORTALITY of ENGLISH and FRENCH TROOPS from WAR and under
TRANSITION to other COLONIES.

Places.	English Mor- tality per 1000.	French Mor- tality per 1000.	Authorities.
Cape of Good Hope . .	15·5	...	} Report 1818 to 1836
Malta	18·7	...	
Canada	20	...	
Gibraltar	22·1	...	
Madras Pres.	52	...	
Bombay Pres.	55	...	
Bengal	63	...	} Mons. Baudin and Dr. Levy
Jamaica	143	...	
Algeria . . . . .	...	70
Egypt . . . . .	...	69
Martinique . . . . .	...	110
Guadaloupe . . . . .	...	105
Antilles . . . . .	...	75

The Mortality of English Troops in Spain averaged 119 in 1,000.