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HOUSING AND TUBERCULOSIS.

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THE work which is to engage our attention resolves itself larg a tremendously important question—one, indeed, probably never more important than to-day. The relation of housing conditions to the origin and spread of various forms of tuberculous diseases is a subject of far-reaching importance. I propose to present some facts and figures relating to this complex problem.

It is an accepted axiom that our highest death-rates exist in the poorest localities. The truth of this does not require to be laboured, but it is of the first importance that we should recognize precisely *to what extent* the influence of locality or housing affects the origin and spread of disease generally, and tuberculosis in particular.

I shall attempt to uphold the proposition that the number of cases of pulmonary tuberculosis in any district is almost precisely in direct proportion to the number of houses of one and two apartments which exist in it. While I think it is possible to demonstrate this fact beyond doubt, it is nevertheless one in regard to which a considerable amount of confusion appears to exist.

I find in many annual health reports statements to the effect that the incidence of pulmonary tuberculosis is much greater in houses consisting of two rooms than in those of one apartment, and in various

¹ Abstract of a Presidential Address delivered last year at the Edinburgh Congress of the Royal Institute of Public Health.

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accepted works on vital statistics this is emphasized. At first sight the statement is inexplicable, if, as we imagine, the origin and spread of the disease is influenced largely by absence of fresh air, overcrowding, and other non-hygienic conditions. A careful scrutiny, however, makes it quite possible to explain the fallacy and to warrant the statement that the number of cases of tuberculous disease increases in proportion as the house accommodation becomes limited. This is shown in the following table:

TABLE I.—INDICATING THE INCIDENCE OF PULMONARY TUBERCULOSIS IN RELATION TO SIZE OF HOUSES IN EDINBURGH.

	Popula- tion.	1910.		1911.		1912.	
		Percent- age to Total Notifica- tions.	Rate per 1,000 In- habitants.	Percent- age to Total Notifica- tions.	Rate per 1,000 In- habitants.	Percent- age to Total Notifica- tions.	Rate per 1,000 In- habitants.
One room ...	18,608	15.0	6.1	13.2	7.4	10.2	6.9
Two rooms ...	94,909	42.7	3.4	43.6	4.8	42.6	5.6
Three rooms ...	69,686	19.6	2.1	18.5	2.7	19.6	3.5
Four rooms and over	122,086	17.3	1.0	12.4	1.0	14.5	1.4
Institutions and lodging-houses	—	5.2	—	12.1	—	12.9	—

From the above table it appears that, while 15 per cent. of the total notification of cases of pulmonary tuberculosis occurred in houses of one room, 42.7 per cent. occurred in those of two apartments. The fallacy becomes apparent when we remember the fact that, obviously, a much smaller proportion of the population live in one-roomed houses than in those of two rooms, and it therefore becomes essential to calculate the rate of incidence per 1,000 of the population. If this method is adopted so far as the City of Edinburgh is concerned (and I have ascertained that the same statistics apply to other large centres of population), it is found that, while 1 per 1,000 of the population are affected by the disease in houses of four and more apartments, 2.1 exist in houses of three rooms, 3.4 in houses of two rooms, and 6.1 in houses of one room. Clearly, therefore, the disease increases with rapid strides in proportion as the house accommodation becomes more limited and objectionable.

The city of Edinburgh is divided into different wards, and from the figures in the accompanying table it will be at once apparent that the number of cases of pulmonary tuberculosis follows almost precisely in direct proportion the number of one and two roomed houses which are found in any of the wards.

TABLE II.—INDICATING PREVALENCE OF PULMONARY TUBERCULOSIS IN THE VARIOUS WARDS OF THE CITY OF EDINBURGH.

Ward.	Number of One and Two Room Houses.	Death-Rate per 1,000 of Population.	Pulmonary Phthisis Notifications per 1,000 of Population.	Infant Mortality.
Calton	1,901	13'5	3'7	93
Canongate	2,793	15'2	4'0	113
Newington	534	12'4	1'5	46
Morningside	144	10'9	1'4	29
Merchiston	734	11'1	1'4	58
Gorgie	1,718	11'6	2'6	81
Haymarket	516	11'6	1'4	104
St. Bernard's	915	11'5	1'5	66
Broughton	1,173	11'2	2'5	80
St. Stephen's	1,150	13'9	2'2	78
St. Andrew's	1,302	13'1	3'5	106
St. Giles's	3,010	21'5	6'2	142
Dalry	3,103	13'9	4'1	107
George Square	2,093	14'9	4'4	135
St. Leonard's	3,325	16'2	4'4	125
Portobello	1,086	14'3	2'1	116
City	—	14'3	3'1	101
Six one-apartment houses in St. Giles's to one in Dalry.				
Five St. Leonard's to one in Dalry.				
Three George Square to one in Dalry.				

Another interesting fact can be gathered from these very convincing figures, as indicating the statements already made, to the effect that the number of cases of the disease increases in proportion to the number of the smallest class of house. The figures referring to Dalry Ward indicate that there are 3,103 houses of one and two rooms, with a death-rate of 13'9. In St. Giles's Ward, however, where there are 3,010 houses of one and two apartments, the death-rate is 21'5.

At first sight it seems difficult to reconcile these figures, but light is thrown upon the subject at once when it is stated that for every house of one apartment in Dalry Ward there are in the proportion of six similar houses in St. Giles's.

The accompanying series of charts emphasizes very clearly the facts I desire to bring out. I have selected three of the largest centres of population in Scotland—viz., Edinburgh, Glasgow, and Greenock—and it is full of interest to glance at the charts referring to these districts, and to see how enormously the death-rate from phthisis rises in almost direct proportion to the limitation of the house accommodation. In Greenock, for example, 87 deaths in houses of four rooms and upwards, 106 in three, 179 in two, and 222 per 100,000 in houses of one room. In Glasgow, while there are 70 deaths in houses of four rooms and upwards, there are 120 in three, 180 in two, and 240 in houses

of one room, and in Edinburgh there are 56 deaths in houses of four rooms and upwards, 111 in three, 146 in two, and 225 deaths in houses of one apartment.

The accompanying illustrations of certain views of some areas in

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Edinburgh will help to explain matters. These show densely crowded localities with an enormous proportion of houses of one and two apartments, and with a death-rate from tuberculous diseases in the first instance of 4.4, and in the second of 3.2.

If the above facts regarding the influence of housing on the origin and spread of tuberculous disease be correct, and if it be true that about 60 per cent. of the total notifications of pulmonary tuberculosis are in connection with cases which occur in houses of one and two

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rooms, let me suggest the proposition that recent legislation in the absence of sweeping schemes of housing reform is likely to be insufficient *per se* to meet the urgency of the situation so far as tuberculous disease is concerned.

It is claimed by some that the key to the situation lies largely, if not wholly, in the carrying out of the provisions of the recent Insurance Act, especially so far as dispensary, domiciliary, and sanatorium benefit are concerned, and many arguments in favour of this contention have

been based upon the figures applicable to recent times. These undoubtedly show an unquestionable fall in the incidence and death-rates of tuberculous disease. It is all-important for us, however, to take a large and comprehensive view of statistics and to examine these most critically

A CHARACTERISTIC VIEW OF OLD EDINBURGH.

A CROWDED PART OF OLD EDINBURGH.

if we are to be justified in drawing conclusions from them. There can be no question but that for many years past the death-rate from tuberculosis has, practically all over the world, shown a satisfactory fall. The following table shows clearly, in quinquennial periods since 1881, the extraordinary extent to which these rates have fallen in almost every country. It is unnecessary to single out a specific instance. Any one selected at random may be taken as a fair example of the others, and no exceptions exist to the general fall.

TABLE III.—INDICATING MORTALITY FROM PULMONARY TUBERCULOSIS
IN VARIOUS CITIES OF THE WORLD,

Death-rate per 1,000 living.

Cities.	1881-1885.	1901-1905.	1912.
London	2'22	1'60	1'35
Edinburgh	2'12	1'61	1'08
Glasgow	3'11	1'76	1'31
Dublin	3'46	3'09	2'45
Belfast	3'82	3'07	2'05
Melbourne	2'33	1'39	1'04
Toronto	2'03	1'74	—
Paris	4'41	3'90	3'32
Amsterdam	2'38	1'44	1'22
Copenhagen	2'73	1'44	1'37
Petrograd	5'49	3'12	2'87
Moscow	4'11	2'68	2'44
Berlin	3'39	2'26	1'68
Leipzig	3'70	1'93	1'59
Vienna	6'85	3'36	2'37
Milan	3'35	2'32	1'69
Venice	3'06	2'00	2'16
New York	3'98	2'15	1'70
Chicago	1'80	1'52	1'44
Buenos Aires	2'70	1'84	1'66

Scotland generally has, of course, been no exception, and has shared in the unquestionable fall during the like period. But it is all-important for us to remember that, while these facts are so certain, tuberculosis does not *alone* occupy a position on the descending scale: precisely the same facts exist in regard to other forms of infectious disease.

The next table seems to go to prove the truth of my contention regarding the mortality rates as they affect Edinburgh, and it will be seen that what has been said regarding the general fall in these throughout the world applies also here.

TABLE IV.—INDICATING MORTALITY RATES IN EDINBURGH.

Death-rate per 1,000 of Population.

Years.					All Causes.	Phthisis.	Enteric Fever.	Diphtheria.	Scarlet Fever.
1882-1891	...	...	...	...	18·37	1·97	0·18	0·22	0·24
1892-1901	...	...	...	...	17·59	1·78	0·11	0·18	0·19
1902-1911	...	...	...	...	15·28	1·30	0·03	0·14	0·09
1912	...	...	...	...	14·63	1·26	0·01	0·09	0·03
1913	...	...	...	...	14·39	1·13	0·03	0·09	0·11

It will be noted that from the year 1882, when the phthisis rate was 1·97 per 1,000 of the population, it has last year fallen to 1·13 per 1,000. It will be further noted that the rates of all the other forms of infectious disease specified on the table have fallen to at least a like extent; and it is further to be borne in mind that, before conclusions can be drawn from these figures, the other tables referring to the statistics of the world and Scotland are also to be kept well in view. In the absence of these it is perfectly possible to draw erroneous conclusions, and to attribute certain results to have followed from specific causes, and these only.

In the next chart much information is obtainable in regard to the course which has been followed by tuberculous diseases in the eight large centres of population in Scotland since the beginning of the registration period in 1856. The highest reaches of each column indicate the tremendous extent to which these diseases existed at that early date, while the middle line in each column shows the progress that was made in each city up to the year 1885, and the lower black column shows the still further progress and indicates the position in each of these centres to-day. All have experienced a marked decrease in numbers. That decrease has been a continuous one throughout the whole period, and while at the early date enormous differences existed, a somewhat levelling-down process has taken place in recent times, as is evidenced by the closer approximation of the various series of black columns. Indeed, we find to-day that Edinburgh and Aberdeen, which show similar results, are also in precisely the same position, as is shown by the average figure applicable to all Scotland. The diagram, however, is useful in another direction, as it shows clearly the progress which has been made in each city towards combating these diseases within certain specified dates. Let us look at the lower two lines of figures at the bottom of the diagram. There we see that from 1881, when the number of deaths from tuberculosis in Glasgow represented 444 per 100,000, the figure has fallen to 217 at the present time; that at the same date the number of deaths in Paisley was 373, and now has fallen to 187; Aberdeen, 278, now fallen to 169; Edinburgh, 299, now fallen to 168; and the interesting fact that, while in 1881 the average for all Scotland was 296, it has now fallen to an almost similar figure of 169 per 100,000. This almost uninterrupted progress of dealing with tuberculous disease throughout the world has been carried out generally without any aid from the more recent developments which legislation has now placed at our disposal.

It is, perhaps, well for us to consider in how far the provision of sanatoria and dispensaries will further the crusade, if these are unaccompanied by providing for the clamant need of dealing directly with the cause rather than to attempt to cure the effect, and I feel

that this all-important phase of the subject will form the basis of the various discussions that are likely to take place in this section of the Congress. Indeed, it is possible to state the question another way.

Is the hope of a successful crusade to be chiefly based upon a clinical treatment of persons suffering from the disease, or of the still further and wider adoption of the preventive methods, the administration of which in the past have so successfully resulted in the reduction of

death-rates of all other forms of infectious disease? The sanatorium is a hospital, and its very existence, indeed, is an admission of failure of preventive methods; but there is an important respect in which a sanatorium differs from an infectious diseases hospital. To the latter patients are sent whilst suffering from a form of infectious disease, and on their return home cured are freed from the responsibility of carrying infection with them. Most unfortunately, these conditions do not accompany to any appreciable extent the treatment of pulmonary tuberculosis in the sanatorium. It is the experience of all of us that a small proportion of patients—indeed, very small—when discharged, can be regarded as free from infection, and a still smaller proportion can be certified as cured. There is a sense, indeed, in which the temporary improvement which may be brought about in many of the patients treated in a sanatorium may be regarded from a preventive point of view as anything but an advance.

The majority of the patients admitted to sanatoria are removed from the poorer and working class districts. Experience indicates that, almost however far the disease may have progressed, a certain modicum of improvement takes place under the improved conditions—feeding and treatment. After the lapse of a varying period—say from three to six months—the survivors are permitted to return to precisely the conditions where they formerly lived.

I have within recent times given much attention to this particular phase of the question, and have been driven to the conclusion that the home conditions to which our sanatorium patients return after treatment cannot be expected to lead to any other result than an aggravation of the disease, and an undoing of the benefit which has accrued from sanatorium treatment within a longer or shorter period.

It must be borne prominently in mind that the disease of which we are treating is not a curable one in the ordinary sense of other forms of infectious disease which are in this condition before discharge from hospital. I feel certain it is the experience of all of us that the outcome of sanatorium treatment is, to state it very temperately, not satisfactory so far as cure is concerned in the vast majority of cases.

One undoubted authority, whose experience is unquestionable, said, in a recent discussion upon the subject, that, of the 2,800 cases which came under his own immediate supervision, only as many as could be counted on one's fingers could be said to have completely recovered. This statement may be accepted in whole or in part, but taken in conjunction with the other figures to which reference has been made, and with the experience of many in other large centres, it seems to prove very conclusively indeed that, while the clinician has his place, and his important place, in connection with the crusade against consumption, and while precisely the same may be said in regard to

dispensaries and sanatoria, the battle must be fought mainly by, and the issues must rest largely in the hands of, local authorities and their medical officers, in carrying out to a greater extent even than has been heretofore the preventive measures which, to a certain extent at least, have served to bring about a very considerable fall in the prevalence of this disease.

The key to the situation lies unquestionably in the housing question. If statistics prove anything, they prove to the hilt that the disease originates and thrives in direct proportion to the unsatisfactory nature of the house and its surroundings; and they prove invariably that an improvement on these conditions is followed, as by the law of cause and effect, by an immediate fall in the tuberculosis rate. One almost wonders why we are so slow to learn these facts. Every local authority knows them well, and every medical officer of health, I am satisfied, is intimately acquainted with them; but it must be admitted that the progress in housing reform is, to say the least of it, not in proportion to our knowledge in regard to these matters. Innumerable illustrations exist of the improvement which follows the outlay of some expenditure in improving the housing conditions, which ought to serve to convince many of us who might be slow to believe. Possibly every local authority can furnish its own statistics. We in Edinburgh certainly can. Wherever improvement schemes have been carried out, an immediate improvement has primarily been noticed in the tuberculosis death-rate. In every large centre of population precisely the same experience has been met.

It is well to remember the operations which have been carried out in London under the supervision of the governors of the Peabody Fund. As most are aware, large objectionable areas were removed in unhealthy districts of the City, and good sanitary, up-to-date accommodation for working classes substituted. I find from the report just issued that the number of persons housed under this scheme is nearly 22,000; that the average weekly earnings of the head of each family was 22s. 3d.; that the death-rate last year among this large population was 10·4, as compared with 14·3 for the whole city of London. The population of working people, therefore, who live in these sanitary houses shows a death-rate of 3·9 below the average of the whole city. I have not the statistics applicable to tuberculous diseases, but it is safe to conclude that these, in like manner with the other figures, show a satisfactory result.

Progress, then, in our attempt to overcome the ravages of tuberculous disease, must be along the line of improved housing conditions. Town-planning schemes should be actively pushed forward, but that by no means exhausts the possibilities. Existing conditions specially must be actively dealt with. It seems largely to be beating the air if

we continue to talk about town-planning schemes for the future while our dense, crowded, insanitary slums are found everywhere existing. These should, in the light of our knowledge of the present day, be dealt with by a firm hand. If what are termed unhealthy houses are found to exist, and collections of these constituting unhealthy areas where death-rates are high, the conditions are then present which beyond all manner of doubt prejudicially affect the health and life of those who reside in them, and nothing short of a clearance, by whatsoever means accomplished, can for a moment be justified.

The question of expenditure is always, of course, a prominent one ; but in these times, when so much is being lavishly laid out in certain directions, it is to be sincerely hoped that what appears to many of us, at any rate, as the most important factor will not much longer continue to occupy a secondary position. It may be that local authorities must acquire old property and build new at a loss, and that the expenditure of ridding large centres of population of their unhealthy housing conditions is considerable. Surely, however, it is not extreme to claim that the profit in improved health conditions, and therefore in the ultimate saving of hospital and sanatorium outlay, would be a perfectly assured one.

The carrying out of improvement schemes is frequently hindered by the difficulty experienced in obtaining house accommodation elsewhere, and it is frequently urged that private enterprise is less and less inclined to provide this, as the financial inducement is not a bright one. I feel strongly, however, that the continued existence of unhealthy dwellings of itself is an element which serves to prevent a demand for more up-to-date accommodation, and in the absence of this demand the supply is not forthcoming.

I have recently had a census taken with the view of obtaining some information regarding the position, financial and otherwise, of the occupants of about 1,000 houses of one and two rooms in this city, and I find that there is a decided tendency on the part of a certain class to occupy a smaller and poorer type of dwelling than is justified by their financial position. It may be definitely said that, so long as these slum dwellings exist, there will be found people who will occupy them, and spend their money, which should be legitimately laid out in rent, in other and, in many instances, less worthy manners. I find in my returns that in a large number of cases persons in receipt of 30s. per week occupy a one-roomed house, and in some instances sums even reaching over £3 per week are earned by the occupants.

The same results are found to apply to houses of two rooms ; and it appears clear that, if the smaller and poorer classes of houses, with the cheapest rents, were, where necessary, condemned and removed, considerable numbers of such occupants, who could well afford to

occupy better dwellings, would find no difficulty whatever in procuring suitable accommodation, and in the presence of such a demand it is not unreasonable to suppose that the supply would not be long in being forthcoming. Whether this be so or not, however, it is perfectly clear that a community, if not urged by humanitarian considerations, must of necessity, even if from no higher motive than that of self-preservation, deal rigorously with the black spots in their cities from which emanate by far the largest proportion of tuberculous disease.

Finally, one may summarize the points which I have desired to bring forward :

1. Pulmonary tuberculosis is a disease which in 70 per cent. or 80 per cent. of cases occurs in houses of three rooms and under ; the number of cases is larger in two-roomed houses than in three ; larger in houses of one room than in two ; and the number of cases of tuberculous disease increases almost in direct proportion to the number of small houses in any district or ward of a city.

2. That since the year 1882 the number of deaths from tuberculosis has shown a rapid and steady decrease ; and a like statement applies to the general death-rate and the death-rate from other forms of infectious disease.

3. That this decrease has been taking place quite apart from, and irrespective of, any special effort to deal with the condition other than the preventive measures which have been carried out in the ordinary march of public health administration.

4. That the establishment of sanatoria and dispensaries, while useful aids in carrying on a general crusade against this form of disease, are not of themselves likely to be attended by markedly beneficial results in the absence of other definite preventive measures.

5. That preventive measures centre largely in the housing question, and that, irrespective of cost, there is an urgent need, in the light of our present-day knowledge, of dealing more effectively than has heretofore been the case with congested areas, dense foci of population, and insanitary dwellings.