

The Present State of Human Tuberculosis in Ireland

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The objects of this paper are —

- (1) To give some information on the present state of human tuberculosis in Ireland as determined by certain criteria or indices.
- (2) To discuss briefly the procedures utilised in the control of human tuberculosis.
- (3) To give an evaluation of the overall effectiveness of the anti-tuberculosis programme.
- (4) To give as far as possible a progress evaluation which should guide future programme activities in this field.

SECTION I

In this section achievement and progress are considered under the headings of—(1) deaths from tuberculosis, (2) cases on Health Authority registers, (3) new cases recorded each year.

Deaths from tuberculosis

To commence the interesting but somewhat terrible story of human tuberculosis in Ireland one must go back more than one hundred years ago to the time of the Great Famine. Immediately prior to that period there was a great population increase and therefore a large proportion of young adults in the population. The adverse social conditions, the seeming low level of natural immunity of the people and the effects of the Great Famine combined to produce in Ireland a national epidemic of tuberculosis which has lasted for more than a century. This epidemic began in a very acute way and rose to a peak immediately after the Famine. In the ten years prior to 1841 it was stated in the Report of the First Census of Ireland that “Consumption—by far the most fatal affection to which the inhabitants are subject—destroyed 135,590 of the population of those families from whom returns were received upon 6th June 1841.” The number of deaths from the disease increased during the ten years 1841-1851 and it was shown in the Report of the Second Census that for this period 153,098 deaths from consumption or pulmonary tuberculosis were believed to have taken place. In the years immediately before and after 1850 about 23,000 deaths from consumption

occurred each year. Granted that the population numbered over 8 millions, yet this mortality from tuberculosis has never been equalled elsewhere on a national scale. For some years after the Famine, the epidemic rates were reduced as the disease had to some extent burnt itself out, but from 1865 it commenced to increase again and Geary showed that the rate gradually rose from 165 deaths from consumption per 100,000 of the population to a peak of 277 for all forms of tuberculosis at the turn of the century. It then began to fall and was 210 for all forms in 1910 and 165 per 100,000 in 1920. In 1930 it was 130 and in 1940 125 per 100,000. The rate rose during the first and second World Wars. The decline, however, was slowed up in the period before and after the First World War by increasing mobility of the population, by the influence of the towns as centres of infection, and by disturbed conditions. In addition, families tend to be relatively large in this country and family spread of infection is typical while the rural population is to a large extent unprotected by natural immunity.

With the termination of the last War the problem of tuberculosis was tackled seriously on a national scale and the rate which in 1946 stood at 114 for all forms and in 1947 at 124 per 100,000 population, commenced to decline. As the various measures, such as increased bed accommodation, advances in chemotherapy, Mass X-ray, B.C.G. and other factors began to have their effect the rates fell further and Table I indicates how much has been achieved in reducing deaths from Tuberculosis in recent years. In 1960 the death rate for all forms of tuberculosis was 16 per 100,000 and in 1959, 17.

Table I shows not only the decline in the number of deaths each year from 1951 to 1960 but the changes in the ages at which deaths occur. Between the ages of 15 and 24 there were 258 deaths from pulmonary tuberculosis in 1951 and in 1960 only 7. In persons between 25 and 34 years of age in 1951 there were 372 deaths, and in 1960, 37 deaths. Between 35-44 years of age, in 1951 364 persons died, in 1960 this had been reduced to 69. In 1951, in these three age categories 980 persons died, in 1960 it was 113. This decline affects all age groups, but it can be seen that in the older age groups the fall in numbers, while still striking, is considerably less than in the younger age groups. In 1951, 57% of the total pulmonary deaths occurred in persons between 15 and 44 years, whereas in 1960 the proportion had fallen to 27%.

A second important feature of the Table is the decline in non-pulmonary tuberculosis deaths, which have fallen to almost one-tenth of the 1951 total. It will be seen that the non-pulmonary deaths occurred mainly in the younger age groups.

In considering deaths from tuberculosis one should appreciate that a very large proportion of the pulmonary deaths occurring to-day are amongst older people who suffer from long continued chronic disease.

In a later study it is hoped to analyse the disease as it affects the population by cohorts and to secure more information on this important aspect of the problem.

In Ireland persons in older age groups, in the course of their

lives have been subjected to much more tuberculous infection than is prevalent to-day and many of the "survivors" have been left with healed pulmonary tuberculosis. Such healed cases are always at risk of breaking down under conditions of stress or by associated conditions such as chronic bronchitis, excessive smoking, or debilitating diseases. These factors are mainly responsible for the relatively large number of cases and deaths in the older age groups. It can be seen from the table that each year the proportion of the deaths occurring in the older section of the population is increasing even though the absolute numbers of deaths among the aged are being reduced. The disease is gradually retreating and its effects are now seen mainly amongst older people with chronic tuberculosis. These may be cases hitherto undiagnosed, or persons with healed disease which has now become reactivated, or the known chronic respiratory crippled cases. All three groups are survivors of the former era of widespread disease when large numbers were affected and prevention and treatment was unsatisfactory.

Registers of cases

With the decline in deaths, death rates are no longer regarded as an adequate indication of the effects of the disease in the community and so other indices are sought. The number of registered cases of tuberculosis remaining under treatment at specific dates and notified to the Health Authorities of the country in accordance with legal requirements is given in Table II. This Table shows the number of cases for each Health Authority and for the last eight years one can see a total decline in numbers. The Health Authority registers include all notified cases of tuberculosis whether under direct treatment by the Health Authority schemes or privately. There are very few known cases not included. The registers include a very wide range of cases varying from children with glands in the neck to chronic cases bed-ridden for perhaps many years. The registers are fluid in the sense that numbers are affected by the activity of case-finding in any area, by the legacy of chronic survivors from an earlier period, by the success of a local service in maintaining satisfactory and continuing attendance by patients and by the activity of the medical officers in keeping the registers up to date.

If one considers the cases under treatment it may be seen that of the registers maintained by the thirty County Health Authorities, in twelve the numbers are small, being less than 300 cases and that for another twelve they are between 300 and 500. Cork City and County (the new Cork Health Authority), and the new Dublin Health Authority (which includes the City and County and Dún Laoghaire) have 8,856 persons on their Registers, almost half of all the known cases in the country. The small figures for County Dublin during the last two years is due to the County figures being included in the Dublin County Borough figures. A drastic write-off, which took place in 1954, of cases which were no longer attending or were regarded as cured is responsible for the sudden large drop in the Dublin numbers in 1955.

Examination of different Health Authority figures shows that in

many counties the figures are so small, that the care of all cases is well within the capacity of the local organisations which are backed by Regional Institutional services.

One might say that there should be standard definitions, standard courses of treatment and arbitrary terminations and decisions as to the retention of cases on registers, but as registers are at present compiled this is not possible and the personal judgment of the medical officers in charge of the cases affects to a large extent the size of the registers.

However, as an indication of the over-all extent of the problem and of the numbers for which each health authority is responsible, the Table has a value. It is pointed out that registers are fluid and are affected by many factors. The question of reorganising the keeping of registers is under consideration.

National register of new cases

Since the control or eradication of tuberculosis is quite impossible without accurate knowledge of the incidence of the disease, its distribution, the nature of the cases with which one has to deal and the rate of progress, a new index was begun in 1955 and fully developed in 1957.

This consists of a regular submission of data on all new cases by the different Health Authorities to the Department of Health. Data are submitted by using code numbers instead of names and are thereby confidential. The material is analysed by the Department with the assistance of the Central Statistics Office. We have now considerable information on all new cases for the past six years, and for the past four years we have been able to carry out a detailed study for the information of the Health Authorities actually concerned with the finding of cases and their treatment.

Table III shows the number of new cases of pulmonary tuberculosis, primary disease and tuberculous pleurisy occurring in Ireland each year from 1955 to 1960, according to age and sex.

It can be seen that there is a considerable reduction in the number of new cases, from 4,613 in 1955 to 2,496 in 1960. For the years 1957-58-59 there was little change in the figures, but falls in numbers occurred in 1955-56, in 1956-57 and again in 1959-60. It can also be seen that the figure of 2,496 new pulmonary cases in a year is still large, still represents a serious health problem and even though deaths no longer occur as they did formerly, an incidence of new cases continuing at this level means a serious drain on the national resources.

On the other hand, the greater the number of infectious cases discovered and treated, the sooner the disease will be eradicated.

Under the headings of the various age groups one can see that during the last six years the reduction in the number of new cases discovered has not been even. In 1955, 2,121 new cases out of a total of 4,613 were persons in the age group 15-34, and 980 new cases were persons over 45 years of age. In 1960 the picture changed for the younger persons and the number of new cases from 15 to 34 years was 910, whereas the number of cases over 45 years was 833. In addition the proportion of all new cases occur-

ring in the older age groups, over 45 years, had increased from 21% of the total in 1955 to 33% in 1960. In the younger age groups the incidence in males and females was very much the same and the decline was similar in the two sexes. In the older age groups the number of males found was very much more than in the case of females and there was little decline in the six years in the number of new cases occurring amongst elderly men.

The figures for 1959 are of special interest. In that year there was actually an increase in male new cases which offset a very small decline in female new cases. There was still a decline in female cases in the age groups 15-44 years but in every other category there was either an inexplicable increase or a failure to decline.

Over all from 1955 to 1960 there was a reduction of 45% in new pulmonary cases, the reduction for males being 43% and for females 51%. The reduction was mainly in the number of cases occurring in the younger age groups, with, as already remarked, little or no reduction in the numbers of older cases particularly in males.

In Table IV a further examination is carried out by breaking down the figures for the country into eight geographical regions as described in the headings of each section of the Table while Table V gives the percentage reduction from 1955 to 1960. The Tables show that the percentage decline in the numbers of new cases in the Dublin conurbation (59.6 per cent) and in Cork City and County (47.8 per cent) were greater than the national average of 45.9 per cent, that the decline was most marked in Dublin and Cork and in the North Midlands (Region 3, 48.9 per cent) and was least in the South Midlands (Region 4, 17.1 per cent) and South Leinster (Region 2, 32.2 per cent). On the other hand, the rates per 10,000 population were initially lower in these latter areas. It can also be seen that the rate of decline for the Western Seaboard Areas was very much the same, being lower than the national average and being more uniform as regards the decline at different age levels. The small increase or failure to decrease in 1959, was uniform all over the country. The table shows that the age and sex distribution is very much the same throughout the country, that the same groups are affected in the same way and that in each area the proportion of new cases occurring amongst the older age groups is increasing. It also shows the fairly uniform distribution of the disease throughout the country, a feature which has an important bearing on its control and eradication.

A feature of the analysis of the new cases is that more are being discovered under urban than rural conditions, urban areas being defined as towns with 1,500 population and over. In 1958 and 1959 1,225 male cases were discovered per 100,000 population in urban areas as against 800 for rural, and for females 800 cases per 100,000 in urban populations as against 600 per 100,000 for rural areas. This was in keeping with the finding of the National Tuberculosis Survey of Ireland which showed a greater incidence of the disease in cities and towns with a rate increasing with the size of the towns.

Table VI shows for the four years 1957 to 1960 the number and percentage of new pulmonary tuberculosis cases grouped according to the severity of the condition as shown on first diagnosis. The classification used is the standard W.H.O. classification and the description in each Section is self-explanatory.

It will be seen that half of all new cases are in the first two categories, and are mild cases with no cavitation. Over the four years there has been little change in the proportion of the cases occurring in the different categories. In categories 6-7-8 and 9, the more severe types, are included 24.2% of all new cases occurring in 1960 and this percentage has varied very little in the last four years. Tuberculosis Authorities have had the clinical impression that an increasing proportion of new cases were of a mild form but the Table would indicate that there has been little change in the pattern of the disease during the four years.

Table VII shows a further examination of the question of severity in relation to the ages of the new cases. Here it is seen that patients in the younger age groups have a somewhat larger proportion in the mild categories than have older persons. Again younger cases have a smaller proportion in the more severe categories than have the older persons.

It is interesting to see the uniform distribution over the four years. It is pointed out that cases in the more severe categories are those most likely to be sputum positive or infectious. Similarly they are more difficult to render non-infectious through treatment and are the problem cases generally.

Table IX shows the number of non-pulmonary new cases diagnosed each year between 1955 and 1960. The over-all picture is one of a declining number of new cases. In contrast to the pulmonary disease the bulk of the cases are in the younger age groups. It will also be seen that there was an increase in 1959. There were more cases amongst females than males in the last five years and the decline in numbers of new cases was greater amongst males than females.

Table X shows the body sites affected by non-pulmonary disease in the last four years. From this Table one can see that there is a uniform pattern of the disease which has not changed over the period as regards the sites affected. It will be noticed that a considerable proportion of cases are tuberculosis of the lymphatic glands, usually cervical glands. In some recent epidemics these have been due to drinking tuberculous milk.

Although the numbers are still relatively high this form of tuberculosis irrespective of site, yields very successfully to treatment and most of the non-pulmonary cases are directly infected by open or sputum positive pulmonary cases, often in the same family, though a proportion of more than 10% are due to milk borne or meat borne disease.

Amongst the mass of material available in connection with new cases of pulmonary tuberculosis mention be made of the manner of discovery of such cases. Table VIII shows how or by whom cases have been discovered and it is seen that the majority are diagnosed first by general practitioners.

Cost of the services

Table XI shows the revenue costs of the Health Authority Tuberculosis services during the last ten years. The costs do not include capital charges or costs in relation to tuberculosis patients in private nursing homes or patients treated privately. The decline in costs would have been much greater but for rising prices, salaries and other charges. It can be seen that the figures show a fall from a peak of £2.84 million in 1955 to £1.66 million in 1960. These figures do not include national health insurance benefits, nor is it possible to give an estimate for loss of earnings or private expenditure in connection with home maintenance or treatment, which must amount to a substantial sum each year.

Institutional accommodation

Table XII shows the number of beds in use for Tuberculosis for each year since 1951, the number of persons on the waiting list at the end of the year and the effective bed demand. A large portion of the present day bed demand is due to chronic bed-ridden cases who cannot be cared for in their own homes. The reduction in the bed demand is striking.

To sum up, in terms of achievement there has been a very substantial decrease in deaths from tuberculosis, particularly in young adults. Those which still occur are mainly amongst elderly persons suffering from chronic disease, who have survived until now from earlier periods of greater prevalence.

Apart from one year (1959) there has been an over-all decline in the number of new cases occurring each year. This decline has been most marked in the younger age periods but has been relatively small amongst the elderly, particularly elderly males. The decline has been most marked in the Dublin conurbation and to a lesser extent in Cork City and County.

The figures show a remarkable uniformity in so far as they reflect the distribution of the disease and its behaviour in the community.

SECTION II

In a total evaluation of a programme, it is also necessary to assess the progress of the various activities or projects included in the programme. In the recent anti-tuberculosis campaign in this country we have had several different phases or stages. There was first a period of planning and study, next a period of organisation, training and institutional building and finally an "attack" period. While of necessity there was overlapping and we have never had clear cut definition or formal pronouncements on the matter, the "attack" stage has been in full operation for about eight or nine years. The campaign is based on a national tuberculosis service which is part of the general public health service working in co-operation with practitioners and hospitals. It includes also a national mass-radiography organisation, a national B C G organisation, has ample institutional accommodation and provides social benefits specially devised to assist tuberculosis patients.

The usual procedure is, that patients suspected of having tuberculosis or already diagnosed or found to have a suspicion of tuberculosis on miniature X-ray are referred by practitioners or hospitals to the tuberculosis service of the Health Authority. Thereafter their diagnosis being confirmed they are accepted as a notification and treated free under the local scheme. Treatment usually begins by admission for a period to a Sanatorium. Table VIII, already referred to, shows for the four years how the new cases were discovered

After a period of intensive treatment in Sanatoria which also includes education on how to live with the disease, patients are usually sputum negative, that is, they have ceased to excrete live tubercle bacilli in their sputum and are thereby non-infectious. They are then discharged and return home and after a further period may return to their work, if it is of a suitable nature. They must, however, continue on treatment and be supervised for at least a further two years. This is necessary lest their condition should deteriorate or the healing process be interrupted or lest they should again become infectious. Finally, when a complete recovery has been made the name of the patient is taken off the register.

To carry out this programme of the detection or discovery of cases, their institutional treatment, and their home treatment and supervision there is an elaborate organisation of clinics, specially trained medical and nursing staff, institutions and laboratories and for the non-pulmonary cases, a range of orthopaedic hospitals and field services organised on a regional basis.

Over the years this organisation has become as efficient and complete as one could reasonably expect and from the "attack" point of view it has worked well. Its main function and success has been to find and treat the individual patient suffering from tuberculosis, to render him or her non-infectious, to cure him or her of the disease and to secure a return to normal life. In this way the chain of infection is broken by the discovery of infectious cases and their successful treatment. An important feature of the care given by the service is the supervision of the family contacts of tuberculosis patients. Such contacts are at special risk. The National Tuberculosis Survey showed that one-third of all cases under active treatment had a previous tuberculosis case or death in their immediate families. The 3,160 patients then on the register with a history of infection spreading in the home, had a background of 5,932 persons known to have had the disease. The total number of family contacts of the known tuberculosis cases under active treatment at the time of the survey was 38,151 and it was therefore shown that the disease tended to be limited to a small proportion of the 650,000 homes in the country. Bearing these facts in mind it is clear that special attention to the families of known cases would be rewarding in discovering new cases at an early stage and treating them successfully.

The co-operation of the general practitioner and the hospital has been essential. They see the patient first, when he or she feels ill. The National Survey showed that the onset of tuberculosis and its

diagnosis was in a very large proportion of cases preceded by a febrile illness or a run-down condition, a pleurisy or other chest illness. Apart from Mass Radiography, the finding of new cases has hitherto depended on the recognition of such conditions as being associated with TB and the referral of cases for chest X-ray or investigation. The easy availability of such services to practitioners is of importance. Burke and Logan in a recent paper further confirmed its importance to practitioners or hospital staffs in recognising these early symptoms.

The National Mass Radiography Association operating six 70 Mm mobile units has carried out over 2 million X-ray examinations since 1951. For the last three years attendance has averaged 280,000 persons each year. There has been a downward trend in public response within the last two years, which it has not been possible to check. In community surveys which have been well attended, it has been shown that the rate of active respiratory tuberculosis found has been 3.3 per thousand examined.

This comparative lack of public co-operation has been shown in many other ways. For example, in some areas the percentage of persons who receive "recall" letters advising them that their X-ray shows an abnormality and that they should report for further investigation and who do not return is as much as 40%. It is true that some of these may later consult private practitioners and eventually do receive treatment. In the meantime, valuable time is lost, the disease spreads and is more difficult to cure and others may be infected. In contact care also there is difficulty in securing regular attendance. It is difficult to ensure that those patients receiving treatment at home will actually take the drugs provided. It is also difficult to ensure that patients will stay long enough in Sanatoria to ensure a satisfactory start of their healing or to render them non-infectious.

We have thus a situation in which the improving efficiency of the service is matched by a serious lack of co-operation on the part of the public. The wastage resulting from this makes the work of treating cases adequately, very much more difficult. It is also very trying on the morale of the staff of the tuberculosis services. Nevertheless, progress is being made and there is no doubt that the disease is gradually being contained, its incidence among young adults being reduced and it is being slowly limited to the older age groups.

From the figures given earlier it is plain that the reservoir of infection is now amongst the older people, who were in early life exposed to much more serious risks of infection and who to-day are suffering from the disease as chronic cases or who are breaking down as fresh cases due to stress or other causes. Magner, recently, on a basis of finding 3.3 active cases per thousand of the population X-rayed and, excluding those under the age of 12 years, estimated that the pool or reservoir of undiscovered cases in the country is 7,260 persons. In 1959 and 1960 of all the new cases having had bacteriological examination of sputum, 58% were positive and were infectious.

This reservoir of infection therefore consists of elderly persons

breaking down, of elderly chronic undiagnosed cases, of cases who were never adequately treated but who ceased to attend or take treatment and of new cases amongst younger people. Each year it has new cases added and at the same time it is being gradually reduced as cases are found, treated and rendered non-infectious.

A factor, not yet mentioned, is that B.C.G. vaccination, of which approximately 60,000 are performed each year, mainly amongst school children and infants, is gradually strengthening community and individual resistance. By matching each year the number of births by a similar number of vaccinations, it is clear that a growing group of persons with an increased resistance to the disease is being slowly built up. Here again we are limited to a certain extent by public apathy.

A feature of mass-radiography is the fall in the proportion of persons recalled for further investigation during the past few years. Thus the recall rate fell from 2.1% in 1958 to 1.9 in 1959 and to 1.7% for the population X-rayed in 1960. Even though the number of cases of active pulmonary tuberculosis found increased slightly amongst those recalled, nevertheless, the fall in the number of recalls is indicative of an improved general situation.

The organisation and development of the anti-tuberculosis campaign and its improvement and development were related during the "attack" stage to conditions of widespread disease and large numbers of cases only waiting to be found and treated. It is plain that conditions have changed and that the problem has also altered.

Hitherto by the association of general practitioners and hospitals, and by co-operation with health authorities in England and elsewhere for transferred cases, it has been possible to discover and treat cases as they present themselves or come forward. In this way, over the years the number of new cases occurring in the younger age groups is growing less, cases can be treated more or less successfully, very few young people die of the disease and each year another large number are brought under control and are rendered non-infectious by the methods hitherto found adequate.

The number of new cases being discovered indicates that there is still a large amount of tuberculosis infection in the community. As long as it is present there is risk. However, as time goes on many of the chronic infectious cases, particularly in older people, will succumb, favourable social conditions will reduce the numbers of "breakdowns" and the lessening numbers of young persons affected will reduce the reservoir of infection.

With the means at our disposal, drugs which both cure and render patients non-infectious, hospital beds, social assistance and the Mass X-ray organisation and B.C.G. vaccination we should not be content to wage a war of attrition. Efforts should be made for more strategic action and our tactics related more specifically to the disease in the community.

While the decline in the number of new cases being found is likely for various reasons to continue, there is no doubt that the existing organisation and methods need to change somewhat in the light of altering conditions.

It should be appreciated that we have come to a difficult stage in this matter. When cases were plentiful and resources adequate it was easy to find and treat them and to know that every case rendered non-infectious was a step forward. Now as the number of cases grows less they become more difficult to find. As the public are less anxious about the disease, co-operation is more difficult to secure. Finally, as they grow more scarce the cost of finding any one case increases rapidly.

In any campaign such as ours the next stage is ordinarily one of eradication. Usually, however, the stage of eradication is commenced when the incidence of known or unknown cases postulated or estimated has been reduced to a very small number. The stage of eradication is marked by a different concept from that of the attack stage. In the attack stage, the finding and treating of the individual case is the major concern. The approach is to the community at large and the reduction in incidence follows and is coincidental. In the eradication stage the approach is to the groups mainly affected by the disease, and the main effort is to eradicate the disease within these groups. In this country because of the pattern of the disease it may be more a matter of containing the disease within these groups, preventing it spreading outside the more heavily infected groups and by ever-tightening control, coupled with the dying-off of the chronic infectious cases, to gradually reduce the spread of the disease and the number of new cases, to vanishing point. In 1960 over 1,289 or 50% approximately of all new cases occurred under the age of 35 years and this indicates that we will still need to practice the "attack" approach, but the fact that 50% occurred over the age of 35 and 33% over the age of 45 years and that this proportion is increasing, shows clearly that we must commence now to develop the techniques and measures necessary to secure eradication and to turn over gradually to eradication within the next two or three years.

SECTION III

Procedures

The procedures in use in our "attack" stage have been successful but it is clear that to secure more specifically in an "eradication" effort they must be modified. This will be difficult as the problem of "eradication" itself is one of great difficulty.

As the infectious cases are reduced in numbers they become harder to find. If "eradication" is to be achieved it becomes more and more important to find them, since the fewer the cases the more important each one becomes because of the relatively greater danger it provides in the community. If we are not to be left with a smouldering endemic long-term infection, always liable to break out again and to develop as a serious threat to community health then every last infectious case must be found and treated so as to render it non-infectious. This indeed poses a difficult task.

In devising new techniques or measures, as statisticians you may be interested to see that the first requirement seems to be the organising of improved recording measures to provide for accurate

frequent assessments of the problem to be carried out and to provide greater epidemiological information. We need to improve the cybernetics of the tuberculosis service in Ireland. In this respect I would welcome the views of the members on the question of the application of operational research and the construction of mathematical models of the various problems connected with the efficient functioning of tuberculosis control. We have come a long way with the introduction of our register of new cases and other recording procedures but it seems to me that there are abundant opportunities for the application of new cybernetic or mathematical techniques in our recording procedures. I do not propose to go into the details of the new procedures required or of the modifications entailed in achieving greater specificity and in developing eradication techniques. However, there are some general remarks that one might make. For example we must concentrate more on the epidemiological approach to the problem rather than the clinical. That the sputum positive or infectious case becomes of ever-increasing importance and the necessity to bring about his conversion to negativity is a clear priority of the service; that the drug-resistant case is even more important as a source of infection; that effective screening of former cases and their families is required; that treatment procedures be reviewed to eliminate "wastage" by inadequate treatment and to secure greater co-operation from patients; that the existing case-finding methods be reviewed to direct them towards the groups which now are the main reservoirs of infection. These broad guide-lines indicate the task which lies before us and which must be worked out for the more effective application of the means which we have already at our disposal and with which and with public co-operation we can finally secure the eradication of tuberculosis from our country and the end of the century old epidemic which has caused so much suffering to our people.

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TABLE I.—NUMBERS OF DEATHS FROM TUBERCULOSIS, PULMONARY AND NON-PULMONARY, FOR YEARS 1951 TO 1960 BY AGE AND SEX

Year	All Ages				Under 1 yr		1—4		5—14		15—24		25—34		35—44		45—54		55—64		65—74		75 and over		
	Rate per 100,000 Pop		Numbers		Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	Pul	Other	
	Pul	Other	Pul	Other																					
1951	59	15	M	942	248	3	20	4	50	2	33	111	43	168	33	195	28	199	18	171	12	72	8	17	3
			F	770	202	3	19	4	36	12	25	147	48	204	23	159	21	106	15	67	7	57	5	11	3
1952	41	12	M	715	208	2	13	9	43	7	32	52	38	125	20	140	21	131	18	159	10	77	12	13	1
			F	492	164	1	12	3	18	13	27	31	42	134	21	101	12	60	12	56	9	32	7	11	4
1953	31	9	M	549	144	4	14	4	28	3	18	29	17	83	16	86	17	115	10	122	11	80	13	23	—
			F	362	132	—	4	4	21	6	30	53	19	77	12	66	11	62	14	45	7	41	10	8	4
1954	27	7	M	496	102	—	8	2	20	4	9	27	12	63	14	83	14	115	11	108	9	80	4	14	1
			F	301	106	1	11	5	22	6	20	21	14	61	9	57	14	51	5	47	7	44	1	8	3
1955	25	5	M	427	85	2	6	2	14	4	6	21	9	57	16	65	11	76	12	114	6	74	4	12	1
			F	302	75	1	8	2	14	2	7	29	7	69	6	58	5	57	9	39	6	33	8	12	5
1956	18	4	M	362	72	1	7	1	14	—	4	6	7	30	5	61	9	68	9	98	8	78	5	10	4
			F	200	55	2	6	—	12	1	6	12	3	36	5	49	4	32	8	37	5	23	4	8	2
1957	20	3	M	383	65	1	6	2	10	2	11	12	6	36	7	62	5	75	11	98	5	71	2	24	2
			F	200	48	2	4	1	7	3	3	11	7	28	6	42	7	34	6	39	5	27	1	13	2
1958	17	2	M	323	52	—	1	—	12	—	4	6	6	21	6	37	6	62	3	98	9	79	3	20	2
			F	179	27	2	2	—	6	1	2	1	2	33	3	41	2	32	1	33	—	23	7	13	2
1959	15	2	M	284	40	1	2	2	7	1	2	2	2	20	4	33	5	65	7	66	5	65	5	29	1
			F	167	26	1	3	1	5	—	3	6	2	15	2	34	7	36	2	32	2	26	—	16	—
1960	14	1	M	268	26	1	1	2	5	1	1	2	3	12	2	39	5	52	2	82	5	58	2	19	—
			F	143	26	—	1	—	4	—	4	5	—	25	2	30	4	34	6	24	2	23	2	7	1

TABLE II—NUMBER OF REGISTERED TUBERCULOSIS PATIENTS REMAINING UNDER TREATMENT IN EACH HEALTH AUTHORITY AREA AT END OF EACH YEAR 1953-1960

Health Authority	1953	1954	1955	1956	1957	1958	1959	1960
Carlow	247	247	212	213	176	122	125	116
Cavan	266	269	142	173	127	131	113	103
Clare	463	482	504	519	576	601	611	599
Cork	1,933	1,943	1,763	1,803	1,558	1,500	1,480	1,396
Donegal	857	921	1,067	1,029	902	934	986	944
Dublin	1,745	1,836	1,744	1,866	1,966	1,897	256	89
Galway	907	791	698	724	679	649	595	482
Kerry	707	666	598	595	593	582	594	530
Kildare	684	754	699	505	479	431	434	481
Kilkenny	338	353	392	382	367	342	386	262
Laoighis	227	215	218	239	252	258	209	227
Leitrim	117	123	120	134	130	125	124	126
Limerick	510	500	419	406	360	460	478	447
Longford	226	194	201	185	182	154	165	174
Louth	806	868	974	985	981	965	776	696
Mayo	820	987	949	781	790	816	887	924
Meath	278	273	324	329	322	350	387	369
Monaghan	251	282	273	283	268	236	246	220
Offaly	336	292	283	268	253	228	183	183
Roscommon	363	421	428	428	432	362	342	322
Sligo	266	260	255	248	214	206	207	195
Tipperary (N R)	232	246	246	305	362	294	341	325
Tipperary (S R)	351	191	280	306	338	366	394	416
Waterford	306	295	298	328	332	337	253	286
Westmeath	372	374	476	483	473	423	383	347
Wexford	510	395	363	368	375	358	341	358
Wicklow	361	360	317	335	304	262	225	187
Cork C B	716	578	794	637	500	416	388	388
Dublin C B	15,573	16,695	9,661	8,747	7,848	7,832	7,688	6,983
Limerick C B	549	517	582	629	599	433	324	306
Waterford C B.	234	233	276	267	247	259	288	292
TOTAL	31,551	32,561	25,554	24,500	22,985	22,329	20,209	18,773

TABLE III.—NUMBERS OF NEW CASES OF PULMONARY TUBERCULOSIS IN THE STATE CLASSIFIED BY AGE AND SEX (INCLUDING NOTIFIED PRIMARY DISEASE AND TUBERCULAR PLEURISIES) IN EACH YEAR 1955-60.

Year	0-5		5-14		15-24		25-34		35-44		45 years and over		Total		TOTAL	Rate per 10,000 Population	Percentage aged 45 years and over
	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
1955	169	159	267	241	582	588	494	457	400	300	685	295	2,593	2,020	4,613	15.9	21.2%
1956	162	120	239	177	427	537	356	411	349	280	749	277	2,282	1,802	4,054	14.1	25.0
1957	109	112	197	169	370	409	289	304	261	199	683	233	1,909	1,426	3,335	11.4	29.3
1958	102	110	178	178	327	373	263	276	265	213	646	243	1,781	1,393	3,174	10.9	28.0
1959	128	136	223	193	326	281	257	207	292	194	689	247	1,915	1,258	3,177	11.3	29.4
1960	67	70	131	111	232	272	213	193	233	141	621	212	1,497	999	2,496	8.8	33.3

TABLE IV—NEW CASES OF PULMONARY TUBERCULOSIS BY AGE, SEX, REGION AND YEAR

Year	0—5		5—14		15—24		25—34		35—44		45 years		Total		Total	Rate per 10,000 Population	Percentage aged 45 years and over
	M	F	M	F	M	F	M	F	M	F	M	F	M	F			

REGION 1—DUBLIN CITY AND COUNTY

1955	118	109	135	105	229	208	186	163	128	78	241	86	1,037	749	1,786	25.4	18.3
1956	102	72	128	98	132	213	111	130	94	90	230	72	797	675	1,472	20.9	20.5
1957	61	66	107	80	88	151	72	99	75	58	174	60	577	514	1,091	15.7	22.4
1958	38	49	82	79	85	98	72	85	80	51	180	64	537	426	963	13.7	25.3
1959	46	47	99	83	81	107	68	57	81	53	195	58	570	405	975	13.6	26.4
1960	17	16	26	26	76	99	55	56	72	39	188	43	444	279	723	10.1	31.9

REGION 2—COUNTIES CARLOW, KILDARE, KILKENNY, WICKLOW

1955	10	4	19	26	29	36	27	32	25	28	43	20	153	146	299	13.4	21.0
1956	5	5	29	18	37	48	26	27	28	78	68	27	193	153	346	15.5	27.4
1957	5	8	18	20	18	24	21	21	26	13	52	16	140	102	242	10.9	28.0
1958	9	9	23	23	19	30	17	23	15	13	48	18	131	116	247	11.1	26.7
1959	8	4	20	15	22	30	20	11	14	19	59	25	143	104	247	11.4	34.0
1960	6	8	14	10	19	18	15	17	19	13	47	17	120	83	203	9.4	31.5

REGION 3—COUNTIES CAVAN, LONGFORD, LOUTH, MEATH, MONAGHAN, WESTMEATH

1955	5	9	22	22	73	64	53	47	37	34	74	41	264	217	481	14.4	23.9
1956	3	4	8	8	36	48	36	35	25	19	72	35	180	149	329	9.8	32.5
1957	4	9	14	6	41	32	28	27	35	20	65	34	187	128	315	9.4	31.4
1958	5	8	10	10	43	47	34	41	35	23	68	29	195	158	353	10.5	27.4
1959	6	5	21	8	45	21	36	28	31	18	84	26	223	106	329	10.3	36.4
1960	3	3	16	11	16	27	26	18	23	19	60	24	144	102	246	7.7	34.1

TABLE IV—NEW CASES OF PULMONARY TUBERCULOSIS BY AGE, SEX, REGION AND YEAR—*continued*

Year	0—5		5—14		15—24		25—34		35—44		45 years		Total		Total	Rate per 10,000 Population	Percentage aged 45 years and over
	M	F	M	F	M	F	M	F	M	F	M	F	M	F			

REGION 4—COUNTIES LAOIS, OFFALY, TIPPERARY (N & S), WATERFORD (AND WATERFORD C.B)

1955	2	—	4	7	42	55	42	31	32	36	51	26	173	155	328	10.9	23.4
1956	6	10	10	6	30	42	21	35	37	30	72	23	176	146	322	10.7	29.5
1957	5	2	4	16	32	30	33	32	39	15	82	20	195	115	310	10.3	32.9
1958	7	4	11	14	27	31	18	30	32	25	67	27	162	131	293	9.8	32.0
1959	4	6	11	22	38	27	21	16	31	27	62	36	167	134	301	10.3	32.2
1960	4	5	13	11	15	22	26	30	35	14	68	29	161	111	272	9.3	35.6

REGION 5—CORK CITY AND COUNTY

1955	16	17	34	31	50	56	44	50	51	40	102	43	297	237	534	15.8	27.1
1956	18	15	14	9	54	52	43	53	39	30	92	30	260	189	449	13.3	27.1
1957	17	15	16	13	41	43	33	32	21	18	75	32	203	153	356	10.0	30.0
1958	23	18	7	14	19	41	27	20	17	19	63	27	156	139	295	8.7	30.5
1959	22	32	13	16	32	24	26	17	23	8	67	24	183	121	304	8.8	29.9
1960	22	17	18	11	12	23	22	19	26	15	65	29	165	114	279	8.4	33.6

REGION 6—COUNTIES CLARE, KERRY, LIMERICK (INCL LIMERICK C.B)

1955	7	8	19	21	53	62	58	48	48	33	57	23	242	195	437	13.0	18.3
1956	20	12	25	16	60	47	40	42	40	41	87	36	272	194	466	13.9	26.3
1957	8	7	18	17	55	45	47	31	21	32	83	28	232	160	392	11.7	28.3
1958	10	12	22	21	54	52	32	31	33	28	97	34	248	178	426	12.7	30.7
1959	15	23	29	23	32	40	36	31	47	29	92	32	251	178	429	13.3	28.9
1960	6	13	14	16	31	29	24	19	14	12	71	20	160	109	269	8.0	33.8

TABLE IV. (CONTD)—NEW CASES OF PULMONARY TUBERCULOSIS BY AGE, SEX, REGION AND YEAR

Year	0—5		5—14		15—24		25—34		35—44		45 years		Total		Total	Rate per 10,000 Population	Percentage aged 45 years and over %
	M	F	M	F	M	F	M	F	M	F	M	F	M	F			
REGION 7—GALWAY, MAYO, ROSCOMMON																	
1955	8	5	7	21	57	58	50	40	39	24	64	32	246	174	420	11.9	22.8
1956	6	1	12	13	46	45	45	45	43	19	85	26	235	151	386	10.0	28.7
1957	3	3	13	11	66	60	35	35	24	28	83	28	224	165	389	10.0	28.2
1958	8	6	14	11	49	49	34	36	35	30	77	30	217	162	379	10.0	28.2
1959	10	7	8	11	46	29	30	21	31	21	85	25	210	114	324	9.7	33.9
1960	4	5	5	10	39	27	23	15	21	13	67	26	159	96	255	7.7	36.4
REGION 8—COUNTIES DONEGAL, LEITRIM, SLIGO.																	
1955	3	1	12	6	43	40	27	32	30	24	44	19	159	122	281	13.0	22.4
1956	2	1	11	9	27	33	28	36	33	18	40	23	141	120	261	12.1	24.1
1957	5	—	7	4	18	16	10	21	15	10	50	17	105	68	173	8.0	38.7
1958	1	4	9	5	23	18	19	11	11	16	42	22	105	76	181	8.4	35.3
1959	11	4	9	11	19	14	17	20	26	14	52	19	134	82	216	10.8	32.8
1960	3	3	9	12	15	17	17	11	22	11	33	20	99	74	173	8.0	30.6

TABLE V—PERCENTAGE FALL 1955-1960 IN NUMBERS OF NEW CASES

Region	Percentage Decline
1	59.6
2	32.2
3	48.9
4	17.1
5	47.8
6	38.7
7	39.3
8	38.5
State	45.9

For definition of regions see Table IV

TABLE VI—NEW CASES OF PULMONARY TUBERCULOSIS BY WHO SEVERITY CLASSIFICATIONS BY YEARS 1957-60.

WHO Severity Classification	Numbers of Cases				Percentage Distribution			
	1957	1958	1959	1960	1957	1958	1959	1960
1 Pulmonary Pathology one side only, no suspicion of cavity	764	641	713	596	26.9	25.7	30.1	30.7
2 Pulmonary Pathology on both sides, no suspicion of cavity	558	612	472	393	19.6	24.5	19.9	20.2
3 Pulmonary Pathology one one side only, suspicion of cavity	126	132	180	119	4.4	5.3	7.6	6.1
4 Pulmonary Pathology one side only, definite cavity	321	319	252	208	11.3	12.8	10.6	10.7
5 Pulmonary Pathology on both sides, suspicion cavity one side	189	148	167	117	6.7	5.9	7.0	6.0
6 Pulmonary Pathology on both sides, definite cavity one side	378	353	318	274	13.3	14.1	13.4	14.1
7 Pulmonary Pathology both sides, suspicion cavity both sides	43	28	36	23	1.5	1.1	1.5	1.2
8 Pulmonary Pathology on both sides, definite cavity one and suspicion of cavity other	61	42	56	50	2.1	1.7	2.4	2.6
9 Pulmonary Pathology both sides, definite cavity both	196	119	110	114	6.9	4.8	4.6	5.9
10 Not stated, etc	204	101	68	49	7.2	4.0	2.9	2.5
TOTAL	2,840	2,495	2,372	1,943	100.0	100.0	100.0	100.0
Aggregate of Categories (6-7-8-9)	678	542	520	461	23.9	21.7	21.9	23.7

TABLE VII —NEW CASES OF PULMONARY TUBERCULOSIS BY SEVERITY FOR TWO MAJOR AGE GROUPS BY SEX AND YEAR

W.H.O. Classification of severity in Categories	Age Group 15 to 34 years						Age Group 45 to 64 Years					
	Numbers			Percentage			Numbers			Percentage		
	M	F	T	M	F	T	M	F	T	M	F	T
							YEAR 1957					
1 and 2	273	371	663	50.7	60.5	55.6	215	87	302	39.9	49.7	42.3
3 to 5	149	134	283	25.8	21.8	23.8	148	39	187	27.5	22.3	26.2
6 to 9	135	108	243	23.4	17.6	20.6	175	49	224	32.4	28.0	31.4
All Categories	576	613	1,189	99.9	99.9	100.0	538	175	713	99.9	100.0	99.9
							YEAR 1958					
1 and 2	260	315	575	53.6	58.6	56.2	221	78	299	44.4	46.7	45.0
3 to 5	116	130	246	23.9	24.2	24.0	139	44	183	27.8	26.3	27.5
6 to 9	109	92	201	22.4	17.1	19.6	137	45	182	27.6	26.9	27.5
All Categories	485	537	1,022	99.9	99.9	99.8	497	167	664	99.8	99.9	100.0
							YEAR 1959					
1 and 2	274	223	497	57.5	61.7	59.2	230	81	311	46.6	46.2	46.7
3 to 5	103	59	162	21.6	16.3	19.3	140	49	189	28.3	28.0	28.2
6 to 9	99	79	178	20.7	21.8	21.3	123	45	168	24.9	25.7	25.0
All Categories	476	361	837	99.8	99.8	99.8	493	175	668	99.8	99.9	100.0
							YEAR 1960					
1 and 2	198	238	436	55.0	62.7	59.0	216	68	284	46.0	44.1	45.5
3 to 5	79	71	150	21.9	18.5	20.3	102	53	155	21.7	34.4	24.8
6 to 9	83	70	153	23.0	18.8	20.7	151	33	184	32.2	21.4	29.6
Categories	360	379	739	99.9	100.0	100.0	469	154	623	99.9	99.9	99.9

For definition of categories see Table VI.

TABLE VIII—DISCOVERY OF NEW CASES OF PULMONARY TUBERCULOSIS
(EXCLUDING PRIMARY DISEASE AND PLEURAL EFFUSION)

Source	1957	1958	1959	1960
Private Practitioner	804	661	586	484
District Medical Officer (Dispensary Doctor)	509	464	353	313
Hospital	677	627	651	516
Mass Radiography	391	377	409	315
Contact	157	134	156	101
Own Accord through Health Authority services	37	38	55	52
Transfer	212	159	152	157
Other	33	31	9	5
Not Stated	10	4	1	—
TOTAL	2,840	2,495	2,372	1,943

TABLE IX—NEW CASES OF NON-PULMONARY TUBERCULOSIS BY YEAR, AGE AND SEX

Year	0—5		5—14		15—24		25—34		35—44		Aged 45 and over		Total		Total	Rate per 10,000 Population
	M	F	M	F	M	F	M	F	M	F	M	F	M	F		
1955	68	60	123	103	109	128	69	93	57	43	62	61	438	487	975	3.3
1956	40	45	83	94	76	108	55	98	89	52	59	70	352	462	814	2.8
1957	63	36	108	79	73	88	48	74	49	48	84	58	425	378	803	2.7
1958	48	33	101	60	56	106	44	88	38	41	58	49	345	377	722	2.4
1959	43	41	77	101	84	90	42	87	43	58	84	79	373	456	829	2.9
1960	29	29	78	89	59	74	30	88	32	46	60	60	283	387	669	2.3

TABLE X—NON-PULMONARY NEW CASES BY YEAR, SEX AND SITE

Site	1957		1958		1959		1960	
	M	F	M	F	M	F	M	F
1 Tuberculosis Meninges	40	22	28	25	30	29	24	29
2 Gastro-intestinal	21	31	25	97	24	47	16	47
3 Bones and Joint (of which spine)	118 (43)	92 (45)	82 (31)	79 (38)	88 (38)	82 (34)	88 (33)	47 (19)
4 Late Effect of T B of Bone and Joint	18	17	23	10	22	13	5	15
5 Skin and Cellular Tissue	9	9	15	19	7	16	6	7
6 Lymphatic System	188	127	117	124	114	184	96	157
7 Genito-Urinary System	58	61	47	73	72	71	36	72
8 Adrenal Glands	—	3	2	2	1	3	1	—
9 Other Organs	8	6	6	7	7	5	7	5
10 Acute Disseminated Miliary	—	—	—	2	6	6	4	7
Above headings	410	368	345	378	371	456	283	386
Site Not Stated	25		—		2		—	
TOTAL	803		723		829		669	

TABLE XI—REVENUE COSTS OF TUBERCULOSIS SERVICES (EXCLUDING CAPITAL EXPENDITURE)

Year	Amount
	£
1951/52	2,462,500
1952/53	2,637,000
1953/54	2,784,000
1954/55	2,844,100
1955/56	2,840,600
1956/57	2,667,000
1957/58	2,376,000
1958/59	2,198,000
1959/60	1,949,000
1960/61	1,662,000

TABLE XII—ADULT PULMONARY TUBERCULOSIS INSTITUTIONAL ACCOMMODATION

Year	Beds Occupied	Waiting List	Bed Demand
November 1951	4,803	381	5,184
November 1952	5,149	660	5,809
November 1953	5,460	289	5,749
October 1954	5,463	177	5,640
October 1955	4,971	89	5,060
October 1956	4,430	67	4,497
October 1957	3,893	26	3,919
October 1958	3,167	17	3,184
October 1959	2,625	10	2,635
October 1960	2,146	6	2,152
October 1961	1,818	3	1,821

DISCUSSION

Dr. Gallen In associating myself with the vote of thanks to Dr. Deeney on his very fine exposition of the state of tuberculosis in Ireland I would like to refer to one or two points in his paper. Over the past decades the rehousing of the people of the cities (where I work) has had a great influence on the regression of the disease. As to deaths the males nowadays tend to die symmetrically distributed around the 64 age group while the females are distributed rather more flatly. This is in part explainable by the fact that in earlier years the infected female population died off leaving the males to survive to die in a later decade.

Registers of cases can only be maintained on strict criteria and rules of proceeding. To allow of individuals having personal ideas of when a patient is to be released without regard to general criteria defeats the object from a statistical standpoint.

A five year age group is essential if age trends are to be accurately followed, ten years tends to cut the top off significant graph movements. Comparison of the figures of disease severity and infection occurring in Dublin City in 1960/61 show the same trends as do Dr. Deeny's country wide figures.

I might say in finishing that it is seldom one hears such an authoritative survey of such a complicated problem and this paper will serve as a headline for many workers in this field.

Dr. Geary I wish that more members and visitors were present here tonight to hear Dr. Deeny's splendid success story—to repeat Mr. Hargadon's dictum I am flattered by our eminent lecturer's reference to my work in the field of tuberculosis statistics very many years ago. The role of statistics and the statisticians is usually the doleful one of pointing to bad spots with a view to remedial action. Dr. Deeny's story is one of triumph all along the line.

As to a few specific points in the paper, Dr. Deeny makes no reference to improvements in social and economic conditions as amongst the factors leading to the elimination of the disease. In my paper of 1930 the emphasis was strongly on the point that the break in the tuberculosis mortality rate which occurred in 1896 coincided with the upturn in the economic trend in Ireland; and in the paper it was also shown that at any time the disease affected the poorer classes in overwhelming greater degree than the better off. Might I ask his opinion as to the extent to which the undoubted improvement in living conditions during the post-war years has been a factor in the decline practically to zero in the mortality rate?

All the very interesting tables appended to the paper tell the same happy story. The decline in mortality and in new cases is much more marked in the younger age groups. Mortality at later ages is conditioned by the reflection that old people must die of something or other and it doesn't matter much, though one old person wants to live a little longer yet!

Dr. Deeny uses the traditional mortality rates and gives rates in his analysis. Might I suggest that he should also consider the rate of mortality per 1,000 cases, analysed by years, areas and age groups. From a glance at his tables I am sure that this rate will yield very interesting results.