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TUBERCULOSIS: CERTAIN UNEXPLAINED MORTALITY FIGURES*

BY

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I want here to deal with a subject which necessarily involves statistical tables and the scrutiny of certain factors of incidence of disease. I am well aware of the desirability of the very greatest and closest attention to these things in detail and for the most meticulous accuracy. Therefore I am afraid that on this occasion I must add the letters with which we are not unfamiliar in the scrutiny of accounts—E. and O.E.—" errors and omissions excepted." You must in fact take this more as a general survey than as a very close scientific examination—all the more so since the factors with which I am dealing are not anywhere fully explained, and are not at the moment the subject of any consensus of scientific opinion. I draw attention to the trends; the conclusions to be drawn are admittedly extremely hypothetical. I wish to discuss the figures representing a certain unexplained mortality in tuberculosis, particularly pulmonary tuberculosis, in the northern half of Great Britain, and more particularly in Scotland. Scotland is a very convenient statistical unit from many points of view; it is a smaller and more manageable country, and its figures are sometimes published ahead of the corresponding figures for England.

Tuberculosis Rates

Tuberculosis rates are, it is agreed, among the most important indices of the state of the public health. I think it will be agreed that the steady fall in tuberculosis mortality in the United Kingdom has been a notable feature of public health figures for many years. The rates for pulmonary and for non-pulmonary tuberculosis each have their special significance. For my purpose it is desirable to examine them separately, where possible, although the combined rates have also, of course, great importance.

Just to run over the background picture. The death rate for pulmonary tuberculosis per 1,000 of the estimated population was, in 1851, for England and Wales, 2.78. In the next 45 years it fell to almost exactly half: it was 1.34 in 1897 and 1.31 in 1898. The fall continued. By 1910 the rate had dropped to 1.02 and by 1920 to 0.87, in spite of the war. The fall still continued; in 1930 it was 0.72; in 1938, before the outbreak of the last war, it was 0.52. These figures follow the recognized course, a course which finds a general parallel in many other countries, even in those greatly ravaged by war and suffering in consequence from various degrees of malnutrition and overcrowding.

There was a short and slight rise of the figures in England and Wales in the early war years, but the rise was neither alarming nor continued. The unexplained figures to which I should like to draw attention are those for Scotland. The curves in the two countries for many years followed the same general course. The death rate per 1,000 for pulmonary tuberculosis in England and Wales was, for example, 0.72 in 1931. In Scotland it was 0.62. In 1938, when, as I have said, the rate in England and Wales was 0.52, the rate in Scotland was also 0.52; that is to say, the falling rate in England had gone faster than in Scotland, and the two were at the same point. The rate in Scotland, however, reacted to 0.63 in 1941, and continued at 0.62 for 1942, 1943, and 1944. This was all the more strange since the destruction of houses owing to aerial bombardment was very much greater in England than in Scotland, and the regular crowding together of the population by night in air-raid shelters, which was such a feature in London during the blitz, had no parallel in Scotland. The Ministry of Health viewed with very great apprehension the result of those enormous numbers of people herding together at night, and sleeping in crowded shelters, out of their homes, during the war years.

Increase of Pulmonary Tuberculosis in Scotland

In 1945, at the end of the war, the Scottish pulmonary tuberculosis rate declined to 60 per estimated 100,000. It appeared to be about to follow the decline which was taking place in England, but this was not borne out by events. The estimated rate for 1947 rose to 66 per 100,000, and this figure was repeated in 1948. No figure so high has been recorded in Scotland for 20 years.

These figures do not seem to be due to any statistical fallacy. Notifications may be, and are, subject to changes due to greater accuracy in diagnosis and to the extensive use of *x*-ray surveys. In an *x*-ray survey among the students of one large city in Scotland, of the total examined—3,465—the rate of significant tuberculosis detected was: for females, 1.95 per 1,000, and for males 2 per 1,000. A statement issued by the Ministry of Health in March, 1949 (*British Medical Journal*, 1949, **1**, 493), said that by June 30, 1948, about 2,500,000 persons had been examined by mass radiography. The number of cases in which clinical diagnosis of active tuberculosis was subsequently made was approximately 9,564, or between 3 and 4 per 1,000 of all persons examined. It is not more than one would expect. The post-war notifications cannot be exactly compared with those of the pre-war years; but I think the post-war notifications can quite justly be compared with each other, and, taken in conjunction with the actual deaths, they present this feature of a rise in pulmonary tuberculosis in which Scotland is exceptional.

In 1945 the notifications in Scotland, which pre-war had been 4,700, rose to 7,300. As I say, a certain proportion of that has to be discounted owing to greater accuracy in diagnosis, but not all of it. In 1946 the notifications

*Presidential address to the Royal Institute of Public Health and Hygiene given on Thursday, May 26.

were 7,627; in 1947, 7,984; and in 1948, 8,208. The deaths follow a similar curve. The deaths from pulmonary tuberculosis in Scotland—and that is as near a watertight statistical figure as you can get, for people are not certified as having died from pulmonary tuberculosis unless there is a fairly strong certainty that that is the cause of death—in 1945 were 2,932; in 1946, 3,231; in 1947, 3,390; and in 1948, 3,417. It is clear, therefore, that the upward trend of notifications is followed to a certain extent by an upward trend of deaths. In 1948, as I have pointed out, the figures are the highest yet; and the 1948 figures are important because they refer to a year with an exceptionally mild winter, as against the exceptionally severe one of 1946–7, which might reasonably have been expected to produce a rise in pulmonary disease of all kinds. The curves are shown in Fig. 1. The figures for respiratory and non-respiratory tuberculosis move quite reasonably until 1939. Then there is a startling rise in notifications of cases of respiratory tuberculosis, and the curve runs on to a plateau. There is no sign whatever of a movement downward. The mortality rate for respiratory tuberculosis follows the notification rate upwards at a short distance.

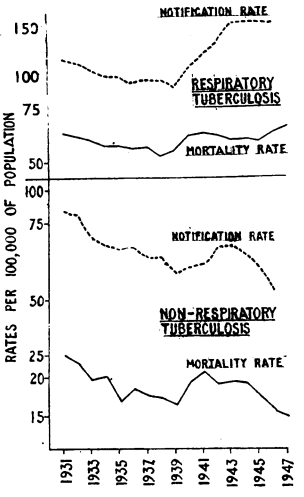

FIG. 1.—Notification and mortality rates of respiratory tuberculosis compared with those of non-respiratory tuberculosis in Scotland.

In contrast to the pulmonary tuberculosis rate, the non-pulmonary tuberculosis rate shows a drop both in number of notifications and mortality. It seems as though after a period of time the curve were resuming its normal shape. I need not remind you of the intense campaign being waged for the purification of milk. It will be seen, therefore, why I decided that it was more advantageous to examine those two curves separately, not combining the curve for the pulmonary cases with that for the non-pulmonary. In that way there will be no misleading conclusions.

Decline in England and Wales

The interesting thing is that this rise is not parallel in the general statistics south of the Border. In England and Wales the notifications of pulmonary tuberculosis were: in 1945, 42,100; 1946, 42,100 (I am leaving out the last two digits); 1947, 43,100; 1948, 43,900, a slight rise. These figures are only to be compared with each other; it is not so useful to compare closely the figures for England with those for Scotland, because the details are different. On the other hand, the deaths were: in 1945, 20,013; 1946, 19,365; 1947, 20,156; 1948, 19,089. It is clear that something quite different is happening in the two countries, and the really interesting question is, Does it stop at the Cheviots, at the artificial political frontier, or not? A striking difference would not be expected between Newcastle and Galashiels and between Lancashire and Lanarkshire.

At this point it is interesting to note that the Scottish figures are high amongst European countries, whilst the English figures are low. We are dealing here not merely with a rise but with a rise in a country with a high tuberculosis figure. In England we are dealing with a fall in a country with a low tuberculosis figure. The most recent death rates from all forms of tuberculosis per 1,000 are as follows: Denmark, in 1946, 32; New Zealand, in 1945, 38; United States, in 1945, 40; Sweden, in 1946, 51; England and Wales, in 1946, 55; Belgium, 66; Switzerland, 76; Scotland, 79; France, 81; Northern Ireland, 83. It will be seen that even in 1946 there was a wide gap between the rate in Scotland (79) and the rate in England and Wales (55). A breakdown of these figures amongst the Scottish towns shows a very high figure in the great industrial centre of Glasgow, and to a smaller extent in Dundee, while Edinburgh is lower, and Aberdeen, surprisingly enough, is lower still. The industrial County of Lanarkshire follows Glasgow. Caithness and Orkney follow Aberdeen. In 1946 the death rate per 100,000 for all forms of tuberculosis was: in Aberdeen 46, in Edinburgh 76, in Dundee 87, and in Glasgow 132. This compares with figures of 42 for New York, 44 for Copenhagen, 51 for Amsterdam, 56 for Stockholm, 78 for Paris, and 110 for Madrid. The rate for Glasgow was a long way above the rate for Madrid.

I have set out here, by courtesy of the Department of Health for Scotland (to whom I am also indebted for the graphs of Fig. 1), the run of the curve as you might have expected it and the run of the curve as it is actually working out (Fig. 2). The curve plotted out from 1931

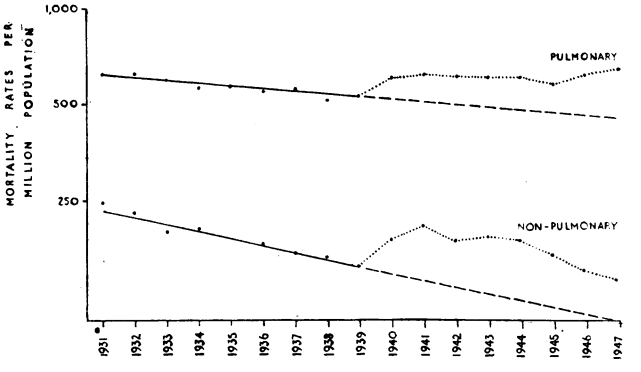

FIG. 2.—Graph showing mortality rates of tuberculosis in Scotland, together with expected curve from 1939–47.

is projected (broken line) on to 1947, with the figures on either side of the line up to this rise of which I have been speaking. The projected line shows how the figures ought to have gone; the dotted line shows how they actually went. The non-pulmonary curve, according to the latest figures, has a trend satisfactorily downwards along the projection, but the pulmonary curve has a trend upwards, away from the projected line.

"Slope to the North"

To come to the next point of which I spoke, the question of the English figures, can we draw any conclusions from an analysis of the figures in England? I believe it is true to say that a "slope to the north" can be discerned. The rate for all forms of tuberculosis in 1946 was 66 in Birmingham, 79 in Manchester, 89 in Liverpool, and 92 in Newcastle. I think it is clear, therefore, that a certain masking of the trends in England is taking place, owing to the averaging of the north and south. It is still more interesting that in the northern areas the rates have tended to rise, and this at a time when the overall rate in England and Wales has continued to fall. As I have said, it would be very queer if completely different trends were shown in Lancashire as against Lanarkshire. The deaths per 100,000 from pulmonary tuberculosis in Lancashire were 70.9 in

1945, 75.1 in 1946, and 76.1 in 1947. The same trend shows in the West Riding of Yorkshire, a county with a great population which can give one a reasonably reliable statistical figure. It is a lower rate, but lately it has moved upwards. That is all the more interesting, since the West Riding figures for the last 50 years or so have been below the average of England and Wales. They are at present tending to rise. The rate was 54.9 in 1945, 53.7 in 1946, and 58.8 in 1947. For Durham County the figures are: 43.0 in 1945, 41.4 in 1946, and 47.4 in 1947.

I do not wish to lay too much emphasis on this trend, because I have not the 1948 figures for those counties, and all these figures may still be distorted by the incidence of the very long and severe winter. In Scotland, as we saw, they have been able to cross the bridge and to give figures for the following year, when the winter was mild. I would therefore not lay too much stress on the rise that occurred in the three northern English counties mentioned. On the other hand, it is true that even in those severe winters this rise did not take place in other areas. It did not take place in Northern Ireland, though the figures there are high, nor in the City of Belfast; nor has it taken place to the same extent in either the cities or the counties of Wales.

Of course in Northern Ireland we are dealing with smaller figures, but there the actual deaths from pulmonary tuberculosis were 799 in 1945, 849 in 1946, and 761 in 1947; and in Belfast 328 in 1945, 343 in 1946, and 281 in 1947. It also is rather odd that the rise did not show itself in the cities or the counties of Wales. In a very great industrial centre such as South Wales roughly the same trend would be expected as is found in Liverpool and in Glasgow. In Glamorgan County the actual deaths were 416 in 1945, 432 in 1946, and 432 in 1947; in Cardiff the actual deaths were 178 in 1945, 164 in 1946, and 161 in 1947. We all know the fallacy of small numbers either in death rates or in any other form of statistical analysis. I do not wish to stress these figures, but it certainly would not be true to say that in them you can detect a rise.

Causes of Upward Trend

Now it is very difficult to see what factors can have changed adversely in the industrial North which have not changed in industrial Wales or in industrial Southern England. What is affecting Glasgow which is not affecting Birmingham and Cardiff? The factor, whatever it is, seems to be associated elsewhere at least with industrialism. The rise in Scotland is mostly in Glasgow and Lanarkshire. The upward trend in Northern England is shown in the industrial counties of Durham, Lancashire, and the West Riding. It is not shown in the neighbouring more-agricultural counties of Northumberland and Cumberland. On the other hand, no rise at all is shown in Sheffield or Leeds. The housing conditions in the northern towns in general have been worse than those in the south, yet one might say that the deterioration, if anything, was greater in Birmingham, Manchester, and, of course, London, all of which suffered wide destruction of houses from air bombardment.

There is another factor which might have to be examined —not so much a deterioration as an equalization. The rationing system has tended to level out any differences in consumption of food and fuel. I think it is probable that, pre-war, there was a greater consumption of food and fuel as one moved northwards. At any rate, the housing was worse, and in general the rents were lower and the surplus available for food was greater. It is possible that the ironing out of these things has increased the impact of climate and housing, and that that is at least partly responsible for the figures I am mentioning.

As you know, the Secretary of State for Scotland has actually instituted an inquiry into the Scottish position. The committee in question has not yet reported, and I think that its first report will be mainly of a factual nature. So far as I know, this committee has not yet arrived at any explanation. And so the fascinating picture is before you of a detective story half read. We do not know the criminal. It is up to us to exercise our intelligence. The field is open; anyone may gain great fame and reputation by solving the puzzle. It is a very remarkable thing in the history of public health that one of the major diseases, one which has been under such careful examination for so many years and has been so closely surveyed in every way, is at present subject to a movement that is entirely unexplained by those who have either the responsibility of dealing with it or the responsibility of giving advice upon it. From the administrative point of view this problem has, naturally, to me the very highest fascination.

Non-respiratory Tuberculosis

I promised to mention the non-respiratory curve. That curve has moved down, as one would expect, I think, parallel with the "cleaning up of the herds." It was, however, puzzling to us in Scotland that our figures remained above those of England, although the cleaning up of the herds has gone much farther in Scotland than in England. That story, however, so far has a happy ending, because the most recent figures of 1948 show that the curve has come down with a run and is only just above that for England. The non-respiratory mortality rate, which in England and Wales was 10 in 1945, 8 in 1946, and 8 in 1947, left us with an unexplained problem in Scotland, where it was 18 in 1945, 15 in 1946, and 14 in 1947. However, the 1948 figure comes down with a run to 9, so it looks as if wisdom were being justified of her children there. But that simply means that that curve is doing what one would expect—it is following a recognized course, the campaign is producing results.

Conclusion

To summarize, the fascinating curve is the one which is not doing what we expect, which is moving the other way—the campaign is not producing results. A doubly interesting point is that in England, where the combination of the various parts of the island is producing a general curve, it would appear, breaking it down more closely, that the curve is not similar in all parts of the Kingdom. Wild speculations may be made; they are as likely to be right, or at any rate to form as reasonable a point of departure, as any other at the moment. One speculation is that there may have been an introduction of a more active strain of infection into Scotland in the considerable Polish migration that took place in the early days of the war. It may not be so; but, at any rate, there certainly was a mass movement to our country of a population which in its own country is highly susceptible to tuberculosis and has a high tuberculosis rate—a population which afterwards was intermingled very intensively with the Scottish people. That may be an entirely erroneous line of inquiry. But when you are faced with an unexplained set of facts you must consider all the likely and all the unlikely explanations. It is possible that the unlikely explanations are quite as right as the likely explanations. Here, then, is a fascinating problem of public health to which no solution has yet been found. I commend it as an example of how to-day it is still possible to find unexplained problems, and of how it may be possible, by the use of intelligence and by industry, for any investigator to find an explanation of facts which so far have baffled everyone.