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THE ECONOMICS OF PUBLIC HEALTH.*

BY

LT.-COL. F. E. FREMANTLE, O.B.E., M.P.,
F.R.C.P. LOND., F.R.C.S. ENG., D.P.H.

THE centre of gravity of professional interests is shifting from the clinical and individualistic side towards that of prevention and mass treatment. Bit by bit private practice is being at least supplemented, in some parts replaced, by official medicine of one kind or another. And official medicine—that is to say, medicine in the service of the State—naturally has special concern with medicine in the mass and with prevention rather than cure. It seems to me that the interest of public health to the profession lies in two special conceptions of medical art and science. Public health stands, in the first place, for mass medicine as opposed to individual medicine—mass medicine, whether in the form of mass diagnosis and mass pathology, or mass treatment and mass prevention. On the other hand, public health stands for health as opposed to sickness—that is, for the prevention of disease and for the promotion of health; in other words, for positive physiology rather than for pathology and treatment. But we English are not very logical; or perhaps we are ultra-logical, in that we let things grow up as they naturally put themselves before us for action, rather than according to preconceived principles. So in the course of promoting health we have a good deal also to do with treatment of early conditions, nipping the unhealthy processes in the bud. Consequently the public health system stands for the prevention of disease, the promotion of health, the diagnosis and treatment of disease in the very earliest stages, and above all, one should say, for the prevention and treatment of disease in the mass.

But before coming to my actual subject I will, if I may, give a word from the public health side to those of you who are mainly engaged on the clinical side of medicine. May I say that I think we who stand for public health are, by degrees, asking you who work in clinical surgery and medicine, who work in teaching hospitals, and therefore are responsible for the upbringing on every side of the future generation of medical practitioners, we are asking you more and more to recognise that the old diagnosis of disease, with

which we learned to be content when we were students, no longer holds good. You have not diagnosed your disease in the individual case when you get back to the microbe in the body. You must go behind what used to be called the *causa causans*, for amongst the *causæ causantes* are the social conditions, the environment of the life in which the individual has long been immersed. In the hospital you are not diagnosing the case to its root basis unless you inquire into the social conditions, into the home. It is essentially the privilege and duty of the worker in public health to make the observations necessary for this diagnosis, which you, from the nature of your work in hospitals, are unable to make. It is a blank which we try to fill, and we fill it by mass diagnosis, not so much by diagnosis in the individual home as by diagnosis in the community. The real difference, therefore, is that we deal with mass diagnosis and observation, we treat or prevent in the mass. And the general results in the mass are shown in vital statistics and correspond to the post-mortem examination or the surgical operation by which you gauge the correctness of your diagnosis or your treatment. The economic results, indeed, if we can get them, are as convincing as your post mortems. The economic results, if accurately stated, are the real “acid test” and measure of the effect of our action.

But we must guard ourselves against the implication, which has been hurled against me in the House of Commons, that in dealing with the economics of public health we are considering our sanitary or our health work as merely a question of money, or even as something which can be measured in terms of money. The main improvement and progress—or deterioration—of health cannot be measured as money; but there is one effect that can be so measured—namely, its influence on the material productive output of the nation. And again, though you may get health with nothing you can show for it in the way of economy, you may get economies which are falsely attributed to improved health.

With these provisos economies are a very valuable illustration of the effects of our work. And at the present time the need for economy after the war, both in national and private life, is so obvious that there is a danger of expenditure being reduced without regard to the return that may be expected of it, unless that return can be shown in terms of pounds, shillings, and pence. For that reason I feel that, in a way, a medical Member of Parliament has not retired from practice, for in the House of Commons he is teaching the nation to practise this mass medicine which we call public health, and in studying and trying to influence Parliament

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we are only trying to get our effect on the average man and the average community, the nucleus of the mass with which public health generally has to deal. Now, the average man wants to realise the object of the measures which are suggested for him, he wants to be convinced as to them, and we who practise preventive medicine of any kind know it is very difficult to convince him of the measures we propose to prevent some disorder which he may not have contracted and which he may imagine he is not in danger of contracting. It is very difficult to convince him of the object of vaccination; he sees and hears very little of small-pox; he learns that many people who are not vaccinated escape from the mild epidemics of the present time; and the consequence is, he is not convinced. But show him some proposal with results measured in pounds, shillings, and pence, and you may be able to convince him of its value for the community, when you cannot convince him in regard to measures which only claim to prevent moral and social evils. Economy in public affairs deals with material currency, but mental and moral values have no counterpart in monetary language. In education, for instance, and in religious matters, no material profit can be shown as a result of suggested expenditure. But in public health there are definite material gains from wise expenditure which can be shown to vary with variations in that expenditure. Therefore this lecture sets out to suggest the material loss occasioned by physical sickness and disablement and the material advantages that may be obtained, or have been obtained, from improvements in the public health.

Certain striking instances of economy and loss are always occurring to us, and perhaps the most striking have been put together by Prof. Irving Fisher, of Yale University, in his "Report on National Vitality, its Wastes and Conservation," prepared for and issued by the National Conservation Commission of the United States in 1909. Although I had considered these matters before hearing the report, it came as a God-send to me in the years before the war when I was thinking them out. I am hoping there may be another report of that sort, and I wish we could have one for this country. Thus, for instance, we read:—

"Dr. George M. Kober thinks it is conservative to say that the annual cost of typhoid in the United States is \$350,000,000, and Dr. L. O. Howard believes that malaria alone costs the country \$100,000,000 annually, and the insect diseases generally \$200,000,000. He points out that one great item of loss is the reduced value of real estate in the malarial regions. By drainage and destruction of mosquitoes most of the waste could be saved."

We all get such illustrations of one kind or another. Amongst others, let me quote a single instance, showing how these matters appeal in the more outlying parts of the world, as in connexion with our own Imperial development. At a lecture last year at the Royal Society of Arts on the subject of British Guiana and British Malaya, both the chairman and the lecturer pointed out how the

development of a country of that sort depended almost entirely on human efficiency and the mass human element and in return might maintain a vast population, there or elsewhere.

"If the Malay Archipelago were inhabited with the same density as Java to-day, it would have a population of 400 million people; the forest of the Congo would carry another 400 million people; and the tropical portions of Brazil and British Guiana would carry another 400 million people, not necessarily resident in those regions."

And yet, so ran the argument, some people welcome the falling birth-rate!

That is the sort of direct statement which appeals to the imagination, and single instances are more convincing than any generalisation. But the more one hears of these single instances, the more obvious is it to our professional imagination and power of vision that there is national wealth here to be saved or produced on a large scale. If so, it is clearly the duty of our profession to collate and test these facts on a comprehensive scale. I have tried accordingly to suggest a national balance-sheet as regards sickness and death for England and Wales. From this may subsequently be derived a balance-sheet of preventable sickness.

Admittedly this can be no strict balance-sheet, ready for audit. Many of the figures are mere guesses at the truth, framed though they are on conservative lines and on the general experience of the profession. Some of the items necessarily lack definition; some overlap. At this pioneer stage one can only give figures as rough diagrams, suggesting the facts, in the hope that they may provoke constructive criticism by economists and may stir the imagination of all concerned in the public weal.

On the expenditure side of our balance-sheet we must show four headings or items: First, loss of efficiency while sick but at work, and loss of work when absent from sickness, convalescence, or death; secondly, the cost of care and treatment; thirdly, loss of work of those attending on the sick; fourthly, the cost of the indirect loss to industry from epidemics and sickness generally. And a fifth item is the insurance against sickness to come, represented by the cost of maintenance of the public health services. On the income side we must show two items: First, the share of the national income due to the lives that have been saved; secondly, the increase of income due to longer life.

EXPENDITURE.

1. *Cost by Loss of Work.*

A definite measure of sickness is provided by the system of National Health Insurance, covering over one-third of the population. Sir George Newman's most interesting annual report on the health of the nation, which I always commend to those in any way interested in the subject, shows each year the amount of sickness registered under the National Health Insurance system. In 1924

there were 13,672,000 insured persons entitled to benefit. Sickness or disablement benefits were paid for 23½ million weeks' incapacity, representing arithmetically a loss of 477,115 years' work, or, putting it the other way round, the loss of a whole year's work of 477,115 persons. Add to that the loss of the first three days' sickness, for which there is no benefit payable under the scheme, and you have the loss of over half a million persons' work for a whole year, or 4 per cent. of the whole. A corresponding loss in proportion in working capacity will have occurred amongst the non-insured.

This result appears to conflict with the estimate in the middle of the last century of Dr. William Farr, our first great vital statistician, that the total number of sick at any time throughout the year was about double the number of deaths in the year. The number of deaths in England and Wales in 1924 was 473,235; so, according to Farr, the sick and disabled would be 946,470—that is to say, just under a million sick out of 39 million population, or a percentage of 2½. No doubt sickness is less fatal now than it was 70 years ago; it is probable that Dr. Farr's rule-of-thumb underestimates the sickness of to-day, which is fairly well represented by the exact figures of health insurance.

If 4 per cent., then, of the whole population are sick at any one time throughout the year, then the whole national income derived from personal service will have been reduced by 4 per cent. Estimates of the national income range from £3,000,000,000 to £4,000,000,000, one-third due to yield of capital, two-thirds to personal services. Taking the lower figure, the loss of national income due to sickness and disablement amounts to 4 per cent. on £2,000,000,000, or £80,000,000 in the year 1924. What does this mean to the Exchequer? If Exchequer receipts from personal services be put on a conservative basis at £100,000,000 out of the £800,000,000 of Budget income, the loss to the Exchequer in 1924 was £4,000,000. Furthermore, the loss from ill-health due to the lessened efficiency of those working, including those engaged in management, invention, and direction of enterprise, is considerable, as every human being knows—probably as much again—the loss of another £80,000,000 to the national income and of £4,000,000 to the Exchequer, making in all a sum of £160,000,000 to the net income and of £8,000,000 to the Exchequer. How much of this is preventable, according to the definition given by Prof. Fisher, of Yale—i.e., “if knowledge now existing among well-informed men in the medical profession were actually applied in a reasonable way and to a reasonable extent?” “At least a third,” reports Prof. Fisher. This gives, then, a preventable loss to the Exchequer of some £3,000,000 a year, and to the national income of £50,000,000, due to total incapacity of workers from sickness or to the lessened efficiency of those still at work.

2. *Cost of Care and Treatment of Sick and Disabled.*

Since out of the insured, amounting to one-third of the population, there were, on average, half a million sick or disabled throughout the year, the number sick or disabled in the whole population of England and Wales should be taken as 1,500,000, half a million in institutions (532,025 less staff, at census, 1921), a million at home.

The annual cost of maintenance of such institutions and of the half million patients at £100 each would be £50,000,000. The cost of the million sick at home includes services of doctors and dentists, nurses and midwives, surgical instrument makers, mental attendants, and other subordinate services (193,406 by census, 1911), apart from those in institutions (71,880 by census, 1911), say 120,000 at an average cost, we may suggest, of £200 = £24,000,000.

3. *Cost of Indirect Loss as by Industry from Epidemics.*

Sickness of any person may have far-reaching effects on those associated with him or dependent on him. In the presence of epidemic disease, moreover, the restrictions on movement and marketing involve considerable losses. Small-pox in 1871–72 cost Philadelphia \$22,000,000; yellow fever in 1878 invaded 132 American towns and cost the country \$100,000,000. The restrictions and precautions taken to prevent the smouldering embers of ever-present infectious disease from breaking out into conflagration are but a wise though costly system of insurance. The loss of work of those engaged in attending on the sick, whether in institutions or at home, reckoned at 200,000 in number, or 1/200th of the population, further loses a corresponding fraction of the national income from personal services—viz., £10,000,000 a year.

4. *Cost of Maintenance of Public Health Services.*

This cannot be definitely given, as many such provisions as housing, sewerage, parks, and open spaces serve other purposes also and would still be required if sickness were eliminated. But the following items of net expenditure other than out of loans, by the local authorities in the year 1924–25, whether paid out of rates or from National Exchequer, less receipts, include the chief part of the cost involved:—

	£		£
Sewers and sewage disposal	7,455,484	Baths and wash-houses	905,299
House refuse, collection and disposal ..	6,488,898	Parks and open spaces	2,675,835
*Hospitals, sanatoria, dispensaries, &c. :		Vaccination	191,416
for tubercle	2,700,930	Port sanitary service ..	94,194
for venereal disease	405,074	Other health services ..	1,306,079
others	3,424,449	Lunacy and mental hospitals	6,464,172
Salaries of health officials (not otherwise included) ..	1,246,800	Mental deficiency	686,926
Maternity and child welfare	1,308,487	Housing and town planning	7,948,361
		Cemeteries	427,785
		Waterworks	177,108
			£43,867,297

* Mostly included in para. 2 above.

INCOME FROM IMPROVED HEALTH.

(1) From lives saved. The death-rates for England and Wales, standardised for age and sex to make them comparable, in the years 1851-55 gave an average of 21.7 per 1000. If this average were applied to the 1923 population, there would have been 833,345 deaths. But, in fact, the death-rate was 10.3 and the number of deaths only 444,785. There was a saving, therefore, in 1923 of 388,560 lives. Valuing each life on an average at £200—as a low estimate of the net future productive power less cost of maintenance¹—the saving in 1923 was equal to a capital sum of £77,712,000.

(2) From lengthened productive age of those living. The mean after-lifetime or expectation of life of males, aged 20, for the years 1838-44 was 40.0 years; that for 1910-12 was 44.1. There was a similar extension for females. The productive age of the nation was therefore increased by over one-tenth, accounting for one-tenth of the £2,000,000,000 of national income due to personal services—viz., £200,000,000. A few instances of life or health saving return for money spent will occur to everyone. "You can cure a cripple," wrote a senior official the other day "for a ten pound note if you catch him early; but you have to spend hundreds on him if you neglect him." An instance of probable return in the future is that to be gained by the stamping out of tubercle, which in the years 1838-42 caused an annual loss of 4419 deaths per million of population, but in 1924 only of 1058. There were still, however, a total of 41,103 deaths from tubercle in 1924. To save these and an equal number every future year at the average value to the community, taken above, would increase the national income by £8,221,000. It would be a rich return for present expenditure.

Summing up these very rough estimates we recognise the following main heads of the achieved gain to the national income from improved health, of the cost of public service for maintenance of health, and of the cost of present-day sickness and disablements:—

<i>Annual gain by productive value—</i>		£
of lives saved .. .. .	.. .. .	77,712,000
from longer age of whole people .. .. .	.. .. .	200,000,000
	Total gain	£277,712,000
<i>Annual cost—</i>		
of Public Health Services .. .. .	.. .. .	43,900,000
of School Medical Service .. .. .	.. .. .	3,200,000
	Total cost of preventive services	£47,100,000
<i>Annual cost of sickness—</i>		
by loss of patient's work .. .. .	.. .. .	80,000,000
lesser efficiency of others .. .. .	.. .. .	80,000,000
loss of work of those engaged in attendance .. .. .	.. .. .	10,000,000
and treatment of sick .. .. .	.. .. .	50,000,000
Care and treatment in institutions .. .. .	.. .. .	24,000,000
Care and treatment at home .. .. .	.. .. .	24,000,000
	Total cost of sickness	£244,000,000

¹ Sir J. Kay-Shuttleworth (1804-77), a Manchester physician, Assistant Poor-law Commissioner and First Secretary of the Education Department, in his "Return of wages of the best class of labourers in Norfolk," calculated that at the age of 20 on a 5 per cent. basis the prospective value of a Norfolk labourer was £482 in wages less £248 for necessary maintenance, or a net value to the community of £234.

To this should be added cost of indirect losses by disturbance of industry and transport, and effect on morale, not limited to time of epidemic—giving a total, say, of £300,000,000. And of this, according to Prof. Fisher, one-third is preventable—viz., £100,000,000. It is a good thing to have some figure of that sort definitely in our minds, because over and over again we are being faced by the shortage of public money, or of our own money for doing this, that, or the other to prevent disease. We want to show there is such an immense loss at the present moment; we want to show there has been such a gain by improved public health in the past that, as we have gained in the past, so can we gain in the future. The adverse balance is some £23,000,000. We must wipe it out and turn it into a steadily increasing national credit.

But there is always this one condition that we think it essential we should make: The more we are moving ahead in exploring medicine by modern methods, the more are we recognising the extraordinary power of the mind and the will over the body. Psychology is taking a leading part in it but so far it is an unexplored part in public health even more than in clinical medicine. Therefore we have to remember that in any measures that may be proposed, above all one must not interfere with the psychology of the people in so far as it is helping towards the recovery and the maintenance of health. We know the extraordinary power of the will in individual sickness and we recognise the power of the will to maintain health; it is a personal effort, conscious or unconscious; conscious when you bring adults to recognise it, but unconscious in the ideal form in which you bring children up to practise healthy habits and lead healthy lives. One way or another the will has a commanding power over the body, in the mass as well as in the individual. With that we have to qualify our suggestions for the spending of public money. If the spending of public money is going to supplant the private and individual effort to health, it will only be so much to the bad; it will mean a weakening of the individual, and, in regard to the total mass of the community, a weakening of the tendency towards keeping healthy and fighting sickness and disease. But if the public moneys are spent in such a way as to provide channels and means for individuals to fit themselves for life; if this expenditure is going to provide officials who will guide the individual to do the best for himself rather than to lay down rules and exact penalties; if the public moneys are being spent so as to make private effort and will effective then, and then only, can we get advantage from a fresh expenditure of money, such as is suggested by the lecture I have had the honour of giving here to-day.

Colonel Fremantle, in acknowledging a vote of thanks, said: I do hope that any of the audience here to-day, or others, if they have definite instances where obvious and clear advantages have been gained by health measures, will be so kind as to

let me know them, and let the public have them, or cause them to be known by writing papers and giving lectures. I shall always be glad to have them, because I cannot get anybody else to enthuse himself on the subject and collect evidence. I have tried to get economists to take it up, and they have expressed their great interest, but they do not get much further. Sir Josiah Stamp was quoted by Prof. Collis in a lecture as having put the value of a human individual at £250, and then it was enlarged to £350, and then to £500. I wrote to Sir Josiah Stamp and asked what was the figure. He said he could not make out how they got the figure, or how he gave it; that he had looked through his notes, and if he could find any more, he would tell me. A year passed and then I wrote

him again—he is now general overseer of the London, Midland and Scottish Railway—and he said it was true he was interested, but he did not think there was much value in the figure. Two or three other professors of economics have professed an interest in it and hope I will go on with it. I want economists to go in for it and get the figures; also our whole profession. We are often getting clear instances where expenditure of money does give a very definite financial return, and if you get such instances I hope you will test them thoroughly and prepare statements on that line. Such instances are more obvious in the tropics and in connexion with the services. If you get such instances, I shall be very glad if you will pass them to me; I will promise to make good use of them.

TECHNIQUE IN THECAL PUNCTURE:

THE PERFECT OPERATION.

BY

HILDRED CARLILL, M.A., M.D. CAMB.,

PHYSICIAN TO WESTMINSTER HOSPITAL AND THE WEST END HOSPITAL FOR NERVOUS DISEASES.

THE usual site for thecal puncture is in the lumbar region. Because it is not given to every housewife, much less to every doctor, to be "handy with a needle," the practitioner should not perform the operation unless his opportunities have given him special experience both as regards technique and, equally important, as regards the diagnostic lessons which are to be learned from seeing the flow of cerebro-spinal fluid.

LUMBAR PUNCTURE: PRACTICAL POINTS.

Practical points for the performance of a perfect lumbar puncture: The first is the *avoidance of pain*. There are two special reasons why the operation should be painless. If the patient is in a ward and is hurt he may be, directly or indirectly, the cause of another patient declining the operation. In many conditions—for example, cerebro-spinal syphilis of any variety—the progress of the disease and the effect of treatment can be assessed only by repeated examinations of the cerebro-spinal fluid. If lumbar puncture is quite painless a patient will always consent to subsequent operations.

A second factor which should be regarded as essential is that the specimen of *cerebro-spinal fluid* collected shall be as it was in the subarachnoid space. The admixture of a *little* operative blood can be calculated for in a cell count, but absolute accuracy is imperilled. The perfect operation implies painlessness and the absence of a single red cell in the specimen. These requirements can be met.

The *diagnosis* of any condition should be made primarily from the facts obtained in the history and from the clinical examination. Our practice

is to write down before we operate what we believe to be the condition of the cerebro-spinal fluid.

Let us assume that the patient is not a sick man in the ordinary sense of the term. He is told that we require to make an examination of his back. He is given an opportunity to empty his bladder and rectum. We have a choice of two positions in which he may be placed for the examination, either bending down from a stool or lying on a bed. His back must be properly illuminated and in such a way that the operator will not cast a shadow on it. If the doctor is right-handed the patient is asked to lie on his right side with the trochanter of his right femur on—not within—the edge of the bed. However poor the condition of the mattress may be, his body, in this position, is supported by the rigid frame of the bed. Also in this position we shall be able to hold the test-tube upright beneath the hilt of the needle. The pillows are removed. For a reason which will be explained later the inexperienced operator will find it is convenient in routine work to raise the *head* of the bed on blocks. If a subtentorial tumour has been diagnosed we may, if we wish, raise the *foot* of the bed before operating. The patient, lying on his right side, should curl himself into a ball as far as he can, and it is most important that his right shoulder, which is underneath, should be well forward. If he lies on his right humerus instead of on the axillary border of his right scapula his vertebral column will be rotated and difficulty may be experienced in the operation. A piece of wool is placed on the bed beneath the proposed site of puncture and tucked under the patient. When the position of the patient is correct—and upon this success depends—he should not move. He should be properly protected from cold. Before operating it is convenient to visualise the subarachnoid space. The opportunity of seeing it as it really exists occurs only during the skilled performance of a laminectomy operation. It cannot be demonstrated in the dissecting room.

The *needles*—two at least should be prepared—should be fine and properly bevelled. With their stylets they are placed for half a minute in a small