

been a large proportion of poverty, with its attendant defects of nourishment; but this influence also must be supposed to have been impartially distributed between the tenancies of the two water-companies.

The present contribution therefore aims only at giving a more exact knowledge of one cause, not at gainsaying the existence of other causes. "The doctrine of epidemic cholera" which has gained almost universal acceptance, does not affect "to explain what may be that power—the exciting cause of" the epidemic manifestation—which at intervals of time has "forayed from place to place about our globe, sometimes" vaguely spreading over a widened area, sometimes seeming to "move in more defined procession, and which now for the third" time has shed its fatal influence on our land. But with this "mystery still unsolved, there has grown more and more into" shape a doctrine which is both intelligible and practical; "that the undiscovered power in its wanderings acts after the" manner of a *ferment*, that it therefore takes effect only amid "congenial circumstances, and that the stuff out of which it" brews poison must be air or water abounding with organic "impurity."* It is only to a part of the above doctrine that the preceding pages immediately refer: but to this part they give a new proof, and to the remainder an indirect confirmation. It entirely consists with the facts here set forth to maintain that, under the specific influence which determines an epidemic period, fecalised drinking-water and fecalised air equally may breed and convey the poison; and that this, whether in one vehicle or the other, may be expected to prevail most forcibly against the feeble and ill-nourished parts of a population.

I have the honour to be, Sir,
&c. &c.

* Report of the Committee for Scientific Inquiries in relation to the Cholera Epidemic of 1853-4; p. 48.—J.S.

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## SANITARY STATE OF THE PEOPLE OF ENGLAND.

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PAPERS RELATING TO THE SANITARY STATE OF THE PEOPLE OF ENGLAND.

INTRODUCTORY REPORT, ADDRESSED (JUNE 1858) TO THE
RIGHT HON. THE PRESIDENT OF THE GENERAL BOARD
OF HEALTH, BY THE MEDICAL OFFICER OF THE BOARD.

SIR,

I HAVE the honour of laying before you a paper which
exposes in a very remarkable manner the present wasteful
expenditure of human life in England.

Presentation of
annexed paper.

It is the work of Dr. Greenhow, Lecturer on Public Health
at St. Thomas's Hospital; who, having recently found it
requisite for his own purposes, as a teacher of sanitary science,
to analyse more minutely than had hitherto been done, the
distribution of diseases among different parts of the com-
munity, has done me the favour of acquainting me with the
results of his inquiry. And as these results appear to me of
singular public interest with reference to sanitary administra-
tion, I have begged Dr. Greenhow to let me submit to you
the paper in which he has embodied them.

It cannot be necessary that, with the paper here to speak
for itself, I should attempt to offer you any complete analysis
of its contents. But there are some of its conclusions which
I would ask leave particularly to mention; partly because of
their own very great interest; and partly because, in the new
light which they afford, the sanitary state of the people of
England almost imperatively claims to be reconsidered as a
whole.

On this opportunity, therefore, I shall venture to submit to
you my opinions as to the degree in which premature death
can practically be prevented in England; and I shall refer to

that most valuable evidence which Dr. Greenhow's paper presents, as illustrating how very much remains to be done in great part of England before the limits of practical preventability will be even distantly approached.

Alleged excess
of deaths in
England.

It has now for some time been taught in the reports of the Registrar-General, that, of the entire annual mortality of England, at least a fourth part is of artificial production.

England is divided into 628 registration districts. Of these there are sixty-four (containing a population of about a million inhabitants) wherein the annual death-rate per 100,000 ranges from 1,500 to 1,700. But the average death-rate of England is about 2,266. Nearly nine-tenths of the registration districts of England show death-rates which are in excess of 1,700, and which, in some notorious cases, run up to 3,100, 3,300, and 3,600.*

No one pretends that people live too long in the 64 districts first referred to. That life is artificially shortened in the other 564 districts, seems the necessary alternative.

At this point the general statistical argument requires to be re-inforced by the more detailed results of two other inquiries:—first, what does medical experience say as to the dependence on removable causes—in other words, as to the preventability, of certain diseases which contribute largely to

* In the Registrar-General's last Quarterly Return (No. 36) it is well argued that, to account for this difference of effect, there must exist some difference of cause; and "whether the cause admit or do not admit of removal, the fact is incontestable and must not be lost sight of, that the excess of deaths in England and Wales over those from causes which exist in 64 districts was 91,856 in the year 1857; for 420,019 persons died in that year [though its death-rate was below the average] and about 328,163 persons would have died had the mortality not exceeded the standard of 17 deaths in 1,000 living." It deserves notice that the mortality which most of all may be called premature—the mortality of young children—shows a still greater range of difference than the mortality of all ages. The death-rates of children in the first year of life were observed during the years 1838–44, to range per 1,000, in the counties of England from 118 in Westmorland to 237 in Lancashire; and in the districts of England from 77 in Glendale, Bellingham, and Haltwhistle to 296 in Aston-under-Lyne and Nottingham.—J.S.

the total mortality of England? and, secondly, what difference is there in the prevalence of these diseases in different districts of England?

It is the second of these questions which, to a great extent, Dr. Greenhow has answered. The value of his answer consists in its applicability to the purposes of local sanitary education and local sanitary improvement; an applicability, which cannot be otherwise tested and defined than by taking the two questions together, and considering the different local pressures of different diseases in connexion with the degree to which each disease admits of prevention.

First, then, as to the preventability of certain diseases.—*Death by old age*, expressing the inevitable doom that our bodily material "wears out" as it lives, is the only mode of death which strict physiology counts *normal*. Each texture and organ of the body, when it has for a while existed in the gradually-attained ripe form in which it best fulfils its purpose, begins to decline from that form, and to fail in that purpose. Little by little, each characteristic structure withers, and each functional power is weakened. Sooner or later in this process, organs, essential to the mere vegetative life of the body as a whole, become incapable of further function; and the body as a whole is then dead.* Thus it is that death, unaccelerated by exterior influences, creeps at last on all men; the textural changes which mark its gradual approach are probably, in their kind, common to every living creature; and to undergo these changes in old age is as natural a part of human life as to have attained in succession youth and manhood. But the "old age" when they consummate themselves in death is not one precisely defined period for all alike. There are personal differences of longevity. Death, virtually by old age, comes to some men even before their sixtieth year. To most men it comes much later. A few complete their fifth vicennium: a few may carry well into it some of

Causes of
death.
Natural death.

* "Causa autem periodi ea est; quod spiritus, instar flammæ lenis, perpetuo prædatorius, et cum hoc conspirans aër externus . . . tandem officinam corporis et machinas et organa perdat, et inhabilia reddat ad munus reparationis."—Bacon, *Hist. Vitæ et Mortis*.—J.S.

their best mental endowments. And apart, so far as is known, from any immediate dependence on exterior circumstances, these differences tend to repeat themselves in particular families. They are differences of stock.* But they are not operative to any great extent. And it cannot be far from the truth to assume that, if there were no artificial interference with the duration of life, death by natural decay would, in this country, under its present circumstances, usually happen at about 80 years of age.†

Premature death.

Now little more than a tenth part of the deaths of England happen at 75 years and upwards. And thus, physiologically speaking, one may say that at least nine-tenths of the entire mortality occurs more or less prematurely.

Unavoidable causes of premature death.

But this physiological statement must be guarded from misapplication. Theoretically, no doubt, every premature death may be regarded as in principle preventable; and that ideal standard is good to be borne in mind by persons who aspire to the highest sanitary results; but, in discussions which are for the immediate practical purposes of public and private hygiene, it has to be remembered that premature death could not be entirely absent from any given generation

* Lord Bacon (loc cit.) noticed this fact, but noticed it with a qualification:—"illud vero experientia docet esse quasdam stirpes *ad tempus* longævas, ut longævitæ sit, quemadmodum morbi, res hæreditaria *in aliquibus periodis*." The meaning of the qualification, expressed in the words which I italicise, seems to be this: that a long-lived type of man can be perpetuated only by the same sort of care (impossible on any large scale for the human subject) as is applied to perpetuate particular valuable qualities of farm stock; while similarly the short-lived type could only be changed by cross breeding.—J.S.

[In proportion as "old age" is normal, its processes of textural and functional obliteration seem to advance simultaneously and equally in all the different organs of the body. Hereditary peculiarities shew themselves in particular families in the tendency of particular organs to "die of old age" earlier than the other organs; and it seems probable that "premature old age" in particular organs is the essential meaning of a vast variety of those structural and functional failures with which men of shabby constitution (and particularly in certain families) die after comparatively short periods of mature life.—J.S., 1887.]

† In the Faroe islands, with a population of about 8,000, it appears that the period for death by old age is from the 80th to the 90th year; for, according to Dr. Panum, *many more deaths happen within that decennium of age than within any other decennium after the completion of the first year of life*.—Virchow's Archiv, I. 493.—J.S.

of the people, except on condition (first) that the generation had started with perfect innate healthiness, and (secondly) that thenceforth no extrinsic cause of death had been in operation against it,—conditions, which we but too well know our present generation could not hope to realise for itself. The function of the sanitary reformer is to reduce every reducible known cause of disease to its least possible degree of destructiveness: at every point he has to watch against too indolent an acquiescence in any existing evil: but, at least provisionally, he cannot refuse to recognize that a certain proportion of what science classifies as premature death is, in the world around him, not practically preventable.

For instance, the certainty of premature death—a certainty quite irrespective of the immediate influence of exterior circumstances—is a *condition under which many are born*. Children come into the world, sometimes with malformations, which render healthy life impossible; sometimes with inherited disease or inherited morbid predisposition; sometimes with various ill-defined weaknesses of vitality, which render them unable to struggle onward, even for a single year, or dispose them more readily to sink under the ordinary trials of infancy. One family has become liable to gout and rheumatism; another to tubercular diseases; another to epilepsy and mania; another to this or that other form of visceral or humoral disease: and children born of these stocks have not the average expectation of healthy life. A certain share of every existing generation has in it from these sources the seeds of premature death. Such seeds may or may not be developed. In respect of many of the cases referred to, medicine has hitherto but imperfectly learnt the art of prevention. In respect of others (and fortunately this applies to the most fatal of the number) exterior circumstances can be shown to exert immense influence over the development of individual predisposition, and perhaps also exert some influence over the further propagation of that hereditary fault.

Unquestionably, however, deaths referred to under the present head are to a certain extent not preventable. And in order to determine whether the limits at which they become

Congenital and hereditary influence.

preventable have in any particular case been exceeded, the following considerations furnish, I think, the safest argument for guidance:—(1) that the influence alleged to be non-preventable in the causation of these deaths is the personal or family predisposition; (2) that in any one country of moderate extent and mixed race, with a population exercising from part to part the freest intercourse and intermarriage and intermigration, this influence would tend to be uniformly diffused; and (3) that, therefore, no natural reason can be conceived for its being in any one district of such a country much more powerful than in another district. So far, then, as personal predisposition accounts for the diseases in question, they would hardly be expected to vary much in their proportionate fatality in different districts of England. And any considerable exception to their uniform diffusion would suggest a very strong suspicion, that in the districts where they excessively prevail certain exciting causes must be specially and preventably in operation.

Contagions of
small-pox,
hooping-cough,
measles, and
scarlatina.

A further, in some degree unavoidable, cause of premature death in every civilized country is the risk of its *current contagions*. In Europe there are certain infectious complaints of which, once in life, nearly all persons are susceptible. The contagions of these diseases are never long absent from large communities; and a child during its first few years of life is almost of necessity exposed to them. Hence it is that, in European experience, the diseases in question—small-pox, hooping-cough, measles, and scarlatina—are so well known as diseases of childhood. To those who choose to avail themselves of Jenner's discovery, small-pox—the most fatal malady of this class—needs no longer be counted as a danger; but liability to the other infections is a more or less considerable risk which science hitherto cannot avert. Hooping-cough, measles, and scarlatina are, therefore, to a certain extent, inevitable causes of premature death. The severity with which any one of these diseases attacks an individual patient depends on his individual constitution; and often we are able to observe that corresponding differences of constitution (the sources of which are quite unknown to us) belong to several members of the same family. But, given a

certain severity of attack, the fatality of these diseases is greatly and evidently proportionate to exterior conditions. And the poor suffer from them immensely more than the rich, partly from possessing less ample means of treatment, but mainly because of the impure atmosphere which commonly surrounds the patient in his overcrowded and unventilated dwelling. In respect, then, of these diseases (as of those previously spoken of) it may fairly be supposed that their natural tendency is to prevail with equal severity or equal mildness in all districts of England; and any disproportionate fatality of these diseases in certain districts, as compared with their habitual fatality in other districts, is a fact which requires to be accounted for by the operation of local causes.

Practically, too, it must be reckoned that, even with the Privation. high civilisation of this country, and with its unequalled system of poor-law relief, *privation* still exists as a cause of premature death. Among the surgical cases treated at hospitals and dispensaries, diseases from insufficient nourishment form a very considerable part. Children especially suffer from this cause; and many of their so-called scrofulous ailments are in fact mere starvation-disorders, which a few weeks of better feeding can cure. And, besides the direct stint of food, and that indirect stint which consists in the use of damaged and adulterated provisions, there are other kinds of privation practically inseparable from poverty. It must have scanty house-room; and this—at least till the means of ventilating poor dwellings are thoroughly popularised—is an increased liability to disease. It must have scanty clothing and scanty fuel, and with little other protection than habit, must encounter inclemencies of weather. It must have a weight of care in its daily struggle for subsistence; it must have little of the variety and pleasurable excitement which are good for mind and body. Few tasks can be more difficult than to estimate the diffusion of poverty, as distinguished from pauperism, in different parts of England; and I have no means of determining whether poverty, in this sense, be one of the local conditions to which any preventable disease at all closely proportions itself. But, as regards pauperism, such certainly is not the case; a glance at Dr. Greenhow's table is

sufficient to show that districts with the highest, and districts with the lowest, proportion of pauper-population do not stand opposedly to one another as regards general death-rate, or as regards the death-rates of particular diseases.

Accidental injuries.

Accidental injuries cannot be excluded from the busy life of a large community. Wounds, fractures and contusions, suffocation and drowning, must occasionally everywhere be causes of premature death. And personal carelessness, which contributes largely to produce these casualties, will also bear fruit in a certain number of other premature deaths—especially of deaths of young children by burns and scalds.

Violence, vice, and intemperance.

Criminal violence, too, will cut short some lives. And *vice* and *intemperance* will receive some of their retribution in the form of untimely death:

Extent to which premature death is unavoidable.

Congenital malformations and weaknesses, in their primary or in their secondary influence; hereditary dispositions to chronic and paroxymal disease of one kind and another; the infectious disorders of infancy and childhood; accidental and criminal injuries; privation in its various forms; intemperance and profligacy;—these are causes of premature death, which, it seems to me, must be provisionally accepted as, *to a certain extent*, inevitable. To a still further extent they must be accepted as only mitigable by degrees. And up to the extent of their inevitability, the death-rate of a population must rise beyond that which would prevail (1,250) if all men lived to their full term of fourscore years.

But what is the extent to which they are inevitable? Experience seems to have answered this question; not perfectly indeed; but with an approximation which, if wrong, is wrong adversely to exaggeration. There are populations which have habitual death-rates of 1,500, 1,600, and 1,700. A million of the inhabitants of England are living on those terms. In 64 registration districts scattered about the land, life is at that advantage.

Are those parts of England exempt, or comparatively exempt, from the morbid influences just recapitulated? There

is no shadow of reason for believing that such is the case. They suffer from all the influences in question to the extent to which those influences may fairly be considered inevitable. Deaths thus arising occur even too abundantly in the healthiest districts of England. They are included in the margin of 250, 350, and 450, which, in respect of such districts, raises the theoretical death-rate of 1,250 to 1,500, 1,600, and 1,700, respectively.

And at this point, as seems to me, the line of demarcation may reasonably and practically be drawn. If it appears (as it presently will appear) that the inevitable influences in question are in some districts of England greatly more fatal than in others, there will be strong *prima facie* grounds for believing that the *local excesses of fatality are due to local circumstances of aggravation*; that *these aggravating local circumstances are such as it is fully possible to counteract*; and that *of the total mortality ascribed to these influences in England a very large share is preventable*.

This conclusion rises in importance in proportion as the diseases to which it relates are more and more frequent. It will presently be applied to those which of all are most fatal to our population; namely, first, to tubercular and other diseases of the lung; and, secondly, to the more special disorders of childhood.

But a large share of the premature mortality of England depends on diseases respecting which it cannot be conceded that they (like those last discussed) are, to a certain extent, inevitable. On the contrary, *thousands of deaths annually result from diseases which are, in the most absolute sense, preventable*; diseases, which either will not arise, or will not spread, in communities which follow certain well-known sanitary laws. For, first, there are certain diseases of which it is hardly a metaphor to say, that they consist in the extension of a putrefactive process from matters outside the body to matters inside the body; diseases, of which the very essence is filth; diseases, which have no local habitation except where putrefiable air or putrefiable water furnishes means for their rise or propagation; diseases, against which there may be found a complete security in the culti-

Premature death by removable causes.

vation of public and private cleanliness.* Yet some tens of thousands of deaths annually arise in England from these diseases. And again, there are diseases of other kinds, which annually kill some thousands more of our population, though the appointed preventives are so definite and so accessible that scarcely a death from such causes ought to occur in any civilised country.

To diseases entirely preventable, and to the preventable proportion of other diseases, is referred, by the allegation which I first quoted, at least a quarter of the mortality of England. And I beg now to bring under your notice some details in reference to both those classes of disease; as to their pressure in England generally; as to the distribution of that pressure in different parts of England; and as to the experience which has been obtained in the means of preventing their rise or reducing their fatality.

Diarrhœa.
diseases.

1. *Cholera, diarrhœa and dysentery* have, during the nine years 1848-56, been fatal to 237,498 persons. If this number of deaths had been equally divided, the annual number would have been 26,388; but the distribution has been unequal. In the two years 1849 and 1854 there were 116,246 deaths; in the two years 1850 and 1855 there were but 29,425, or little more than a fourth part of the former amount. This inequality depends on the present tendency of diarrhœal diseases to prevail in certain years epidemically. A large proportion of the excess of deaths in 1849 and 1854 occurred during a few summer weeks, when the epidemic influence was at its height, and when it occasioned in various parts of the country a very alarming mortality.

* "No city, so far as science may be trusted, can deserve immunity from epidemic disease, except by making absolute cleanliness the first law of its existence;—such cleanliness, I mean, as consists in the perfect adaptation of drainage, water-supply, scavenging, and ventilation, to the purposes they should respectively fulfil; such cleanliness as consists in carrying away by these means, inoffensively, all refuse materials of life—gaseous, solid, or fluid—from the person, the house, the factory, or the thoroughfare, so soon as possible after their formation, and with as near an approach as their several natures allow to one continuous current of removal."—*Reports on City of London.*—J.S.

Diarrhœal diseases, for two reasons, claim particular attention. In the first place, the registration-returns report them to be increasing in this country. During the years 1838-42 the deaths reported as due to them were only 13 per 1,000 of the deaths from all causes; during the years 1847-55 the proportion reported was five times as great. And, in the second place, their epidemic aggravations are sometimes of appalling severity. These things are almost forgotten when they are past; but probably, since the days of the great plague, death has never so scared an English population as in the cholera-epidemic of Newcastle in 1853, and in the Golden Square outbreak in 1854.

Dr. Greenhow's paper shows that these diseases have prevailed in different parts of the country with an astounding inequality. The average annual death-rate by cholera has ranged, from nothing and nearly nothing in some districts, to 357 and 365 and 403 in others. If cholera alone had shown this enormous range of difference, it might properly be questioned whether the history of two epidemics (for the figures are of course mainly derived from the death-lists of 1848-9 and 1853-4) is enough to justify generalisations in reference to the local affinities of a disease apparently so erratic and fitful in its attacks. Accidental influences might have counted for much in this restricted experience; and it might be expected that our next epidemic visitation would do something towards equalising the death-rates. No doubt this deserves consideration; most of all in those places which have hitherto escaped cholera apparently by no merits of their own. But cholera has not been alone in showing this great range. Local differences of death-rate scarcely less wide have been shown by those diarrhœal diseases which are always present among the population. Ordinary diarrhœa and dysentery have ranged in their joint average annual death-rate from under 10 in several districts, to 303 and 305 and 345 in others. Or if all diarrhœal diseases, epidemic and non-epidemic, be taken together (as Dr. Greenhow has taken them) under the single heading of "alvine flux," the average annual death-rate by this class of disease has ranged in

different districts, from 4, 8, 10, 14 and 17 in some, to 463, 493, 519, 568 and 663 in others.

It may be imagined that the lowest of these death-rates occurs under circumstances of exceptional healthiness which cannot generally be realized. So, instead of taking it for comparison (though I do not admit the objection), I will take *ten times its amount* as my standard. Let the importance of the subject be estimated from one simple statement:—If the diarrhoeal death-rate of England generally were even *only ten times* the minimum diarrhoeal death-rate, there would be an annual saving in England of nearly 20,000 lives.

Few things in medicine seem more certain than the general meaning of high diarrhoeal death-rates. The mucous membrane of the intestinal canal is the excreting surface to which nature directs all the accidental putridities which enter us. Whether they have been breathed, or drunk, or eaten, or sucked up into the blood from the surfaces of foul sores, or directly injected into blood-vessels by the physiological experimenter, there it is that they settle and act. As wine "gets into the head," so these agents get into the bowels.* There, as their universal result, they tend to produce diarrhoea;—simple diarrhoea, in the absence of specific infections; specific diarrhoea, when the ferments of cholera and typhoid fever are in operation. And any such distribution of diarrhoeal disease as has just been noticed warrants a presumption—indeed, so far as I know, a practical certainty, that, *in the districts which suffer the high diarrhoeal death-rates, the population either breathes or drinks a large amount of putrefying animal refuse.*

A certain quantity of diarrhoea depends, no doubt, on other causes than putrefactive pollution of the system. Phthisis not rarely proves fatal by its effects on the intestinal canal; and probably a few of these phthisical deaths are registered under the name of the secondary disease. Temporary faults of diet very often occasion diarrhoea, though not often fatal diarrhoea. Habitually improper food (especially as regards infants and

* In some cases of putrid infection, perhaps most in those which are of slowest action, the tonsils and mucous membrane of the pharynx seem particularly to suffer.—J.S.

very young children) and various other personal influences contribute to the total of diarrhoeal deaths. But causes which are merely personal would tend to operate evenly, or almost evenly, throughout the country. That their aggregate results are inconsiderable, may be inferred from the minimum figures quoted above; and the fullest allowance for them cannot materially affect the general conclusion which I have stated.

That conclusion might be supported by almost innumerable instances, both in reference to the occasional epidemic prevalence of cholera, and in reference to the habitual endemic prevalence of diarrhoea and dysentery. To the latter point I shall hereafter refer again in speaking of the death-rates of young children, who are probably the chief sufferers from endemic disorder of the bowels. And in reference to the epidemic disease, I trouble you with only two illustrations.

The first relates to the exemption of Tynemouth, in 1853, from an epidemic which prevailed in its neighbourhood. Newcastle and Gateshead suffered on that occasion the most terrible outbreak of cholera yet experienced in England, and lost within a few weeks nearly 2,000 of their population. In the borough of Tynemouth, only eight miles below Newcastle, and connected with it by railway as well as by river, there occurred during that epidemic period only four fatal indigenous cases. This escape was not due to an entire non-participation in the epidemic influence; for diarrhoea was generally prevalent in Tynemouth while cholera was in Newcastle. Nor did it depend on the absence of opportunities for contagion; for many thousand persons from Newcastle and Gateshead fled to Tynemouth, and many continued to pass daily between the towns during the whole time of the visitation. The remarkable immunity of Tynemouth is the more remarkable from its contrast with the heavy mortality experienced during the epidemic of 1848–9, when the deaths in the parish from cholera and diarrhoea amounted to 463.*

* The contingent expenses for the maintenance of widows and orphans whose claims arose out of that four month's visitation, appear to have amounted within the next four years to 7,500*l.* The cost (direct and indirect) of the epidemic at Newcastle and Gateshead, was estimated at about 40,000*l.* over and above the large losses sustained from the temporary stoppage of trade.—J.S.

The great difference between these results seems to have been entirely due to sanitary improvements effected in Tynemouth during the interval between the two visitations. Dr. Greenhow (who at that time was chairman of the Local Board, and took an active part in promoting its sanitary measures) has written the following account* of the course which was adopted:—

“The Public Health Act was applied to the Borough of Tynemouth, on the petition of the Town Council, in the summer of 1851. The provisions of the Act, relative to the registration and regulation of common lodging-houses and slaughter-houses and the construction of new streets and houses, were immediately put in force. Care was taken to prevent the erection of houses without proper conveniences and provision for ventilation; no ash pits were allowed to be made against the main walls of dwelling-houses or without proper doors and covers; wherever sewers existed, drains from the houses were insisted on; and all persons laying out new streets were compelled to have back entrances to the houses, and to provide for the construction of drains from the backs of the houses, instead of carrying them underneath the basement story, as was previously usual.

“In the autumn of 1852, when the re-appearance of cholera in this country was considered probable, an active inspection of the town was instituted by the Public Health Act Committee; the bye courts and lanes were thoroughly cleansed; the gully grates trapped; the foul open ditch behind the North-street was cleansed and filled in; and many other local nuisances throughout the borough were removed. On the report of the first death from cholera in Newcastle, in 1853, the like measures were again resorted to. The courts, lanes, and common lodging-houses were inspected by the health-committee, aided by other members of the town council. Every common lodging-house in the town was peremptorily ordered to be lime-washed and cleansed within 48 hours, an order which was strictly obeyed. A large staff of carts and men were at once employed to cleanse all the courts, lanes, and back passages in the town, which, after the rough dirt was removed, were sluiced with water thrown into them by a powerful fire-engine afloat on the river. All the courts and smaller streets, after being thus perfectly cleansed, were lime-washed. Depôts of quicklime for the use of the poor were placed in convenient places throughout the borough, at the expense of the Board of Health: and to induce them to make free use of it, the local authorities personally visited the inhabitants of the localities in which cholera had formerly prevailed. Ruinous

* Cholera in Tynemouth in 1831-32, 1848-49, and 1853. By E. Headlam Greenhow, M.D., read before the Epidemiological Society of London, February 5, 1855.—J.S.

“channels were repaired; and where the gullies were imperfectly trapped this was rectified, and chloride of lime, of which a ton was speedily consumed, was profusely used for the purpose of disinfecting them. In the course of 14 days the town was brought into as good a sanitary state as possible under existing circumstances, 1,500 cartloads of manure having been removed in that short period from the vicinity of human habitations. The entire expense incurred by these operations amounted to 230*l.*, which was afterwards reduced to less than 200*l.* by the sale of the manure.”

The second case relates to the distribution of cholera-deaths during two epidemics in the southern districts of London. These districts (comprising nearly a fifth of the entire population of the metropolis) have been notorious for the great severity with which cholera has visited them on each occasion of its epidemic prevalence in England. During the last invasion these districts were accidentally the seat of a gigantic sanitary experiment; and a difference in one sanitary condition was seen to influence most remarkably the distribution of the cholera-mortality. For throughout those districts, during the epidemic of 1853-4, there were distributed, by two rival water-companies, two different qualities of water; so that one large population was drinking a tolerably good water, another large population an exceedingly foul water; while in all other respects these two populations, being intermixed in the same districts, and even in the same streets of these districts, were living under precisely similar social and sanitary circumstances. And when, at the end of the epidemic period, the death-rates of these populations were compared, it was found that the cholera-mortality, in the houses supplied by the bad water, had been $3\frac{1}{2}$ times as great as in the houses supplied by the better water. This proof of the fatal influence of foul water was rendered still stronger by reference to what had occurred in the same districts in the epidemic of 1848-9. For on that occasion, the experiment on the two populations had been tried in a reverse way. The company which during the later epidemic gave the better water, had given during the earlier epidemic even a worse water than its rival's; and the population supplied by it had at that time suffered a proportionately

worse cholera-mortality. So that the consequence of the improvement made by the one water-company, in the interval between the two epidemics was, that, whereas in the epidemic of 1848-9 there had died 1,925 of their tenants, there died in the epidemic of 1853-4 only 611; while among the tenants of the rival company (whose supply between the two epidemics had become worse instead of better) the deaths, which in 1848-9 had been 2,880, were in 1853-4 increased to 3,476.* And when these numbers are made proportionate to the populations or tenancies concerned in the two periods respectively, it is found that the cholera death-rates per 10,000 tenants of the companies were about as follows:—for those who in 1848-9 drank the worse water, 125; for their neighbours, who in the same epidemic drank a water somewhat less impure, 118; for those who in 1853-4 drank the worst water which had been supplied, 130; for those who in this epidemic drank a comparatively clean water, 37. The quality of water which (as is illustrated in the first three of these numbers) has produced such fatal results in the metropolis, causing two-thirds of the cholera-deaths in those parts of London which have most severely suffered from the disease, has been river-water polluted by town-drainage; water, pumped from the Thames within range of the sewage of London; water which, according to the concurrent testimony of chemical and microscopical observers, was abundantly charged with matters in course of putrefactive change.†

* Since the epidemic of 1854, this company has had recourse to purer sources of supply.—J.S.

† See "Report on the Influence of Impure Water in the last Two Epidemics of Cholera," 1855. When I inquired, with Mr. Hume and Mr. Bateman, into the causes of the severe epidemic of cholera at Newcastle and Gateshead, such evidence as we could collect on the influence of the water-supply (which had been partly pumped from the Tyne) did not justify us in saying more than that "the water was such as ought never to have been distributed, and that on the most favourable view we can adopt, it must be regarded with grave suspicion in relation to its influence on the late outbreak." In many instances, there has been reason to believe that some of the most destructive outbreaks which have occurred in particular groups of houses have depended on the use of well-water, into which impurities had either been carelessly thrown or had drained or leaked through the adjoining soil. Numerous highly instructive

2. Under the Registrar-General's head of *Typhus* (which Fever does not include infantile fever or remittent fever) there were recorded during the nine years 1848-56 as many as 156,340 deaths; being at the rate of 17,371 deaths per annum.

illustrations, both to this effect, and generally as to the influence of polluted water, have been collected by Dr. Snow in various writings from 1849 to the present time; especially in his work "On the Mode of Communication of Cholera," 1855. The facts have been brought together by Dr. Snow, with a view to illustrate his peculiar doctrine (first advanced in 1849) as to the contagiousness of cholera. This doctrine is, that cholera propagates itself by a "morbid matter," which, passing from one patient in his evacuations, is accidentally swallowed by other persons as a pollution of food or water; that an increase of the swallowed germ of disease takes place in the interior of the stomach and bowels, giving rise to the essential actions of cholera, as at first a local derangement; and that the "morbid matter of cholera having the property of reproducing its own kind, must necessarily have some sort of structure, most likely that of a cell.".... Whatever may be the worth of the theory, it has been of use in contributing to draw attention to the vast hygienic importance of a pure water-supply; and Dr. Snow's most zealous labours in collecting evidence on this subject deserve grateful acknowledgment from every one who is interested in the subject. Some interesting and important experiments, made in 1854 by Professor Thiersch, of Erlangen, seemed to show that cholera evacuations *in the course of their decomposition* acquire contagious property.... According to the observations of Professor Pettenkofer at Munich and Professor Acland at Oxford, it would seem that during cholera-periods the immigration of persons suffering diarrhœa has been followed by outbreaks of cholera in places previously uninfected; and Professor Pettenkofer ascribes this fact to an infective influence exerted by the fæces of such persons in the cesspools and adjoining soil of ill-conditioned places to which they go. An infection of this kind would probably extend itself to the polluted well-waters of such soils, and might render them, if swallowed, capable of exciting cholera by direct contagion. It is encouraging to sanitary reformers, to observe that cases of apparent introduction of cholera-contagion by human intercourse are essentially different from such cases of infection as are presented by measles or small-pox. The multiplication of poison in the latter diseases takes place exclusively within the human body; it has no immediate dependence on differences of medium; and wherever human beings can cross one another's path, the susceptible person may contract infection.... For diffusing the contagion of cholera, if truly the disease be contagious, foulness of medium seems indispensable. Indeed, it is no ordinary foulness which taints air or food or water with the leaven of decaying excrement. Therefore, as regards cholera, it seems highly probable that the immigration of infected persons might occur to any extent without exciting epidemic outbreaks, if it occurred only into places of irreproachable sanitary conditions, especially as regards the supply of water, and the continuous removal of house-refuse. Compare Pettenkofer über die Verbreitungsart der Cholera, 1854; Acland on the Cholera at Oxford, 1856; and Thiersch's Infections-versuche an Thieren mit dem Inhalte des Cholera-darmes, 1856.—J.S.

The common judgment of the medical profession on the controllability of continued fever is well expressed in a phrase which the late M. Baudens, an eminent physician of the French army, used in describing his Crimean experience of the disease:—*On pourrait le faire naître et mourir à volonté.*

It is essentially a disease of filth. Where the unventilated atmosphere of habitually overcrowded places reeks with a stagnant steam from the breathing and sweating of its inhabitants—a steam which condenses in foetid drops on the window panes, or soaks and rots in the papered or plastered walls; or where putrefying fæces are accumulated in cesspools or ill-conditioned drains, to taint the air or leak into the drinking water of a population; there “fever” tends to prevail in one or other of its forms.

In one or other of its forms, I say;—for the researches of modern pathologists have shown that for accuracy’s sake it is requisite to distinguish at least two forms of continued fever.* And it seems highly probable that these forms, while both equally associated with filth, are yet not both essentially associated with the same kind of filth. One of them (the *typhoid fever* of modern observers) has intimate affinity to the cause last mentioned—the faecal pollution of air and water. The other (which is now distinctively called *typhus*) more nearly associates itself with overcrowding, especially of destitute persons, and probably has its essential source in the putrefaction of their undispersed exhalations. The typhoid form, specially affecting the intestinal canal, is, in its nature as in its causes, very closely related to the diarrhoeal diseases already spoken of. There exists no conclusive evidence to show whether this form of disease be in any degree or any

* While writing, I observe that a paper, including original observations apparently of much importance on the subject of continued fever, has just been communicated to the Royal Medical and Chirurgical Society by Dr. Murchison. In respect of the distinction between the typhus and typhoid forms, this paper (so far as may be judged from the abstract of it published in the British Medical Journal of June 12th) strongly supports the opinion expressed in 1849 by Dr. William Jenner, in his classical essay on the subject, that “the specific cause of typhus and typhoid fevers are absolutely different from each other.”—J.S.

manner contagious; but almost certainly it cannot spread atmospherically by means of exhalations from the sick. Distinctive typhus, on the other hand, works its chief results without affecting the bowels. Possibly its first and greatest influence is exerted on the blood, but its symptoms are chiefly obvious in the nervous system, the skin and the lungs; and the exhalations from a patient undergoing it are, till they have been neutralised by dilution with pure air, capable of communicating the same form of disease. It has some hitherto unexplained connexion with extremes of poverty and destitution. No such ravages have been made by it as when it has been associated with famine, and—apparently by reason of this association—has prevailed as a national epidemic.*

A knowledge of the distinction between these two forms of disease has hitherto not become general enough in England for the name of typhoid fever to have been kept separate in the registration-returns. Though probably much more fatal in ordinary years than the true typhus, with which it is confounded, it has hitherto no statistical existence. I have therefore no choice but to speak of continued fever as though it were but a single form of disease, communicable from person to person.†

* It would be mere speculation in the present state of knowledge to dwell on certain analogies which exist between the state of persons dwelling in foul atmospheres and the state of persons suffering starvation. It may suffice to observe, that they probably have in common a defective defecation of the system. The starved body, which cannot renew the waste of its texture by the ordinary resources of food, may be conceived as eking itself out, and maintaining the continuity of its organs, by stuff which under ordinary circumstances of nutrition would have been discharged as effete. It would thus come to consist to an abnormal extent of stale material in a state verging on dissolution. And just as the rags of poverty may by a touch be torn asunder, so the half-starved tissues which they cover fall under very small injuries into disproportionate ulceration and gangrene. The fact that during times of famine masses of population are found with their textures and juices in this state (undefecated because unrenewed) may perhaps have something to do with their fatal susceptibility to typhus; for, under such circumstances, the contagion of this form of disease will spread and multiply (like the contagion of small-pox amid an unprotected population) at a rate quite disproportionate to the sanitary defects of localities.—J. S.

† Dr. William Jenner, who has contributed so importantly to the separation of the two forms of disease, observes: “With respect to the contagious nature

Among the 105 registration-districts into which Dr. Greenhow has inquired, there is none but has suffered deaths from fever. The death-rate from this cause has ranged from 21 in one district, 33 in a second, and under 50 in five others, to 204, 207, and 209. The fact of a few deaths from fever cannot be accepted as conclusive proof of sanitary neglect in the district where they have occurred; for unavoidable contagion may have been imported—even the fatal cases themselves may have come—from the fever-nest of some adjoining jurisdiction. But I do not hesitate to say that the registration of any fever-deaths in a district not suffering from famine is a thing which, for the credit of the local sanitary authority, ought to be susceptible of some such explanation. And as the death-rate rises from a minimum of 21, which is itself an excess, to a maximum of 209, which is ten times that excess, the chance of finding exculpatory circumstances is diminished at every step. Perhaps even

“ of typhus fever, I know no one who entertains a doubt. If typhoid fever be “ contagious, it is infinitely less so than typhus fever.” That the experience of the London Fever Hospital (in days when that distinction of forms was not yet drawn) was conclusive as to the infectiousness of “ fever ” is shown by Dr. Tweedie in the following sentences. “ Every physician, with one exception “ (the late Dr. Bateman) who has been connected with the Fever Hospital “ has been attacked with fever during his attendance, and three out of eight “ physicians have died. The resident medical officers, matrons, porters, “ domestic servants and nurses have one and all invariably been the subject “ of fever; and the laundresses, whose duty it is to wash the patients’ clothes, “ are so invariably and frequently attacked, that few women will undertake this “ duty. The resident medical officer was attacked with fever, and it became “ necessary to appoint some one to perform his duties. The first person who “ thus officiated took the precaution of sleeping at home, yet his duties were “ soon interrupted by an attack of fever, which confined him a considerable “ time. He was succeeded by an individual in robust health, a disbeliever in “ the doctrine of contagion. He performed his duty only ten days, when “ symptoms of severe fever appeared. There is no security in this narrative, “ striking as it is, against the favourite argument of the non-contagionists; but “ the following collateral circumstances present an obstacle to the intrusion of “ malaria, which only bigotry or the spirit of partizanship can enable it to “ surmount. The Fever Hospital stands in the centre of a large field, where the “ production of malaria is exceedingly improbable; and on the same lawn, and “ within a few yards of it, stands the Small-pox Hospital; but no case of “ genuine fever has occurred among the medical officers or domestics of that “ institution for the last eight years.” — *Cyclopædia Pract. Med., Art. Contagion.*—J.S.

in the districts which have suffered least from fever such circumstances could not commonly be shown to have prevailed: but infinitely less is the probability of excuse, and infinitely greater is the presumption of gross sanitary neglect, in those districts which have suffered tenfold the minimum fatality.

The undoubted contagiousness of one form of fever may, as I have said, be a partial exculpation of districts where deaths from typhus have been registered; but even this, only at the expense of other districts whence the contagion has come, and without any lessening of the national responsibility for the quantity of preventable death. And where many fever-deaths have been registered, the exculpation cannot be more than partial. Quite exceptionally, a well-ordered household may receive the fatal contagion from some filthy hovel which has bred it. But generally speaking the contagion has little tendency to multiply itself, except where the same conditions exist as those under which it began. Oftenest of all, therefore, it is from hovel to hovel, from crowded lodging-house to crowded lodging-house, that the infection of fever spreads. Whether it be commonly requisite for the origination of fever in these filthy places that the specific contagion should each time be re-introduced from without, is a theoretical question on which the medical profession is not unanimous; but the practical lesson, respecting which there is no difference of opinion, is admirably taught by the most eminent medical teacher* of the present generation, as “ the unquestionable fact that fever “ is fostered and spread through those impurities which “ sanitary measures are intended to banish . . . The specific “ exciting cause of continued fever cannot, perhaps, be utterly “ expelled or precluded; but when present in a community “ it may be rendered comparatively harmless by taking away “ the main conditions of its morbid efficacy and of its “ faculty of propagation.”

Every collection of medical experience teems with instances to illustrate what are those “ main conditions ” on which the

* Dr. Watson in his *Lectures on the Practice of Physic*. Fourth edition, vol. ii., p. 835.—J.S.

fatality of fever depends. Such instances are of every degree of magnitude, but in substance they all agree. The experience of common lodging-houses,* the experience of single courts in a town,† the experience of hospitals and workhouses,‡ the

* See Assistant-Commissioner Harris's Report on the Operation of the Common Lodging-houses Acts, 1857; and an illustration given by Dr. Wyld in the Transact. of the Social Science Association, p. 482.—J.S.

See Dr. Southwood Smith's Report to the Poor Law Commissioners in 1838; a paper which especially deserves to be referred to, because the commencement of State-interference on behalf of the health of the labouring classes may be said to date from its publication, and to have been in a very important degree determined by its facts and arguments. See also Report (with evidence) of Commissioners for inquiring into the State of Large Towns and Populous Districts.—J.S.

‡ See Sir Gilbert Blane on the Prevalence of different Diseases in London, and Miss Nightingale's Evidence before the Commissioners appointed to inquire into the Regulations affecting the Sanitary Condition of the Army. Last century's familiar fever, in its epidemic form, was "the hospital-fever" as well as the "gaol-fever." Sir Gilbert Blane mentions that in 1783, when he was elected physician of St. Thomas's Hospital, "febrile infection prevailed there so much that his two immediate predecessors, and one of the surgeons, besides several of the menial attendants, had died in the course of the preceding year of fever caught in the hospital; upon which the number of patients was reduced, and new methods of cleanliness and ventilation were adopted. All the wards (he continues) have ever since been annually whitewashed; the strictest attention has been paid to the cleanliness of bed and body clothes, washing, sweeping, and all other means of removing offensive matter." As I happen to have been long connected with St. Thomas's Hospital, I may mention that, in five and twenty years, during which I have been intimately acquainted with its working under those improved arrangements, I have not known of any physician or surgeon or apothecary contracting fever, and but rarely have heard of the disease extending to a nurse or sister in constant attendance on the sick. During the Crimean campaign there was a time when in the Scutari hospitals, "typhus attacked both sick and well. . . Also there were frequent relapses of fever . . . and the wounded having come in for wounds, frequently died from fever." The lady who made her beneficent home in those dreadful scenes, and who has laboured her utmost to render their recurrence impossible, describes the circumstances of the sufferers:—"The space for each patient was one fourth of what it ought to have been. . . It is impossible to describe the state of the atmosphere in the barrack hospital at night. I have been well acquainted with the dwellings of the worst parts of most of the great cities in Europe, but never have been in an atmosphere which I could compare with it. . . . The sewer gases blow into the wards and corridors. A change of wind so as to blow up the open mouths of the drains was, therefore, not unfrequently marked by outbreaks of fever among the patients. . . . The drinking water was not free from organic matter; on one occasion the dirty hospital dresses have been seen in the tank which supplied water. . . . A dead horse also lay for some weeks in the aqueduct."

experience of barracks,* the experience of the navy,† the

It needs not be said that fever was only one of many murderous diseases which prevailed under those circumstances. And when the causes of "hospital fever" were extinguished, hospital gangrene and cholera and diarrhœa went as the fever went; for the hospitals were at last brought to a sanitary condition, in which Miss Nightingale could say of them, "I know of no buildings in the world I could compare with them, the original defect of construction of course excepted."—*Evidence*, especially 9,998, 10,006, 10,014.—J.S.

* Dr. Balfour, the Secretary of the Army Sanitary Commission, furnished for the report a memorandum on the health of the Guards stationed in the Tower of London during the fifteen years 1839–54; dividing this period into three stages, as it were, of sanitary experiment. 1st, from April 1839 to September 1843, the troops were exposed to emanations from the tidal ditch into which the drains of the tower emptied their contents; 2ndly, from October 1843 to September 1849, the ditch had been dried, but the troops were still quartered in old, badly-constructed barracks, and were supplied with water from the river; 3rdly, from October 1849 till February 1854, the men occupied the new barrack, and were furnished with water of excellent quality for cooking and drinking. Concurrently with these changes the rate of admission into hospital on account of continued fever and typhus declined from 107·11 in the first period to 93·73 in the second and 59·11 in the third; while the death-rate from the same diseases diminished from 4·79 in the first period to 3·06 in the second and 2·97 in the third. During the five successive years, 1843–7, M. Boudin observed at the Military Hospital at Versailles, that about the month of October there was a very fatal epidemic of typhoid fever, consisting exclusively of cases admitted from the garrison of St. Cloud. This epidemic began a week after the king's arrival, and disappeared directly after his departure; it never affected either the civil population of St. Cloud, or the officers, or even the *sous-officiers*, though the latter inhabited the same barrack as the corporals and soldiers. M. Boudin's inquiry gave him the following solution of the case:—The garrison of St. Cloud at its ordinary strength of four to five hundred men enjoyed good health; but when, on the king's arrival, its strength was raised to twelve hundred—and this number was packed into narrow unventilated spaces—the fever broke out. The *sous-officiers*, beside being better fed and less worked, had always at least one room for each two of their number.—J.S.

† See Lind's "Essay on the most effectual Means of Preserving the Health of Seamen in the Royal Navy, 1757," and Sir Gilbert Blane "On the Comparative Health of the Navy" during the fifty years 1779–1829. As late as 1780, Haslar Hospital received from the channel fleet, 5,539 cases of fever in the year. But not fifty years afterwards the Vice-Admiral of England (Lord de Saumarez, who died at an advanced age in 1836) was able to say, that within his recollection the efficiency of the navy had been doubled by improvements in its health. For (says Sir G. Blane) while "scurvy had been extirpated" by that general introduction of lemon juice, which marks the year 1796 as "an era in the history of the health of the navy, fever also had been greatly subdued . . . by improvements in the method of promoting ventilation and cleanliness, and particularly by the strict discipline adopted and enforced in the channel fleet; fever, of which the 'ascertained cause' had been 'air contaminated by foul and stagnant exhalations, particularly those from the living body;' fever, which had 'been a more grievous and general source of mortality in the navy

experience of prisons,*—all are to the same effect. Every history of the worst prevalence of fever, when it has existed independently of famine, has connected its ravages with overcrowding and filth.

Not a century has passed since it was distinctively the disease of prisons. It was the *gaol fever* of our great John Howard, who well knew the sanitary circumstances which develop it. And no better illustration can be had of those circumstances—no better illustration of the control which society possesses over them—than is afforded by turning from the prisons of the present day, wherein epidemic fever is an unknown disease, to the prisons of the last generation.

It was in 1777 that Howard—dedicating his work to the House of Commons “in gratitude for the encouragement which they had given to the design,” drew attention to various forms of cruelty in the then prevailing system of prison discipline, and specially alleged that prison-life, such as it then was, engendered diseases by which “many who went in healthy are in a few months changed to emaciated dejected objects.” He described the atmosphere of prisons:—“My reader (he says) will judge of its malignity when I assure him that my clothes were in my first journeys so offensive that in a postchaise I could not bear the windows drawn up, and was therefore obliged to travel commonly on horseback. The leaves of my memorandum book were often so tainted that I could not use it till after spreading it an hour or two before the fire; and even my antidote, a vial of vinegar, has, after using it in a few prisons, become intolerably disagreeable. I did not wonder that in those journeys many gaolers made excuses, and did

“than even the scurvy, being more difficult to deal with both in point of prevention and cure.” The kind of atmosphere may be inferred from Dr. Lind’s statement:—“I have known a thousand [imprest] men confined together in one guardship, some hundreds of whom had neither a bed, nor so much as a change of linen. I have seen many of these brought into Haslar Hospital in the same clothes and shirts they had on when pressed several months before.”—J.S.

* In contrast to the quotations from Howard in the text, see, as regards our own times, the Reports of the Inspectors of Prisons, and the Essay of Dr. Baly on the Mortality in Prisons.—J.S.

“not go with me into the felons’ wards.... Any one may judge of the probability there is against the health and life of prisoners crowded in close rooms, cells, and subterranean dungeons for fourteen or fifteen hours out of the four-and-twenty. In some of these caverns the floor is very damp; in others there is sometimes an inch or two of water, and the straw or bedding is laid on such floors, seldom on barrack bedsteads.... Some gaols have no sewers or vaults, and in those that have, if they be not properly attended to, they are, even to a visitant, offensive beyond expression.... In some prisons the window tax, which the gaolers have to pay, tempts them to stop the windows and stifle the prisoners. In many gaols, and in most bridewells, there is no allowance of bedding or straw for prisoners to sleep on; and if by any means they get a little it is not changed for months together, so that it is offensive and almost worn to dust. Some lie upon rags, others upon the bare floors.” He then spoke of the necessary consequence of this life:—“I am ready to think that none who give credit to what is contained in the foregoing pages will wonder at the havoc made by the gaol fever. From my own observations in 1773, 1774, and 1775, I was fully convinced that many more prisoners were destroyed by it than were put to death by all the public executions in the kingdom. This frequent effect of confinement in prison seems generally understood, and shows how full of emphatical meaning is the curse of a severe creditor, who pronounces his debtor’s doom to *rot in gaol*. I believe I have learned the full import of this sentence from the vast numbers who, to my certain knowledge, and some of them before my eyes, have perished by the gaol fever.”

It is almost unnecessary to say that the state of things which Howard described has not been witnessed in the prisons in England by any one of the present generation. The keeping of criminals has been amended with due regard to sanitary requirements; and now, if even a single felon were known to die in England under circumstances which 85 years ago were the rule and habit of prison life, the whole

strength of public opinion would express itself as against a murder. Yet, outside that privileged area, fever continues its ravages. It continues them under circumstances which—except for the mere bars and bolts of the prison-house—are identical with those which Howard described. And if his language seems familiar to the eye, it is not because his work has of late years often been consciously quoted. It is because the same close dark cells, the same damp floor, the same foetid atmosphere, have had to be again and again described by officers of health and parochial medical officers; no longer indeed as the scandals of prison discipline, but as constituting the too frequent household circumstances of the poor.

Chiefly from among our labouring population, fever takes its annual seventeen or eighteen thousand victims. And besides the thousands whom it kills, there are many times the number whom it prostrates for weeks and months, and whom, with their families, it impoverishes or perhaps ruins and pauperises.

Howard closed his memorable appeal by suggesting that “even if no mercy were due to prisoners, the gaol distemper” is a national concern of no small importance.” Its claims to this rank of importance are surely not yet at an end, while its causes remain virulent in the homes of our working population, while its cruel contagion is maintained at their cost, and while so many thousand lives are yearly sacrificed to the negligence which lets it continue.

3. *Pulmonary affections*, including phthisis, cause very nearly a quarter of the annual mortality of England. Every 100,000 of our population yields on an average 552 annual victims to this deadly class of disorder.

This death-rate is far from being uniform throughout the country. In the northern division of England the death-rate is only 463; in the adjoining north-western division it is 683; in Cumberland and Herefordshire it is 435; in Lancashire it is 706. Still wider is the range of difference in the district death-rates. They vary from 216, 242, and 304 to 851, 859, and 999.

Pulmonary
affections.

In order to recognize the local conditions which determine these differences of death-rate, it is requisite to distinguish three principal forms of pulmonary affection.

a. First, there is *pulmonary phthisis*, which kills on an average in England more than 50,000 persons a year. And beside these who die under the pulmonary form of tubercular disease, 8,000 more are annually registered as dying of *scrofula* and *tabes mesenterica*. And under the same constitutional tendency, manifested in still other forms of local disease, there must remain other thousands to count.

Phthisis, therefore, deserves especial study; not only because (Scrofula.) of the 50,000 deaths which it annually causes; but because it is the type of a great family of diseases, whereof the other members are hitherto less perfectly registered than it; and because, in observing the local distribution of deaths by phthisis, we can tolerably well estimate the distribution of many thousands of other deaths.

There is a further reason, for which the mortality by phthisis ought to be very jealously criticised; a reason, for which its local differences of pressure deserve quite peculiarly to be regarded as a matter of national concern. The tendency to tubercular disease is one which transmits itself from parent to child; and thus, if in any one generation the disease be artificially engendered or increased, that misfortune does not confine its consequences to the generation which first suffers them. *Whatever tends to increase tubercular disease among the adult members of a population must be regarded as assuredly tending to produce a progressive degeneration of race.*

In proceeding to criticise the range of death-rate by tubercular phthisis, I must observe that the nature of the disease exempts its death-rate from many sources of fallacy to which the local statistics of some other diseases are subject. Phthisis is chronic, non-infectious, non-epidemic: in districts of some size it is not likely to vary much from year to year; and a septennial average of its district-pressure must almost of necessity give a true representation of what it professes to represent. But as phthisis principally affects the ages subsequent to puberty, statistical results are perhaps most

trustworthy when they are calculated for ages over 20. And because certain diseases which may be wrongly confounded with true phthisis are much more frequent in the men than in the women of the districts which suffer them, the female death-rate is a surer test than the male. Accordingly the most decisive figures for measuring differences of local death-rate by phthisis are those which relate to the female population, and especially to the female population at ages above puberty.

District death-rates by phthisis generally (without distinction of sex or age) range from 134, 144, 165, 173 and 183 to 390, 407, 409, 421 and 445. The female death-rate by phthisis ranges from 156 to 517. The adult female death-rate by phthisis ranges from 229 to 588.

These figures bear unequivocal testimony to the operation of local causes in the production of tubercular disease. The most important among such local causes is shown by Dr. Greenhow to consist in the industrial relations of the people. The great contrasts are found to lie between populations, respectively agricultural and manufacturing. *In proportion as the male and female populations are severally attracted to in-door branches of industry, in such proportion, other things being equal, their respective death-rates by phthisis are increased.*

This fact associates itself with a very important result, which was well developed a few years ago by Dr. Baly in his admirable essay on the mortality in prisons. From examination of the medical records of the Milbank Penitentiary, he had learnt, "that the mortality caused by tubercular disease had been between three and four times as great during the eighteen years, 1825-42, among the convicts confined in this prison as it was in the year 1842 among persons of the same period of life in London generally; and that three-fourths of the excess of deaths from all causes in the Penitentiary above the rate of mortality of all persons in the metropolis of the same period of life had been due to the prevalence of that disease." Comparing the large number of prisoners in whom tubercular disease of the lungs first showed itself while they were in the Penitentiary with

the small number who were affected with it at the time of their reception, he was convinced "that imprisonment exerted here a very powerful influence in causing the development of the disease." Extending his inquiry to the other prisons of England, and to the prisons of other states in Europe and America, he found that the influence was one of universal operation, and learnt (as might have been expected) that other forms of scrofula were developed in the same proportion as pulmonary phthisis; that not merely this one form of the infiction, but tubercular disease in all its forms, resulted from the long-continued influence of imprisonment on the bodily health. This influence appears to be partly physical and partly moral:—among its component parts (with cold and poorness of diet) Dr. Baly enumerates deficient ventilation, sedentary occupations, and want of active bodily exercise, and a listless or dejected state of mind.*

* Of the points referred to by Dr. Baly, there are some in which the life of a textile population, especially of a textile-factory population, is comparable to the life of prisoners. At its best it has to a great extent the evils of monotony, of deficient bodily exercise, of physical seclusion from sun and air, and of mental privation from what is beautiful and animating in external nature. And thus probably, even at its best, it tends to produce some amount of vital depression, some kind of mental and bodily etiolation during which (especially in the case of persons otherwise predisposed to scrofula) there is a heightened liability to tubercular disease. Under an abuse of the factory system, these evils may be infinitely developed, in proportion to fewness of holidays and length of daily work time; most of all, no doubt, where the overtasked population does its work in ill ventilated places. The Saturday half-holiday, if it becomes general, is likely to be of considerable importance in mitigating the evils referred to. And generally speaking, it may be said that employers who take an interest in promoting the recreation of their workpeople, especially by out-door exercise or the pursuit of natural history, are great sanitary benefactors. The number of such men is now not inconsiderable; and the relations between capital and labour are, I believe, every year becoming more merciful. From a most interesting paper (*On the relations betwixt Employer and Employed under the Factory System; by Edward Akroyd, M.P.*) in the transactions of the Social Science Association, I extract the following description of the resources and inducements for recreation which one manufacturer—the author of the paper—has provided for his nearly 5,000 operatives:—A library is attached to the works, to which "any of my workpeople have access free of charge. A news-room is provided, supplied with the newspapers of the metropolis and of the locality, and also with the current periodical literature. A band is established at the works, and its performances are very creditable. It plays out of doors occasionally when the weather is favourable, at other times in a room provided for that purpose. Allotment gardens are provided for the workmen, and in connexion therewith a horticultural and floral society has been established to promote the

During the fifteen years which have elapsed since the publication of Dr. Baly's paper, progress has been made toward removing from prison-life many causes of scrofulous disease; and as the fever-mortality of Howard's time long ago followed the removal of its causes, so, no doubt, the high tubercular mortality of prisons is at present in course of extinction.

It is to be hoped that the evil, as it exists in our great centres of manufacture, may prove to be not inevitable.

Removable causes have notoriously in many cases so much to do with the increase of tubercular disease, that it at least deserves patient and skilful inquiry to determine whether the development of phthisis among men and women engaged in manufacture really be an essential appanage of such employment, even when not excessively laboured in, or depend perhaps on defective ventilation and other removable accidents of the system. The opinion of the medical profession would certainly incline to the latter view. It would suggest that an inquiry into the sanitary circumstances of our great manufacturing populations must almost certainly lead to the discovery of evils which may be palliated or removed, and consequently to the indication of means for lessening this cruel tax on the industry of our people. Inadequate ventilation is an influence not unlikely to prevail where numbers of persons work together in one in-door employment; and medical experience would point very decidedly to this influence, wherever it exists, as an adequate explanation of high tubercular mortality.*

"knowledge and cultivation of fruits, flowers, plants, and vegetables. An exhibition is held annually, at which prizes are given for the best productions of the respective gardens. To strengthen the habit of observation, and to cherish a taste for the beauties of nature, I give prizes for the best collection of wild plants and ferns growing in the neighbourhood. Recreation grounds are provided for the juvenile and adult members of the establishment, and every encouragement is given to the practice of healthy out-door sports and athletic games."—J.S.

* One of the most eminent of French physicians, M. Baudelocque, writing in 1832, described this class of diseases as almost exclusively due to particular conditions of the atmosphere in which the patient resides: asserting, namely, that, if the houses are so placed that the sun's rays cannot reach them, or the fresh air be renewed without difficulty,—if, in short, they are small, low, dark, and badly aired,—scrofulous disease will inevitably supervene. And although his opinion in its extreme form is not generally received by the medical profes-

In corroboration of this view, I may cite the very important facts recently elicited by the Commissioners appointed to inquire into the Sanitary Condition of the Army. The Commissioners state that, "while in civil life [population of " 24 large towns] at the soldiers' ages the deaths by pulmonary " diseases are 6.3 per 1,000; they amount in the cavalry to " 7.3; in the infantry of the line to 10.2; in the guards to " 13.8 per 1,000; and that of the entire number of deaths from " all causes in the army, diseases of the lungs constitute " in the cavalry 53.9 per cent.; in the infantry of the line " 57.277 per cent.; in the guards 67.683 per cent." They argue, "that in civil life insufficient clothing, insufficient " and unwholesome food, sedentary and unwholesome occupa- " tions, and the vitiated atmosphere of unhealthy dwellings " all contribute to the propagation of this class of diseases. " But in the army it cannot be alleged that the clothing, the " food, or the nature of the occupation in itself are of a " character which would justify the imputation that they are " among the predisposing causes of the excessive mortality of " the soldier by pulmonary disease." And they accordingly conclude, "that the ravages committed in the ranks of the " army by pulmonary disease are to be traced in a great " degree to the vitiated atmosphere generated by over-crowd- " ing and defective ventilation, and the absence of proper " sewerage in barracks: this one cause acting with such " intensity, especially when superadded to a certain amount " of exposure, as not only to produce in the foot guards an " amount of the disease in question which is greater than is " produced in civil life by all the four causes united, but " which actually carries off annually a number of men in the " infantry nearly equalling, and in the guards actually ex- " ceeding, the number of civilians of the same age who die of " all diseases put together."

sion, nearly all writers concur in recognizing the very great degree in which scrofulous manifestations depend on removable causes, and especially on unwholesome conditions of dwelling. Dr. Watson (in the recent edition of his Lectures, vol. i., p. 107) says,—“Scrofula depends in part upon hereditary con- “ stitutions; it partly arises also from exposure to cold and wet; but there is “ most reason for believing that impure air is a very powerful agent in calling “ scrofula into action, and in aggravating the strumous diathesis.”—J.S.

Pulmonary
inflammations.

b. A second very important part of the mortality from pulmonary affections is that which consists in deaths from common *non-tubercular pulmonary disease* among the labouring population. And the best available materials for comparison are got by taking together all diseases, except phthisis, of the respiratory organs in the male population at ages above twenty. The local death-rates calculated from these materials range from 66 to 869. And Dr. Greenhow shows the important fact, that *high death-rates in the present category mainly depend on the local pursuit of particular branches of industry*. Two kinds of occupation are in this especially hurtful; first, those which give rise to mechanical irritation of the air passages, by diffusing in the air of work-places any considerable amount of metallic or earthy grit, or even of flax-dust or cotton or woollen fluff; secondly, those in which the operatives are exposed to abrupt changes of temperature. At the head of the first class, Dr. Greenhow places the mining of lead, tin, and copper; and he specially refers to "the most exclusively lead-mining district in England," as one which loses by diseases of the chest in consequence of its prevalent employment a "larger annual proportion of its adult male inhabitants than the unhealthiest city in the kingdom," and as "the place in which there is a larger proportion of widows than in any other place in the kingdom." Towns which are the seat of fine manufacture in metals (especially of cutlery-manufacture) and towns where certain textile manufactures are carried on, and districts of pottery-manufacture, are shown to suffer high mortality from the same class of diseases. Again, in some of the above-named occupations, as well as in various other branches of industry, there are processes which require to be conducted at a high temperature; so that the operatives, especially in winter, are exposed to vicissitudes of heat and cold, and derive from this cause such liability to lung disease as affects very considerably the death-rate of the district. It is not easy to separate this influence from the other with precision enough for statistical purposes; but it seems probable that the high mortality of male operatives in pottery-manufacture may be more due to this cause, while that of

female operatives in the same manufacture would be rather due to mechanical irritation of the lungs. For the biscuit-rubbing (which diffuses a quantity of gritty dust) is chiefly done by women; while the slip-kilns (in which the pappy "slip" of clay and flint is evaporated at a high temperature) as well as the baking kilns and furnaces are of course tended by men.

It seems probable that in some districts the chronic inflammatory diseases which result from mechanical irritation of the lungs are not properly distinguished from true tubercular phthisis; and that deaths from the former diseases are often mistakenly certified for registration under the name of "consumption." Fallacy from this source is avoided by taking together as a single group all affections of the respiratory organs, *tubercular and non-tubercular*; and when this is done, the resulting scale of adult male death-rates is seen to range from 221 and 306 to 1,298 and 1,440. The two last death-rates belong to the two principal lead-mining districts: and, that their enormous excess depends on the prevailing male occupation, is made manifest by Dr. Greenhow's figures. He shows that in these very two districts, where the male death-rates are respectively 1,298 and 1,440, the corresponding female death-rates are but 717 and 779. And this fact is the more convincing, because it seems that, apart from interfering circumstances, the pulmonary death-rate of adult females tends to be somewhat higher than that of adult males,

c. The *infantine death-rate from pulmonary affections* is a third very important head under which to consider our national mortality from that class of disease. Every year more than 23,000 children under five years of age die of inflammations of the respiratory organs, besides nearly 4,000 whose deaths are attributed to phthisis. And these 27,000 deaths are so unequally distributed, that the corresponding death-rate in proportion to the infantine population ranges from 213 in the healthiest district of England to 2,897 in the unhealthiest. The causes of this immense range of death-rate may most conveniently be considered as part of the general question of infantine mortality.

Inflammations
in infancy.

Mortality of
young children.

4. The *death-rates of young children* are, in my opinion, among the most important studies in sanitary science. In the first place their tender young lives, as compared with the more hardened and acclimatised lives of the adult population, furnish a very sensitive test of sanitary circumstances; so that differences of infantine death-rate are, under certain qualifications, the best proof of differences of household condition in any number of compared districts. And, secondly, those places where infants are most apt to die are necessarily the places where survivors are most apt to be sickly; and where, if they struggle through a scrofulous childhood to realise an abortive puberty, they beget a still sicklier brood than themselves, even less capable of labour and even less susceptible of education. It cannot be too distinctly recognised that *a high local mortality of children must almost necessarily denote a high local prevalence of those causes which determine a degeneration of race.*

The Registrar-General has not for many years analysed the infantine death-rates of England. But on the one occasion, when he published such an analysis (relating to the years 1838-44) it appeared that in some districts the death-rates of childhood were five times as high as in others; and I have no reason to question that similar inequalities prevail at the present time.

Deaths which occur in excess within five years of birth are mainly due to two sets of causes; first, to the common infectious diseases of childhood prevailing with unusual fatality; and, secondly, to the endemic prevalence of convulsive disorders, diarrhoea and pulmonary inflammation.

Infectious
diseases.

a. First, then, as regards the *infectious diseases of childhood*:—Scarlatina, measles, hooping-cough and small-pox have, during the eight years 1848-55, destroyed 297,555 persons. Their average annual fatality amounts to about 37,000 deaths. In about three-fourths of the total number of deaths, the subjects are under five years of age.

These diseases, both separately and jointly, have produced very different death-rates in different districts of England. But special caution is requisite in drawing conclusions from these death-rates. On the one hand, the diseases spread by

personal infection;—their diffusion in any district must commonly have been determined by the arrival of an infected person, and by his coming into contact with others who had not yet suffered from the infection with which he was suffering. On the other hand, atmospheric influences have apparently much to do with the epidemic spread of infection; and the influences most favourable to the process, in respect of one disease or another, are absent sometimes for considerable lengths of time.* The disease in consequence prevails very unequally in different years, and its inequalities are not simultaneous in all places. It may happen, especially with remote districts, that the infection is absent from among the population at a time when exterior circumstances are favourable to its extension and fatality; and a low death-rate may result from this accident. Or the opposite may be the case;—the infection may be present, with facilities for its personal communication, at a time when exterior chemical conditions are tending to produce what is called an “epidemic period;” and the result will of course be a widely different one. Single years are thus able to weigh so unequally in the calculation of local death-rates, that the comparison of such rates is inevitably fallacious, unless it be founded on the experience of considerable periods of time.† In the comparison which

* Such influences are very imperfectly known to us. Differences of chemical action in the atmosphere—perhaps differences of chemical action of solar light—seem especially to deserve study, but are hitherto almost uninvestigated. As regards some diseases (especially the diarrhoeal) solar heat appears to tell with great effect; but mere difference of temperature does not make the difference between a year when cholera prevails epidemically and a year when it cannot become epidemic. With reference to the action of heat in favouring diarrhoeal diseases, it is proper to remember Magendie's Statement (*L'Union Médicale*, 1852, p. 236) that by injecting into the blood-vessels two grammes or even one gramme of putrid material during very hot weather, he could produce death as certainly as by injecting three, four, or even ten grammes during winter.—J.S.

† When I observe, for instance, in regard of small-pox, that in certain districts its fatality in single years has been 40, 50, 60 even 90 per cent. of its entire septennial fatality, I am not disposed to consider seven years as a sufficiently long period for determining the true small-pox death-rate of small and remote districts. As a check on the tendency to draw too absolute conclusions from the vital statistics of short periods of time, it is instructive to notice what long periods are requisite for determining the laws of phenomena in other departments of science, where the disturbing influences are not more numerous than here. Mr. Glaisher finds “that a period of daily observations of 43 years “is insufficient to determine the mean daily temperature.”—J.S.

follows, I refer to results on so large a scale that it seems impossible to misunderstand them.

Measles,
hooping-cough,
and scarlatina.

Looking only to very large masses of population, and comparing the four millions of population who occupy the south-eastern quarter of England with the two and a half millions who occupy the north-western counties, I find that the aggregate death-rate from *measles*, *hooping-cough* and *scarlatina*, among the latter population is more than twice as great as among the former. At first sight, one might be disposed to attribute this difference to the greater facilities for mutual infection which exist among the densely collocated population of the north-western counties, and to the consequently earlier age at which on an average the infection is likely to be contracted;—influences, which of course count for something. But (as will presently be seen) certain non-infectious diseases of infancy, especially the convulsive disorders, are in even a greater excess in the same counties. And this fact renders it extremely probable that, if that denser gathering together of the population be the cause of the increased mortality from infectious disorders, it produces its effect not only by rendering the disorders more prone to spread, but likewise by rendering them more fatal to those whom they attack. In other words, it probably illustrates on a large scale one of the effects of overcrowding and defective ventilation, for there can be no doubt that these sanitary defects, existing to the degree in which they would develop the nervous disorders of infancy, would greatly aggravate the fatality of the infectious diseases in question. The fact perhaps further illustrates that very terrible possibility to which I have adverted—an increasing weakness of life in the population of our great centres of industry.

Other influences essentially connected with poverty, will tend to make all these diseases more fatal in places which are thronged with a poor labouring population. And possibly there exist in respect of each disease (especially perhaps in respect of *scarlatina*) certain conditions of local climate—unexamined conditions of soil and water-supply, for instance, which may be not indifferent to the result. But these matters are hitherto uninvestigated; and I do not feel

justified in saying more, than they seem to me well deserving of investigation. For *the wide range of local death-rates from measles, hooping-cough and scarlatina, among districts where all the populations have undoubtedly had abundant means of becoming infected, leads to the conclusion that local influences of one kind or another must have been very greatly concerned in determining the proportionate fatality.*

Small-pox during the nine years 1848–56 killed 41,290 Small-pox. persons, being at the rate of 4,587 a year. As to the almost entire preventability of these deaths there is, among competent persons, no difference of opinion. In countries where vaccination is general, the fatality of small-pox has under its influence declined to some small fraction of that which formerly prevailed; so that where formerly in a given population there would have occurred 100 deaths by small-pox, there now occur as few as 4 or 5. Of those who still die of small-pox in England, the immense majority are non-vaccinated or ill-vaccinated persons; and *it is certain that, if vaccination were universally performed in the best known manner, deaths by small-pox would be among the rarest entries in the register.*

The absence of small-pox deaths from the mortality returns of any district, especially of a remote district, does not of necessity indicate that the population is well protected by vaccination; for accidentally it may have happened that during several consecutive years the contagion of small-pox has not been introduced, and that the protectedness of the population has in consequence been untested. But the converse proof is a sufficient one:—the presence of many small-pox deaths in local returns is evidence that vaccination is not satisfactorily practised. Accordingly, the very large continuance of small-pox to which I have adverted is among the most painful facts which are to be gathered from the registration-returns of England. To foreign nations, who have learnt from us the means of preventing small-pox, it must seem almost incredible that we still annually suffer four or five thousand deaths by the disease. And the Registrar-General's last quarterly report is in this respect

a curious illustration of the slow rate of social progress, containing evidence as it does that in *certain considerable districts of England, during the three months ending March 31, sixty years after Jenner's discovery, deaths by small-pox were amounting to a fourth part of the entire district-mortality.*

No evidence can be more conclusive than this as to the neglect of vaccination in certain parts of the country. But other evidence unfortunately is not absent. In the report which I had last year the honour to present on the subject of vaccination, and in a very excellent paper "On Public Vaccination in England and Wales," communicated by Dr. Seaton to the Association for the Promotion of Social Science, such neglect is abundantly proved. "It is calculated (says Dr. Seaton in the Memorial of the Epidemiological Society) that where the Vaccination Act works well, 80 per cent. of the births will probably have to be provided for by the public vaccinator. . . . In looking at the infantile public vaccinations for 1854, there will be found unions like Halifax, Biggleswade, and Lincoln, in which there were respectively 73, 82, and 87 per cent. of the births; while in Liverpool there were but 57 per cent.; in Hastings, 44 per cent.; in Newport, 40 per cent.; and in Northampton but 27 per cent. Now what may be done in a town like Halifax may surely be compassed in Liverpool, in Newport, or in Northampton. There can be no conceivable reason why the results which have been attained at Lincoln should not be reached at Hastings. If 90 per cent. can be vaccinated in the Conway union, why should only 40 per cent. be vaccinated in that of Holyhead? I need scarcely say, that it is not for a moment contended that all unions should exhibit *the same* percentage of public vaccinations. In every union there will be local circumstances to be taken into account,* which will influence, and even in some districts (as the colliery districts where special arrangements are made) influence materially this per-centage; but, making an allowance for

* "The migratory character of the population in some unions, and the extent to which gratuitous vaccination is given by medical men, not public vaccinators, are circumstances of this kind."—J.S.

"these, no such discrepancies as those I have pointed out ought to exist, and any objection which may be raised on that score may altogether, or in a great measure, be got rid of, by taking *the same* town in different years. Take Durham, for example, in which the public vaccinations were 71 per cent. of the births in 1854, 46 per cent. in 1855, and again 60 per cent. in 1856; or Newport, 40 per cent. in 1854, 62 per cent. in 1855, and only 33 per cent. in 1856; or Devizes, 72 per cent. in 1854, 38 per cent. in 1855, 29 per cent. in 1856; or Winchester, 68 per cent. in 1854, 39 per cent. in 1855, 32 per cent. in 1856. In the same town, with any regular system at work, the percentage of vaccinations would under ordinary circumstances scarcely vary."

b. *Convulsive or nervous diseases, diarrhœa and respiratory inflammations* may properly be considered together as Acute non-infectious diseases. regards their endemic prevalence among young children. Their conjoint operation is to destroy every year about 72,000 children, and thus to occasion about a sixth part of the total mortality of England. Eminently they are diseases of towns, perhaps especially of great manufacturing towns. And I take them together, because I have some doubts whether the comparative absence of one or even two of these diseases may not sometimes (either in fact or through errors of naming) be counterbalanced by the very high development of another, and whether it might not in consequence be easy to draw wrong conclusions from an isolated scale of death-rates by one of the diseases exclusively.*

It hardly needs to be stated that these diseases are produced by other than endemic influences. That abrupt changes of temperature and imperfect protection against cold favour inflammation of the lungs and air-passages, that improper food (specially likely to be given to the children of the poor) produces diarrhœa, that the irritation of teething and many other temporary influences cause convulsions, no one questions

* One remarkable case to illustrate this question may be quoted from Dr. Greenhow's paper. The highest death-rate by infantile nervous disorders (3,832) is in a district where the infantile death-rate from diarrhœa is only 35, and that from respiratory affections only 351.—J.S.

But why should the resulting death-rates vary as they do in different districts of the country? The average death-rate produced by these disorders in three of the healthiest rural districts of England (taken together, since these districts are small, to increase the basis of comparison) is 925;—in the unhealthiest district of England the corresponding death-rate is 6,895. Why are these non-infectious infantine complaints seven times as fatal in one district as another? To answer this question let the diseases be considered separately.

Convulsive disorders.

First, of *nervous disorders incidental to early life*, there have died during the nine years 1848–56 as many as 330,881 young children, or annually almost 37,000. And the distribution of this large infantine mortality has been strikingly uneven throughout the country; the resulting local death-rates per 100,000 male children under five years of age having ranged, from 302, 355, 561, 836 and 847, to 2,938, 3,107, 3,301, 3,496 and 3,886. Some of the districts with low death-rates are small, and comparatively few additional deaths would have influenced their rate; but a fair estimate of the very great extent of real range, apart from all sources of fallacy, may be gathered from the fact that the average death-rate by these diseases throughout the north-western counties of England is about $2\frac{1}{2}$ times as high as throughout the eastern, south-eastern, and south midland counties.

Two thirds of the deaths under consideration are registered as deaths by “convulsions;” and probably there is little real difference between these and the other cases which are grouped as “nervous disorders of infancy.” Accordingly, the history which I am about to quote, though it nominally relates to only one form of these diseases, may be considered equally instructive in reference to them all. It consists in the remarkable experience of the Dublin Lying-in Hospital, as told by Dr. Collins, formerly master of the institution. Seventy-four years ago this experience was to the effect, that of 17,650 children born in the institution, 2,944 had died within the first fortnight; being more than every sixth child, or about 17 per cent. on the births; and that nearly all these deaths (19 out of every 20) had been occasioned by “nine-day fits.” Dr. Clarke, who at that time was master, “considered a foul

“and vitiated state of the air in the wards of the hospital to be the principal cause of this disease,” and adopted arrangements by which “a free circulation of air was at all times secured through the wards, and effected in such a way as to put it out of the power of the nurses to control it.” Of 8,033 children born subsequently to the wards being ventilated, as described, only 419 died; being about $5\frac{1}{8}$ per cent. on the births, or less than a third part of the previous mortality. Under additional improvements the death-rate became still further reduced. Among 16,654 infants born during the seven years of Dr. Collins’s mastership, only 286 died—being 1·7 per cent., and of these only 37 from the disease which had formerly been so fatal; so that, within 50 years of Dr. Clarke’s reform, the general mortality had been reduced to one tenth of what it was, and the special convulsive mortality to one sixty-eighth of what it was.

Secondly, the infantile mortality which arises in *non-tubercular diseases (almost exclusively inflammations) of the respiratory organs* is very large. In 1856 the deaths of children under five years of age from pneumonia, bronchitis and croup amounted to 28,763. Of the preventability of these diseases I cannot give so compact an illustration as that which I have just quoted in reference to the nervous diseases of infancy. But I may remark that their great prevalence in localities which have bred the largest share of certain other endemic diseases has often struck me; and that I have thus been led, from the time of my earliest engagement in sanitary matters, to class the pulmonary inflammations of infancy among the diseases which are oftenest of endemic origin. This view receives definite support from Dr. Greenhow’s figures, which show a range of infantile death-rate by these diseases of the lung, from 155 as a minimum to 2,397 as a maximum. The mother—whose tendency it is to refer “taking cold” to out-door influences exclusively, and who, if her child’s breathing ails, tortures her own conscience with doubts whether he has been exposed ever so little to one wind or another, and whether it would not be safer to keep him altogether within doors, might usefully study this part of the statistics. The more favour-

able of the death-rates under consideration are those of rural populations, the two lowest of all belonging to the two most northerly of Dr. Greenhow's 105 districts; while the high death-rates eminently belong to towns, and are no doubt mainly dependent on those poisonous in-door influences which attend in such large proportion on the urban residence of the poor, and develop to so great an extent the other forms of infantile mortality.

Diarrhœa.

Thirdly, by *diarrhœa* and *dysentery* there annually die more than 11,000 children under five years of age. The death-rate ranges, from an average of 76 in three of the healthiest districts, to 1,452 and 1,687 and 1,779. This in itself (unless infantile diarrhœa were an exception to what I have stated of diarrhœa generally) would suggest as almost certain that, in the places where the high death-rates prevail, there must be operating against the lives of the community those evils which specially depend on defects of house-drainage, with consequent non-removal of animal refuse from about the dwellings and water-sources of the population. And, in fact, it will be seen in Dr. Greenhow's tables, that the seats of a high diarrhœal mortality among young children chiefly exist amid those dense urban aggregations of life where the well-organised removal of refuse-matters is so specially indispensable to health. Part of the result, even a considerable part, depends no doubt (as is the case with all excessive infantile mortality) on the engagement of mothers in various branches of industry; which, leading to their absence from home, must occasion on a very large scale in some places the improper feeding of infants. But that the other influence is not inoperative—that the causes of adult diarrhœa are likewise to a great extent the causes of infantile diarrhœa—seems quite unquestionable. And in illustration of this statement, I cannot do better than quote the following very remarkable passage from the well-known work* of Dr. West on the diseases of early life. "Although (says Dr. West) while I " was physician to the Finsbury Dispensary, a large amount " of disease among children as well as among adults came

* Lectures on the Diseases of Infancy and Childhood. Third edition, p. 489.—J.S.

" under my notice, yet *my acquaintance with those severer*
 " *forms of infantile diarrhœa which approach to the charac-*
 " *ter of dysentery, and which give rise to similar lesions,*
 " *has been derived almost exclusively from observations in*
 " *Lambeth and the adjoining parishes.** The children in both
 " districts are alike subjected to the evils of improper and
 " insufficient food, and of close and ill-ventilated dwellings;
 " but in the latter there are superadded certain very import-
 " ant influences of a local character. A considerable portion
 " of this district on the Surrey side of the Thames lies below
 " high-water mark, and the kitchens and cellars of some of
 " the houses near the river become flooded at unusually high
 " tides. The sewerage throughout is very defective: in many
 " parts it is effected entirely by open drains, while in some
 " places there are mere cesspools which have no communica-
 " tion with any drain whatever. Cases of infantile dysentery
 " do not occur with the same frequency in all parts of this
 " district, but they are most numerous and most severe
 " wherever these noxious influences are most abundant."

Reverting, then, once more to the gross mortality due among young children to the conjoint action of those three classes of disease which I have now separately spoken of, I believe that *the vast range of that aggregate mortality in different districts of England is due to the varying prevalence of two local causes:—*

first, to differences of degree in *common sanitary defects* of residence; some places abounding more than others in the foul air and foul water of undrained, unpaved, unscavenged, unwashed, unlighted, unventilated localities and houses;—

and, secondly, to *occupational differences* among the inhabitants; there being certain large towns where women are greatly engaged in branches of industry away from homes; where consequently these homes are ill kept; where the children are little looked after; and where infants who should

* "To this statement I may now add, that since the opening of the hospital for sick children, the patients of which come from much the same district as that inhabited by my former patients at the Finsbury Dispensary, I have not yet seen, among 3,400 cases, a single instance of severe dysentery."—J.S.

be at the breast are improperly fed or starved, or have their cries of hunger and distress quieted by those various fatal opiates which are in such request at the centres of our manufacturing industry.*

Means do not exist for appreciating at all accurately the proportionate influence of these two sets of causes. That the second of them is of great importance cannot be denied; and it is on this account, as well as on other accounts, a thing greatly to be desired, that the large manufacturing employers of female labour should address themselves to counteracting, as far as possible, the domestic evils which result from that system of industry. But lest the proportionate influence of this cause should be exaggerated, it is necessary to observe that the highest death-rate among infants, not only from the diseases here spoken of, but likewise from infectious diseases, exists in a large town where the population is not manufacturing. Taking together the common infectious disorders of infancy with those nervous and diarrhoeal and respiratory diseases which have last been spoken of—an annual total of more than 100,000 deaths—we find that they are distributed in different places according to an aggregate death-rate which ranges from about 1,303 to about 9,044; that the low rate belongs as an average to three of the healthiest districts of England, and the high rate to the one unhealthiest district; that the last is not a manufacturing town; and that the causes in operation there to produce its immense infantile mortality must presumably be those unwholesome conditions of dwelling which local authorities, under the Nuisances Removal Act and other sanitary laws, are specially empowered to counteract.

* Examinations which have been made of the causes of mortality of foundling-institutions, throw light on many influences which are likely to be injurious to infants whose mothers are withdrawn from them. A series of papers containing the result of such examinations has lately been published by Dr. Routh, in the British Medical Journal, 1858. Want of breast-milk is of course recognized to be a frequent and powerful influence in producing the high mortality of foundlings; but another and chief cause (according to the observations of M. Hervieux) is found to consist in the "want of exercise and the abuse of the "recumbent position" to which un-nursed children are especially exposed. The infant of the engaged mother would be almost as apt as the foundling to suffer from these evils.—J.S.

I have now spoken of those kinds of disease which, because of their immense fatality, deserve especial consideration. I have referred to facts which are notorious as to the causation of such diseases. In the subjoined figures you can read at a glance that vast range of their local death-rates which Dr. Greenhow has the merit of having made evident for public information.

1. *Annual death-rates, by diseases which are either wholly or almost wholly preventable under good sanitary arrangements, have ranged in different districts as follows:—*

Cholera.	Diarrhœa and Dysentery.	Continued Fever.	Small-pox.
From nothing to 403	From 4 to 345	From 21 to 209	From nothing to 146

2. *Annual death-rates, by diseases which to some considerable extent are inevitable, but of which the severity or the frequency may be controlled by good sanitary arrangements, have ranged in different districts as follows:—*

Tubercular Phthisis in Women.	Non-tubercular Lung-diseases in Men.	Common Infectious Disorders of Childhood.	Convulsive Disorders of Childhood.	Pulmonary Affections of Childhood.
From 229 to 588	From 66 to 869	From 694 to 2,149	From 280 to 3,832	From 213 to 2,897

And let me beg leave again to bring before you the several totals of death which year by year are thus unequally distributed. Looking at the last eight or nine years* for which materials are before me, I find that the annual average of deaths by the *three diarrhoeal diseases* has amounted to 26,388; by *fevers* (typhus, typhoid, infantile and remittent) to 18,616; by *small-pox*, to 4,587; by *tubercular diseases* (male and female, at all ages) to 57,982; by *non-tubercular*

* For some diseases I have been favoured by the Registrar-General with the unpublished figures for 1856. In these cases my average is founded on the nine years 1848-56; in other cases on the eight years 1848-55.—J.S.

respiratory diseases (male and female, at all ages) to 50,273, whereof 23,020 have belonged to childhood; by the *common infectious disorders* to more than 32,000; by the *nervous disorders of childhood*, to nearly 37,000. Here altogether are 227,000 deaths, annually distributed with the utmost inequality. After reasonably estimating the degrees in which they severally are preventable, it can no longer seem so difficult to make a very large beginning towards striking off the annual 100,000 deaths against which the Registrar-General protests as deaths of artificial production.

Other preventable causes of death.

Many others remain; but, after speaking of preventable deaths which may be counted by tens of thousands, it seems almost trivial to dwell on diseases which annually kill but a few thousands among them.

Yet some of them deserve notice.

Ague.

Ague does not overtly kill even two hundred a year. Yet if one may judge by the experience of the Peterborough Hospital (where out of 1,394 cases during nine years only one proved fatal) the injured are immensely numerous in proportion to the directly killed.* And, beyond all doubt, the deaths are much less infrequent than they seem; for when the malarious influence destroys life in this climate, almost always it is by secondary results; and the deaths which thus occur are registered, not as *ague-deaths*, but as due to dropsy, or liver-disease, or other abdominal affection.

It needs not now to be shown that *ague* is preventable. Before the time of the great fire of London—or let me rather say, before the better draining and paving which attended the reconstruction of London—endemic *ague* was among the most prevalent and most fatal diseases of the metropolis. Even a century ago, according to Dr. Fothergill, it still had a considerable prevalence. Now it is scarcely (if at all) known to us, except as imported from the undrained marsh-districts of other parts of the kingdom, where appropriate means have not hitherto been employed for its extinction.

Scurvy.

Purpura and *Scurvy* annually kill from two to three hundred persons. In their origin and nature these diseases

* See Dr. Greenhow, *seq.*, page 105.—J.S.

are different; and it is therefore to be wished that they could have been separately enumerated.* *Scurvy*, it is well known, is but a modified starvation, dependent on the absence of vegetable food. It was this disease which used to decimate our navy and render long sea-voyages almost impossible. It was mainly by *scurvy* that Anson, in his celebrated voyage of 1740–2, lost within the first ten months nearly two-thirds of his crew, and during the remaining period about half of the survivors. It was against *scurvy* that Cook had attained his great success, when in 1775, after three years' absence, he brought back a healthy crew, which, out of 112 men, had lost only one by disease. And the perfect preventability of *scurvy* is well shown in the experience of our navy; from which, even in the year 1780, Haslar Hospital received as many as 1,457 cases; and in which at present the disease is never seen. Undoubtedly, therefore, it is by neglect of sanitary precautions, and through punishable disobedience to the law,† that *scurvy* to a considerable extent still prevails in our mercantile marine, and that so many cases of great severity are still received into civil hospitals situated in the neighbourhood of our docks. In land-life the common consumption of the potato serves so completely to prevent *scurvy*, that poverty perhaps never becomes an occasion of the disease, except when the potato-crop has failed. Voluntary abstinence from vegetable diet is sometimes, but very rarely, the circumstance to which an individual case of *scurvy* on shore may be ascribed. But the main source of such *scurvy* as still exists in England is no doubt maritime, and depends on the absence of due provision for the diet of crews during long voyages. The "Weekly Return of new cases of sickness in the public institutions of the metropolis," communicated to the Board of Health by the Association of Officers of Health, has occasionally

* In the Registrar-General's Report for 1855, *scurvy* is distinguished from *purpura*. Out of 197 male deaths and 127 female deaths attributed to the two diseases, sixty male and thirteen female deaths are especially referred to *scurvy*.—J.S.

† Mercantile Marine Acts: 7 and 8 Vict. cap. 112.; 13 and 14 Vict. cap. 93.; 14 and 15 Vict. cap. 96.; and the Passengers Act, 15 and 16 Vict. cap. 44.—J.S.

during the last few months quoted striking facts of this kind from the experience of the hospital ship "Dreadnought."*

Puerperal
fever.

Puerperal Fever is registered as killing about 1,500 mothers a year. Probably other fatal cases of the disease are included in the list of about 3,000 women annually described as dying of *peritonitis* and of *childbirth*. Statistically, the number is not large. But every one must wish it were less; for death rarely falls with more individual heaviness than when it comes in this form to rob the household of a mother in her happiest and hopefulest moment. And the death strikes every observer so essentially in the light of an accident, that it makes more impression of suddenness and evitability than almost any death not actually by violence. Fortunately the disease is in a very unusual degree preventable; for the experience of Lying-in Hospitals enables us quite confidently to class it among the putrid infections. Its propagation has in too many instances been traced to personal agencies which, now when they are understood, it would be criminal not to guard

* Ex. gr. October 24; "All the scurvy cases [six] were returning from India, and came in *two* ships; in one, all the provisions were bad; in both, the lime-juice. It is the common tale in all scurvy cases admitted here, that the lime-juice was either bad or deficient."—November 7; "One of the [new] scurvy cases occurred in the return voyage from the East Indies; there were sixteen hands working the ship, and fifteen had scurvy; the provisions were good. The lime-juice taken from England was expended on reaching India, and what they had obtained there turned bad before they were out of the Bay of Bengal; consequently they were without this necessary during the remainder of the voyage."—November 28; "The case of dysentery is that of a man who has previously suffered from the same disease, and who ascribes its recurrence to cold and the want of *lime-juice* in returning from India; the lime-juice supplied having been stale and unfit for use."—December 5; "Three cases of scurvy were admitted from the ship 'Ardbeg,' belonging to Glasgow. The provisions were tolerably good, but only two table-spoonfuls of lime-juice were allowed every eight days. The Act requires half an ounce of lime-juice to be given daily, but it is little attended to."—January 30; "A case of scurvy was admitted from a Hamburg vessel, destined for California, with six hands, five being disabled by scurvy."—March 13; "Ten cases of scurvy have been admitted. Five of these patients are from the 'Countess of Seafeld,' from Shanghai. The crew consisted of ten; out of which one died, and six were disabled by scurvy. None of the officers were affected. The passage lasted four months and twenty-one days. Only a gill of lime-juice and a pint of vinegar were allowed per fortnight for the first two months. Even bread was deficient. The other cases came from the 'Sirocco,' of Sunderland, from Bombay, and the 'Jane,' of Liverpool, from Callao."—J.S.

against; and its ordinary origin stands in intimate relation to sanitary faults which never ought to surround either the healthy or the sick.

In respect of the General Lying-in Hospital in the York Road, during the twenty years 1837-56, Dr. Rigby, the physician of the Institution, has publicly alleged that the mortality (almost entirely from puerperal fever) ranged, *according to the efficiency or inefficiency of ventilation*, from less than 5 to more than 90 per 1,000 cases delivered. Exception having been taken by the Committee of the Hospital to some parts of Dr. Rigby's statement, the statistics were re-examined, with special regard to any questionable facts, by Dr. Odling, the Medical Officer of Health of Lambeth. This gentleman, setting aside periods in regard of which any doubts could be raised, and comparing ten years during which he believed it to be "admitted by both parties, that systematic ventilation *was not* practised," with seven years during which he believed it to be "admitted by both parties that systematic ventilation *was efficiently* practised," found that during the former period the death-rate had been 46.42, during the latter period only 4.81, for every 1,000 deliveries. And after making allowance for other influences (among which serious defects of drainage had been mentioned) Dr. Odling concluded his letter to the Committee by pointing out "that for seven years co-incidentally with efficient ventilation there was an extraordinarily low death-rate, and that the change from ventilation to non-ventilation was in a few months time followed by an increase of mortality."

That women may receive the infection of puerperal fever at the hands of those who previously have been in attendance on cases of erysipelas, is now among the certainties of medicine. It has been established by a large amount of very fatal experience. And that the same contagion may arise in ordinary post-mortem putridity, and be propagated from this source, is likewise certain. Immense mortality from puerperal fever in one division of the Vienna Lying-in Hospital, varying from about a fourth to about a ninth part of all the deliveries which took place there, was believed by Dr. Semelweiss, the head of the department, to depend on an

infection of which "the real source was to be found in the hands of the medical men in attendance contaminated with cadaveric poison." The other division of the hospital (reserved for the practical instruction of midwives, whose training does not require them to be brought into contact with dead bodies) suffered only about a tenth part as much as the first; and this was the more noticeable as the second division was inferior to the first in the size and airiness of its wards. Dr. Semelweis, acting upon his supposition as to the cause of the disease, required that the male attendants of the first division should, as much as possible, avoid contact with cadaveric matter; that after such contact they should never make a vaginal examination till the following day; and that, besides very thoroughly cleansing their hands, they should systematically *disinfect them with a solution of chlorine*. The latter precaution was not introduced till some months after the more general precautions had been adopted. The result of these measures was, that the mortality of the first division at once fell to the usual average of the second division. In 1846, the death-rate per cent. had been $13\frac{2}{3}$; in 1847 it was $5\frac{1}{5}$; in 1848 it was $1\frac{1}{3}$.*

Erysipelas.

Erysipelas, under its own name, kills about 2,000 a year, and under other names, perhaps many more. It has two forms not distinguished in the registers, and probably not essentially different; whereof one particularly belongs to surgical practice, as an occasional very serious complication of wounds. The poison of this *traumatic erysipelas* seems to be identical with that of puerperal fever. Intimately associated with the atmosphere which breeds it, are other calamitous influences, which are apt to prevail with erysipelas epidemically in the wards of ill-kept hospitals, threatening every open wound of every patient who lies there, arresting the vital processes of repair and putrefying its material, infecting the whole blood with mischief propagated from the part, converting slight injuries into grave dangers, and often defeating the success of the best-performed surgical operations. The experience of the old Hôtel Dieu (*maison de Dieu, porte du ciel*) was in

* See Dr. Routh on the Epidemic Puerperal Fever of Vienna. Med. Chirurg. Trans. xxxii.—J.S.

this respect most lamentable: and no wonder—when Howard used to see "five or six in one bed, and some of them dying"—that "hardly any acute cases, childbed cases, or capital operations survived," or that the operation of trepanning was laid aside as one which for fifty years had never been known to succeed.* The Scutari Hospitals, during the earlier part of the Crimean war, illustrated a similar connection of cause and effect, under circumstances to which I have already adverted;† and here, as in the Hôtel Dieu and in innumerable other instances, the evil ceased under a system of stricter cleanliness, improved ventilation, and diminished crowding. The old hospital ship "Dreadnought" had acquired a very evil reputation for the prevalence of these infections; dependent, no doubt, in part on the natural ill-adaptedness of a ship to the purposes of a hospital; but probably also in part dependent on organic contamination still lingering in the wooden walls of the wards. Early last year another more commodious ship was substituted for the "Dreadnought," and Mr. Tudor, the resident surgeon, informs me that, whereas in the two years preceding that change 9 out of 22 amputations had terminated fatally, only one amputation had proved fatal out of 16 performed in the year following the change; and that, whereas formerly erysipelas and hospital-gangrene were so common and so spreading as to have let him see there at one time as many as 18 cases of hospital-gangrene, he has now scarcely seen erysipelas, except in patients admitted with it, from whom, as a rule, it no longer spreads to other inmates of the ward.

Traumatic
erysipelas,
hospital-
gangrene,
pyæmia.

Erysipelas of the kind which is not associated with wounds has, in some respects, more affinity to the eruptive fevers than to the above-mentioned traumatic diseases, and might therefore perhaps conveniently be called by a distinctive name. But the circumstances under which it arises have appeared to me so often to be circumstances of local unwholesomeness, that I am disposed to believe there is little essential difference between this form, which begins as a

Erysipelatous
fever.

* See Sir Gilbert Blane in the remarks on St. Thomas's Hospital, in his paper on the Prevalence of Different Diseases in London.—J.S.

† See preceding page 24.—J.S.

febrile attack, and the other form, which begins as a local infection; and as the latter is quite unquestionably due to defective sanitary conditions, so I have strong suspicion that the former will be found a very infrequent disease when the causes of other endemic contagions have become less rife.

Insanity.

Insanity, according to the registers, causes only 500 deaths per annum; but of 7,650 deaths annually attributed to *paralysis*, and 1,840 annually attributed to *epilepsy*, many, no doubt, are of insane patients. It deserves attention that, so far as very imperfect statistics can determine the matter, insanity appears to be increasing in this country. In the last (eleventh) report of the Commissioners in Lunacy it is mentioned that in 1852 the number of pauper lunatics and idiots was returned by the Poor Law Board as 21,158; but in 1857, as 27,693. No disease has less immediate connexion than insanity with such exterior influences as are under the control of local sanitary authorities; but there is not an absence of indirect connexion. The mental activity which belongs to eager competition in a crowded and ambitious country is a frequent cause of cerebral disorder to persons who from parentage or other circumstances are predisposed to it; and this special influence is, of course, likely to develop itself in proportion as the particular period is fraught with occasions of excitement and fatigue. But what deserves here to be borne in mind, just as in reference to the development of scrofulous and tubercular disease, is the great power of all depressing circumstances to co-operate with the special cause. Those whom privation or disease has recently exhausted, or whose health is chronically deteriorated by unwholesome conditions of occupation or residence, succumb to the operation of mental causes which the brain of the healthy body could bear without injury. It is under such circumstances that many of our labouring classes suffer their first access of mental derangement; and I have every reason to believe that if we could obtain accurate statistics of the local distribution of insanity we should find its excesses among those parts of the adult population which suffer the largest preventable mortality from consumption and its kindred disorders.

Violence in more than 14,000 annual instances, is the Violence. registered cause of death. Generally on this class of premature deaths, I have not yet been able to make my inquiries with sufficient minuteness to learn what prospect there may be of lessening their large annual amount, and can only venture to name some among them which to my present knowledge seem susceptible of reduction.

In about 422 of the above cases fatal *poisoning* was discovered. To what further extent it may have operated without discovery, and to what extent the adulterations of food and drugs have been hurtful to life, are questions which at present I have no means of solving. The law (Vict. 14 and 15, cap. 13.) which forbids arsenic to be sold otherwise than coloured, and except with full registration of the sale and in presence of a witness known to both buyer and vender, has probably diminished the felonious uses of that drug; and an extension of the principle of that Act, to the regulation of the sale of all such poisons as are commonly used for criminal purposes, would greatly diminish the present almost unrestricted facilities for clandestine homicide.

In more than 5,000 cases *wounds, fractures, and contusions* are specified as having been the causes of death; some of them homicidal, but the very large majority accidental; and of the latter, some self-inflicted by the sufferers, while many arose in the carelessness of others. It is specially the last of these classes which already has been reduced, and probably admits of still further reduction. Whatever acts of legislation, or whatever decisions from the bench, tend to increase or fix the responsibility of persons for accidentally injurious consequences of their neglectful acts or omissions, must operate in this direction; and it seems certain that the "Act (Vict. 9 and "10, cap. 93.) for compensating the families of persons killed "by accident" has therein been of essential service. The Factory Act (Vict. 7 and 8, cap. 15.) and the Act for inspection of Coal Mines (Vict. 13 and 14, cap. 100.) have no doubt greatly reduced the frequency of serious accidents in both those branches of industry by increasing the responsibility of employers. Yet in 1854 the coalminers were represented to

be still losing 1,000 lives per annum from accidents of a preventable kind.

Among the 14,000 lives annually lost by violence are counted more than 1,800 cases where children are *burnt or scalded to death*. These numerous deaths by fire, and other still more numerous injuries which are not fatal, are referable to the domestic habits of parents; occurring almost exclusively among the poorer classes, where children cannot possibly be tended with the same vigilance as among the rich. Probably a large share of such casualties arises during the absence of mothers engaged in branches of industry which take them from home; and it seems likely that the evil would diminish with the development of well-conducted *crèches* and infant schools, which, on other accounts, are so very greatly to be desired for the infant population of places where mothers are engaged in manufactures and other non-domestic industry.

About 314 among the violent deaths are annually attributed to *intemperance*. Unfortunately that number expresses only a trace of the mischief which is done to human life by the abuse of spirituous liquors. But it opens the very difficult question of *preventable deaths arising in moral causes*; and I should be dealing uncandidly with my subject, if I did not expressly admit, in relation to it, the reality of that class of causes, and the greatness of their influence, direct and indirect. Not only do intemperance and profligacy create diseases which, except for them, would have no existence;* but also they act immensely in aggravation of the endemic causes of disease; adding to what is horrid and deadly in the unwholesomest haunts of our large cities, and rendering it a greatly more difficult task to remove such evils as are simply physical. Yet, that full justice may be done, let us well remember that such physical and such moral conditions act and re-act on one another: that, among the local circumstances which are hostile to health, some of the most prominent are equally hostile to moral and intellectual education. It has been my duty to make myself intimately acquainted with places

* Every year from four to five hundred infants are registered as having died from congenital syphilis.—J.S.

respecting which it may with truth be said, that vice and ignorance and brutality are among their active causes of disease: but from my first moment of personal intimacy with such places till now, my feeling has grown stronger and stronger, that populations, born and bred in such slums of cities as are nurseries of physical disease, must find it difficult to evolve survivors who shall not be vicious and ignorant and brutal. The same soil nurtures both growths of misery. And if social reformers of the two sorts addressed themselves jointly to those afflicting scenes, it would be no easy problem to determine whether, in their co-operation, the schoolmaster and moral teacher were doing more for the bodily health, or the sanitary improver doing more for the progress of education and the lessening of crime.

In commencing this introduction to Dr. Greenhow's paper, Conclusion. I stated that his results appeared to me of singular importance in their bearing on sanitary administration. And it is in this practical respect that I venture to beg for them your particular attention.

It is possible that, from accidental circumstances which would only reveal themselves to a local inquirer, his figures may here and there convey a not quite perfect picture of the real state of a district. It is on this account that I have refrained from particularising any district by name in connexion with remarks which could not be other than condemnatory, lest ever in the individual case I should have overlooked even a fraction of extenuating circumstance.

But, as regards all that is of substantial importance in the figures, there is no room for fallacy. But any one who will candidly consider *what are the possible meanings of those differences of death-rates*, only one conclusion can, I think, at last be arrived at. The diseases which are shown to prevail in different districts with such surprising degrees of inequality are eminently the diseases which can be prevented. And to me the conclusion seems inevitable that in certain parts of England, sometimes by good fortune, sometimes by good local government, definite causes of disease are kept at or near their

least conceivable activity; while, in other parts of England, the same causes are prevailing with as little check as if the community were one of savages to whom science had never taught her first and simplest lessons.

My own seven years' experience in the service of a local sanitary authority has given me a strong belief in the general disposition of such authorities to exert themselves efficiently against the causes of premature death, when but once they have become fully and publicly informed of the existence and fatality of such causes. *Fully informed*, I say;—because the non-removal of evils which occasion so much human misery commonly depends much less on the supineness of the local authority, as its primary cause, than on the absence of local consciousness as to the real facts of the case. *Publicly informed*, I say;—because local sanitary authorities, exercising their powers virtually without control, and being, like individual men, not incapable of indolence and error, peculiarly require that their fulfilment of very important duties should be subject to public criticism. Failing this check, it is unquestionable that the existing constitution of such authorities must sometimes endanger the objects for which they are constituted. Elected on the principle of being the representatives of rate-payers, the members are sometimes a little apt to forget that, for sanitary purposes, they are also the appointed guardians of masses of human beings whose lives are at stake in the business. They do not always remember that the interests of life are at least as sacred as the separate interests of pocket. And this danger especially deserves to be guarded against; for it has not infrequently happened that local owners of low house-property have procured themselves to be elected members of sanitary boards with a view to the protection of their own unworthy interests by systematic resistance to sanitary improvement.

The suggestions which I would respectfully offer, for dealing with what appears to me a great national question, are based on this view of the case. Holding the opinion which I have stated as to the meaning of high special death-rates; feeling convinced that they substantially depend on the non-removal of local and removable causes, and that this non-removal

commonly results from the absence of adequate local information as to the nature and extent of the existing evils; I would look to the systematic publication of facts, and to the influence of general opinion, as the main agencies of cure. In the last resort, if these means should fail, other remedies would assuredly not be wanting.

I submit that all such cases of high special death-rates as have been referred to in the present paper, ought to be thoroughly investigated; that *the local public and the general public and the government and the legislature ought to have before them the precise facts of each case where a preventable or partly preventable disease prevails to great excess in any particular district.*

Under the public Health Act, 1848, the Government had the power of enforcing the adoption of that Act on any locality wherein the general death-rate had on a seven years' average exceeded the common death-rate of the country. Under the Local Government Bill now before Parliament, this central power is no longer to be retained. And if it be a well-founded opinion which I have ventured to express, that the sanitary progress of localities is almost an educational matter (wherein enlightenment counts for much more than compulsion) the resignation of that power is no loss to the objects in view. But the absence of such compulsory power makes it, I submit, all the more urgently important that *the department on which will devolve the present medical responsibilities of the Board of Health should have under its habitual cognisance the class of cases to which I have particularly referred.*

The Public Health Bill now before Parliament, will if it become law provide for this object. Her Majesty's Privy Council, empowered to "cause to be made such inquiries as they see fit, in relation to any matters concerning the public health in any place or places," will be able to bring before local authorities, and the people under their jurisdiction, the facts in which the latter are so greatly interested. The appointed officers will be able to state, not only in such general terms as I have here employed, but in terms distinctly applicable to each case investigated, what local evils

have to be removed in order to abate in various districts their present tenfold or hundredfold multiplication of some preventable disease.

But it is only to a limited extent that this kind of inquiry, as an action of Government, would be possible. The 105 districts of which the statistics are included in Dr. Greenhow's paper constitute merely a sixth part of the registration districts of England. The entire question relates to removable causes of death operating on eighteen millions of population. Government inquiry could scarcely do more than indicate year by year in a summary way the broad facts of glaring cases. It could not supersede, nor ought it to supersede, the necessity for great local exertions where so much human life is at stake. And it seems to me a very obvious conclusion to draw from the immense disparity in the pressure of different diseases, that *local authorities, most of all where large urban populations are concerned, are imperatively bound to keep themselves properly advised by skilled officers as to the special causes of disease operating within their respective jurisdictions.*

Throughout the greater portion of England the local authority under the Nuisances Removal and Diseases Prevention Acts is also the authority or part of the authority for poor law relief. In all such portions, therefore, it stands in relation with the system of medical attendance which (covering the whole country) is part of that relief; and nothing would be easier than for the sanitary authority, under these circumstances, to be kept tolerably conversant with whatever relates to the sanitary condition of the poor. Wherever local boards of health exist, they already possess the power of appointing medical officers; but where municipal corporations and improvement-commissioners are the sanitary authority, they commonly have not obtained in express terms the power of making such appointments. It seems desirable that the power should universally be held. And in respect of large towns, especially of large manufacturing towns, I am strongly of opinion that it should be obligatory on the local government either (as in the districts of London under the Metropolitan Local Management Act) to appoint permanent officers of

health, or to obtain periodical reports from occasional medical inspectors.

There is a fatal misapprehension in many minds as to the time when such officers may be useful. Too commonly it is imagined that the time for their activity is the time when epidemic disease is present; too commonly it is unknown or forgotten that just at such a time they are least able to do good. The local conditions which favour epidemic visitation are conditions which for the most part it takes time to create, and which it always takes time to remove. The death-rates of certain ordinary diseases measure those local conditions, and predict where are the sure places for epidemic mortality to fall. It is in the interval between epidemic periods that measures may be taken which, while they reduce those ordinary death-rates, give security against the dreaded invasion. But in the moment of pestilence little can be done. Administrative bodies may suddenly have leapt, under stress of terror, to the point at which scientific information has for years been standing; panic may have rendered them as docile as they just before were incredulous; but radical sanitary reforms cannot be extemporised. If some hundreds of thousands of people in the middle of a cholera-epidemic find themselves (as was the case a few years back in Rotherhithe and Southwark and Lambeth) drinking water polluted with sewage, who is there that at a moment's notice can transplant the pumps and pipes of the water-supply? Or if the broad river amid a dense population has been allowed, in spite of all warnings to the contrary, to become the tidal sewer of a gigantic city, what intensity of alarm, when at last it is awakened, can shorten the years which must elapse before the consequences of that error are effaced?

But farther, the ordinary, not the extraordinary diseases, are those which most call for sanitary reform. Let local authorities do their utmost against the daily diseases of their districts,—against the diarrhoea, against the typhus and typhoid fevers, against the small-pox, against the phthisis, against the special diseases of operatives, against the murderous mortality of infants; confident that in taking this course they will be adopting the best precautions against occasional pestilence;

and equally confident that, in abating year by year whatever are the local redundancies of habitual disease, they will be counteracting causes of death far more powerful than those which, because of their suddenness, seem so terrible in the moment of exceptional visitation.

It is to the *vast excess of severity wherewith those habitual disorders press upon certain parts of the population*, that I especially point as the presumptive evidence of corresponding sanitary faults. And the fact that those disorders are developed, some of them *in proportion to the urban character of the district*, some of them *in proportion to the manufacturing industry of the people*, is matter for very painful reflection.

Every year now adds to the relative growth of our town populations: every year increases the development of our manufacturing system; and there can be no well-wisher to the country but must rejoice in what is great and good in those wonderful manifestations of our national life. But surely it is needful to consider, whether the advantages of our social progress must have with them such evils as I have described; whether the higher civilization of urban life cannot be attained without a corresponding development of diseases which depend on the non-removal of excrement, and the non-ventilation of dwellings; whether the manufacturing greatness of England be not compatible with better sanitary care for the lives of the employed, and with less enormous entail of infantine disease.

These questions are not uninteresting to the ratepayers of places where high death-rates prevail. For sanitary neglect is a mistaken parsimony. Fever and cholera are costly items to count against the cheapness of filthy residence and ditch-drawn drinking-water: widowhood and orphanage make it expensive to sanction unventilated workplaces and needlessly fatal occupations.

Nor is that the only sense in which such questions concern the public economist. For the physical strength of a nation is among the chief factors of national prosperity. And with us, of late that raw material may well have risen in value, while eastern war and westward emigration have been draining

into their respective channels so much of our English manhood.

And if the subject may justly claim to be considered by the government and the legislature of this country, it is not only on such grounds as those. The sacredness of human life against unjust aggression is the principle above all others by which society subsists. To have realized this principle in law and government is the first indication of a social state: and in any community pretending to be civilized, the failure of protection for life has ever been felt as a public scandal.

For a time it was only against brute violence that the knowledge of the legislator enabled him to cope in founding the conditions of personal security; and his duty was sufficiently fulfilled when his enactments were commensurate with his knowledge. But modern civilization would scarcely have deserved its name if, with the light of its much greater knowledge, it had refrained from applying the same principle to all cases which fairly fall within its terms; and our statutes contain abundant evidence that, according to the spirit of English law, life cannot rightfully be wasted by neglect any more than it can rightfully be taken by violence.

It is indeed only by very gradual increase, that legislation and government can succeed in giving to human life the same security against the infliction of preventable disease as against the infliction of wilful violence; and millions may have died before this public carefulness for individual safety can have become co-extensive with even the present certainties of preventive medicine.

But growing knowledge will bear its fruit. It has now been fully recognized that, within the very centres of civilization, controllable influences are working against human life more cruelly than brute violence ever worked in the first discordant beginnings of society: it has been shown that in certain districts of England the operation of those controllable causes is vastly more powerful than in others; that, within the rule of certain sanitary authorities, particular forms of disease undergo a multiplication—a five-fold and ten-fold and twenty-fold multiplication—of their lowest

familiar fatality. To suppose that such sanitary authorities can permanently disavow an interest in this knowledge, or that public opinion will long hold them irresponsible for so monstrous a waste of life, would be to misunderstand the meaning of civilisation, or to belie the humanity of England.

I have the honour to be, Sir,

&c., &c., &c.

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PAPERS RELATING TO THE CONSTITUTION  
OF THE MEDICAL PROFESSION, &c.  
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