SOCIAL CLASS DISTRIBUTION OF RESPIRATORY TUBERCULOSIS NOTIFICATIONS IN NORTHERN IRELAND, 1949-53

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Recently the social class distribution of respiratory tuberculosis mortality for males in Northern Ireland has been examined for the first time, using deaths in the period 1949-53 and the 1951 census population (Merrett, 1959). This paper presents the social class distribution of respiratory tuberculosis morbidity, as measured by notifications, for males in Northern Ireland during the same period.

The Northern Ireland Tuberculosis Authority is responsible for the prevention and treatment of tuberculosis for the whole country (*Brit. med. J.*, 1954; Cheeseman, 1956; Elder, 1953) and their records include respiratory tuberculosis notifications classified by age, sex, and "state of disease" for each year since 1948. Patients diagnosed as having active primary tuberculosis were excluded from the published notifications from 1952 onwards, but the numbers of such patients have been made available to me and are included in the notifications occurring in the period 1949-53 which have been used in the following analysis (Northern Ireland Tuberculosis Authority, 1957). The Authority has further provided details of occupations followed by notified persons at the time of diagnosis.

The "state of disease" classification used by the Authority is that suggested for England and Wales by the Ministry of Health (1947), namely:

Group 1.—Cases with slight constitutional disturbances.

Group 2.—All cases which cannot be placed in Groups 1 and 3.

Group 3.—Cases with profound systematic disturbance or constitutional deterioration and with marked impairment of function, either local or general.

Throughout this report these will be referred to as Stage 1, Stage 2, and Stage 3.

The method used for classifying occupations and thence social class is that used by the General Register Office (1956).

MATERIAL

In Northern Ireland in 1949-53 there were 4,702 notifications of respiratory tuberculosis among males; of these, 3,777, whose age, social class, and "state of disease" were known, were aged 15 years and over. Of the 3,777 male notifications included in this report, 3,532 (93.5 per cent.) were classified as "occupied or retired" and the remaining 245 (6.5 per cent.) as "unoccupied", these terms being used in the same sense as in the official reports for England and Wales (*e.g.* Registrar General, 1958). The "unoccupied" group does not include persons who are out of work; they are classified by their last occupation and included in the "occupied or retired" group. These proportions are very similar to those found in the analysis of deaths from respiratory tuberculosis in Northern Ireland from 1949-53 (Merrett, 1959), when 95.5 per cent. of the deaths were classified as "occupied or retired" and 4.5 per cent. as "unoccupied".

Classification by social class resulted in 61 notifications in Social Class I (Professional), 416 in Class II ("Intermediate"), 1,761 in Class III (Skilled), 639 in Class IV (Partly-skilled), and 665 in Class V (Unskilled). The distribution of notifications by state of disease and social class is shown in Table I.

TABLE I

NUMBER OF NOTIFICATIONS OF RESPIRATORY TUBERCULOSIS IN MALES AGED 15 YEARS AND OVER IN NORTHERN IRELAND (1949-53) BY SOCIAL CLASS AND STAGE OF DISEASE

Social Class	Stage of Disease							
	1		2		3		Total	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
I	23	37.7	28	45.9	10	16.4	61	100
II	133	32.0	201	48.3	82	19.7	416	100
III	608	34.7	850	48.5	293	16.7	1,751	100
IV	223	34.9	274	42.9	142	22.2	639	100
V	161	24.2	345	51.9	159	23.9	665	100
Unoccupied	93	38.0	88	35.9	64	26.1	245	100
Total ..	1,241	32.9	1,786	47.3	750	19.9	3,777	100

RESULTS

The percentage distributions of Table I show that, as the social class becomes less favourable, notifications of more advanced tuberculosis (Stage 3) become relatively more common than those of early disease (Stage 1).

Table II shows the standardized morbidity ratios for all males aged 15 years and over, irrespective of state of disease, and for each stage separately. These ratios could unfortunately mask age differences which have already been reported by other workers (Lowe, 1954; Cheeseman, 1956; Department of Health for Scotland, 1958). This Table is only included for the sake of interest, and from what follows it will be seen that the ratios would have been unreliable for depicting the social class variation in notification rates in some age groups. The average annual notification rates for specified age groups are shown in Table III (opposite) for each social class and stage of disease. This breakdown resulted in a small number of notifications in some age and social class groups, especially in Social Class I and in the older age groups of the other social classes. These rates have been accepted at their face value, but it must be remembered that they may be unreliable.

All Notifications Combined.—For all notifications combined, there is no consistent social class trend apparent in each age group shown in Table III; thus at different ages different social classes have the maximum rates. The maxima appear twice in Social Classes II and III, once in Social Class IV, and four times in Social Class V.

Cheeseman (1956) found that the notification

rates for Northern Ireland had two peaks, a major peak occurring at 20–24 years and a minor peak at 50–54 years. This has also been shown for respiratory tuberculosis notifications of males in Scotland (Department of Health for Scotland, 1958), where the notification rates for 1956 had peaks at ages 15–24 and 45–64 years. This is consistent with the present data where each social class clearly has a peak between ages 15 and 24. As social class becomes less favourable, the second peaks become more clearly defined. In Social Class III the minor peak occurs at 55–59 years and in Social Class V the major peak at 55–59 years (Fig. 1, overleaf). Social Class IV is intermediate between III and V, the difference between the heights of the peaks being small. A striking feature of Social Class II morbidity is the very high rates for the two youngest age groups, but it should be noted that, as the rate for age 15–19 years is based on a small number of notifications, it is possible that the true peak is attained in the next age group, 20–24 years, which has the second highest notification rate. In the present study the rates of Social Class I are based on small numbers and no really definable age distribution is possible, although the maximum rate occurred in the age group 20–24 years.

The reliable rates thus imply that the age morbidity curve with a single peak at early adult ages, which is typical of males in the high social classes, changes as the social class becomes less favourable to a bimodal curve with the major peak at about age 55 or over. Thus, as social class becomes less favourable, morbidity at older ages become greater than at younger ages. The social class and age relationship was then examined for the three stages of severity of the disease.

TABLE II

STANDARDIZED MORBIDITY RATIOS AND THEIR STANDARD ERRORS BASED ON THE NOTIFICATIONS OF RESPIRATORY TUBERCULOSIS IN MALES AGED 15 YEARS AND OVER IN NORTHERN IRELAND (1949–53), BY STAGE OF DISEASE AND SOCIAL CLASS

Stage of Disease	Social Class					
	I	II	III	IV	V	Unoccupied
	S.M.R. ± S.E.*	S.M.R. ± S.E.	S.M.R. ± S.E.	S.M.R. ± S.E.	S.M.R. ± S.E.	S.M.R. ± S.E.
All Notifications	73 ± 9.3	60 ± 2.9	119 ± 2.8	84 ± 3.3	113 ± 4.4	135 ± 8.6
1	96 ± 20.1	80 ± 6.9	120 ± 4.9	84 ± 5.6	85 ± 6.7	103 ± 10.7
2	67 ± 12.6	56 ± 4.0	123 ± 4.2	78 ± 4.7	123 ± 6.6	136 ± 14.5
3	56 ± 17.8	48 ± 5.3	107 ± 6.2	100 ± 8.4	134 ± 10.7	239 ± 29.9

* Standardized morbidity ratios ± standard error.

Stage 1.—Social Class III has the greatest morbidity at all ages combined (Table III). However, this is not consistent in each age group. In no single age group did Social Class III have the highest rate, but in seven it has the second highest. No other social class consistently has the greatest rate and, as Table III shows, the maximum rate occurred in two age groups in each of the Social Classes I, II and V and in three age groups in Class IV. Each social class showed a major peak between ages 15-24 (Fig. 2, Stage 1, overleaf), but there is a suggestion of a minor peak at a later age in the lower social classes. In these classes (IV and V) the difference in the rates at the younger and the older ages is not as great as in the other social classes.

Lowe (1954), in his survey of Birmingham notifications for 1951, and Cheeseman (1956) both found in their respective studies of Stage 1 notifications that maximum morbidity for males occurred at age 15-19 years. There is also some evidence of a very much lower peak in Lowe's data at age 50-54 years.

Stage 2.—The age distribution of the notification rates of this stage is characterized by its two peaks. This has already been reported by other writers. Cheeseman (1956) showed that the major peak occurred at age 20-24 years and the minor, which was slightly smaller than the major, at age 50-54 years. The major peak in the data discussed by Lowe (1954) also occurred at age 20-24 years and an appreciably smaller minor peak at age 45-49 years. In the present data this bimodal characteristic is much more marked in each of Social Classes III, IV, and V than in either of the two remaining classes. In fact, as social class lowered, the major peak occurred at an older age and was markedly higher than the minor peak in the lowest social class (Fig. 2, Stage 2). It is also of interest that in Social Class V males between the ages of 35 and 65 years consistently have the greatest morbidity rate of all the social classes.

Stage 3.—As there are only ten Stage 3 notifications in Social Class I, this class has been omitted from the following results in this group, although

TABLE III

RESPIRATORY TUBERCULOSIS MORBIDITY AMONG MALES IN NORTHERN IRELAND (1949-53), BY AGE, SOCIAL CLASS, AND STAGE OF DISEASE

Average annual notification rates per 100,000 of the population at stated age group in years

Stage of Disease	Social Class	Age Group (yrs)									
		15-19	20-24	25-34	35-44	45-54	55-59	60-64	65-69	70 and Over	Total 15 and Over
All Notifications	I	(72)	(191)	(154)	(86)	(142)	(53)	(102)	(112)	(—)	112
	II	(362)	313	143	87	84	49	50	(33)	(15)	83
	III	266	282	214	153	187	209	175	115	(18)	198
	IV	132	181	134	154	158	141	150	(97)	(27)	138
	V	155	211	178	172	237	264	183	(109)	(26)	181
	Unoccupied	140	(197)	(117)	(21)	(103)	(310)	(544)	2,201	1,266	243
1	I	(72)	(95)	(89)	(31)	(20)	(—)	(—)	(37)	(—)	42
	II	(201)	154	64	25	(16)	(9)	(3)	(5)	(2)	27
	III	159	137	73	35	37	(26)	(19)	(16)	(2)	69
	IV	83	71	56	41	37	(21)	(24)	(11)	(9)	48
	V	67	71	53	40	43	(37)	(20)	(13)	(—)	44
	Unoccupied	94	(135)	(70)	(—)	(17)	(62)	(42)	(503)	(107)	92
2	I	(—)	(72)	(65)	(39)	(102)	(—)	(68)	(—)	(—)	51
	II	(80)	126	62	48	50	(20)	(20)	(18)	(9)	46
	III	78	119	114	85	106	122	86	79	(6)	96
	IV	(30)	81	55	68	80	(72)	(73)	(64)	(9)	59
	V	60	100	90	102	116	171	104	(58)	(9)	94
	Unoccupied	36	(52)	(47)	(—)	(68)	(62)	(335)	(818)	553	87
3	I	(—)	(24)	(—)	(16)	(20)	(53)	(34)	(75)	(—)	(18)
	II	(80)	(33)	(17)	(14)	(18)	(20)	(28)	(10)	(4)	16
	III	29	26	27	33	44	61	69	(20)	(10)	33
	IV	(19)	(29)	22	45	42	(47)	(53)	(21)	(9)	31
	V	(29)	(40)	35	30	77	(57)	(59)	(39)	(17)	64
	Unoccupied	(10)	(10)	(—)	(21)	(17)	(186)	(167)	(881)	606	64
2 and 3	I	(—)	(95)	(65)	(54)	(102)	(53)	(75)	(—)	(—)	70
	II	(161)	159	80	62	(68)	(40)	(102)	(28)	(12)	56
	III	107	145	141	118	150	182	155	99	(16)	129
	IV	49	110	77	113	122	119	126	(86)	(18)	90
	V	88	140	125	132	193	227	164	(97)	(26)	137
	Unoccupied	46	(62)	(47)	(21)	(85)	(248)	(502)	1,698	1,159	151

Figures in brackets are based on less than twenty notifications.

FIG. 1.—Notification rates of respiratory tuberculosis in Northern Ireland, 1949–53

the rates for Social Class I are shown in Table III and in Fig. 2, Stage 3. Morbidity is greatest in five of the nine age groups in Social Class V, in two in Class III, and in one in each of Classes II and IV, and there is no consistent run of maximum rates in any one social class. There is evidence of a bimodal distribution in each of the four social classes, and in the lower classes the major peak tends to occur at a later age than in the higher classes. This is evident from Fig. 2, Stage 3, and a point worthy of note is that the major peak occurs earlier in the unskilled occupations (Social Class V), namely at age 45–54 years compared with age 60–64 years for Social Classes III and IV. Social Class II also showed a slight tendency to have a second peak in the earlier age group (45–54 years), but this is less marked than in the other social classes.

Comparison between Stages of Disease.—This analysis would be incomplete without a comparison of the notification rates between the stages of disease for each age and social class. Up to age 25 years, the rates in Stage 1 are greater than those in Stage 3 for

all social classes, the difference being least in the partly-skilled and unskilled occupations. With the exception of males aged 20–24 years in Social Classes IV and V, where Stage 2 has the maximum rate, the Stage 2 rates are greater than those of Stage 3 but less than those of Stage 1. From 25 to 44 years the rates for Stage 1 are again higher than those for Stage 3 except for partly-skilled males aged 35–44 years, the difference being least in the lower social classes. Except in the higher social classes the rates for the intermediate Stage 2 are greater than those of the other two stages.

After age 45, except in a few age and social class groups where the number of notifications is small, the Stage 2 rates are the greatest, with Stage 3 greater than Stage 1.

Thus, as age increases so do the notifications of more serious tuberculosis, and this holds for each social class.

Unoccupied Group.—Reference to the unoccupied group has so far been omitted, mainly because the number of notifications of males between the age of

FIG. 2.—Classified notification rates of respiratory tuberculosis in Northern Ireland, 1949-53.

20-64 is so small as to make it risky to draw any conclusion from them. Moreover, 85 (34.7 per cent.) of this group were aged 15-19 and 106 (43.3 per cent.) were aged 65 years and over. Most of the 85 were still at school or had not yet started their first employment, and it is only in this group of the "unoccupied" that any confidence can be placed in the rates. As was to be expected, the majority of these 85 were in the early stages of the disease (Stage 1), the average annual notification rates being 94, 36, and 10 per 100,000 of the population for Stages 1, 2, and 3 respectively. For age 65 years and over the occupations of all but one of the males were stated as "persons of leisure, retired". It is unlikely that this number had never been employed; probably if the truth were known most of these 105 should be re-allocated to the other social classes, in which case the average annual notification rates are understated

in the last two age groups in each of the social classes. Unfortunately the amount of this understatement cannot be estimated. Of the 105 stated to be "persons of leisure, retired", fourteen (13.3 per cent.) were classified as Stage 1, 44 (41.9 per cent.) as Stage 2, and 47 (44.8 per cent.) as Stage 3.

DISCUSSION

In Northern Ireland the investigation of respiratory tuberculosis is for the most part carried out by the chest clinics and mass radiography units. Approximately 15 per cent. of the population in Northern Ireland is examined radiologically annually and many of these are persons who are examined every year in organized groups. Thus the number of people seen for the first time each year is only a small percentage of the population and is not fully

representative of the population from which it is drawn. In view of the findings of Bradbury (1948) that, even with 70 per cent. of the population being examined radiologically, only 50 per cent. of the tuberculous would be discovered, the notification rates discussed earlier may well underestimate the true incidence of respiratory tuberculosis in Northern Ireland. This would seem to apply mainly to Stage 1 disease, which by definition involves only slight constitutional disturbance and is very often symptomless so that it is detected mainly by mass radiography and by the examination of contacts of other affected persons. During most of the period concerned the policy of the mass radiography service in Northern Ireland was such that efforts were largely concentrated on young adults in industry. This is apparent from Table IV, which shows that, for 1951, the middle year of the period examined, the greatest proportion of the male population examined was between the ages of 15 and 24 years. This may explain at least in part the small difference in the total morbidity rates for Social Classes III and V. This difference is largely due to the higher notification rates of Stage 1 disease in the younger age groups of Social Class III males. If, because of the present policy already mentioned, a greater proportion of the skilled than unskilled trades is being examined by mass radiography in the young adult male age groups, then this apparent difference in social class morbidity might be more easily understood. Unfortunately no data are available to enable a comparison to be made of the proportions examined radiologically in each social class.

TABLE IV
MASS RADIOGRAPHY OF MALES IN NORTHERN IRELAND
IN 1951

Age Group (yrs)	Number x-rayed	Percentage of Northern Ireland Population x-rayed
Under 15	6,527	3.4
15-24	11,712	11.2
25-34	7,866	8.5
34-44	5,233	5.9
45-59	4,083	3.9
60 and Over	728	0.9
Total	36,149	5.4

Stage 2 notifications should contain no symptomless people and may well be considered with the more advanced type of the disease (Stage 3) as progressive stages after the time when symptoms first appear. The notification of these two stages depends largely on the attitude of the affected males. Some will seek early advice and others will delay, the former being more likely to be diagnosed as Stage 2 and the latter as Stage 3. This is partially

borne out by the fact that, except in the unskilled occupations and to a lesser degree in Social Class IV of the present data, the maximum rate occurred at an earlier age for Stage 2 than for Stage 3 notifications. The reverse is true, however, of Social Class V, where the maximum rate occurred some 10 years earlier in Stage 3 than in Stage 2.

It seems likely, therefore, that Stage 2 and Stage 3 cases considered together would yield rates approximating closely to the true morbidity rates in males aged 15 and over for respiratory tuberculosis in which symptoms are manifest. These combined rates are shown in Table III, which shows that the highest rate occurs in the age group 45-54 years for Social Class I, but in view of the small number of notifications involved no great importance should be attached to this. Social Class II rates, however, show a tendency to decrease from the youngest age group surveyed. Social Classes III and V both show a bimodal distribution, the peaks occurring at ages 20-24 and 55-59 years, the latter being the major peak in each case. Social Class IV also has a peak at age 20-24 years and, although the major peak is less clearly defined, the maximum rate occurs at 60-64 years. After age 34 Social Class V experiences the highest morbidity and Social Classes I and II have rates consistently lower than Classes III to V.

As age advances, the proportion of respiratory tuberculosis with symptoms diagnosed increases in each of the social classes (Table V, opposite). This is not unexpected, but it is worthy of note that, even in the younger age groups, the proportion of advanced cases to the total cases of tuberculosis notified is greater in Social Class V than in the other social classes. This might well be due to a real difference in the morbidity experience of the various social classes. Alternatively, it might be explained if relatively fewer unskilled men in these age groups were being examined radiologically. If this were so, fewer cases would be classified in Stage 1 in the younger age groups in Social Class V and Stage 2 and 3 notifications would predominate.

Since persons dying from respiratory tuberculosis may be considered as either Stage 2 or Stage 3 cases, the morbidity in this combined group may reflect the mortality trend. As a crude test the standardized morbidity ratios for Stages 2 and 3 combined and the mortality ratios for males in Northern Ireland and the standardized mortality ratios for males in England and Wales are shown in Table VI (opposite). The ratios for morbidity and mortality are similar for Social Classes I, II, and III in Northern Ireland, but differ widely in the partly-skilled and unskilled occupations. In the comparison of Northern Ireland morbidity with England and Wales mortality, the

TABLE V

NOTIFICATION RATES OF STAGES 2 AND 3 COMBINED AS A PERCENTAGE OF THE CORRESPONDING RATE FOR ALL NOTIFICATIONS

Social Class	Age Group (yrs)									Total 15 and Over
	15-19	20-24	25-34	35-44	45-54	55-59	60-64	65-59	70 and Over	
I	(0)	(50)	(42)	(63)	(86)	(100)	(100)	(67)	(*)	63
II	(44)	51	56	71	81	82	96	(85)	(80)	67
III	40	51	66	77	80	87	89	86	(89)	65
IV	37	61	57	73	77	84	84	(89)	(67)	65
V	57	66	70	77	81	86	89	(89)	(100)	77

* No notifications.

Figures in brackets show percentages whose denominator is based on less than twenty notifications.

TABLE VI

COMPARISON OF STANDARDIZED MORBIDITY RATIOS FOR MALES IN NORTHERN IRELAND WITH STANDARDIZED MORTALITY RATIOS IN NORTHERN IRELAND AND ENGLAND AND WALES FOR RESPIRATORY TUBERCULOSIS (1949-53)

Social Class	Northern Ireland		England and Wales*
	Standardized Morbidity Ratio $\pm$ S.E.	Standardized Mortality Ratio $\pm$ S.E.	Standardized Mortality Ratio $\pm$ S.E.
I	64 $\pm$ 10.3	63 $\pm$ 14.1	58 $\pm$ 2.3
II	54 $\pm$ 3.2	49 $\pm$ 3.9	63 $\pm$ 1.1
III	118 $\pm$ 3.5	112 $\pm$ 5.0	102 $\pm$ 0.8
IV	84 $\pm$ 4.1	51 $\pm$ 4.7	95 $\pm$ 1.4
V	127 $\pm$ 5.6	203 $\pm$ 10.1	143 $\pm$ 1.8

* Based on ages 20-64 years.

ratios are much more alike for each social class. This, I feel, gives more weight to the arguments previously put forward (Merrett, 1959), that insufficient information about occupation, especially of the partly-skilled and unskilled workers, is being given to the registrars in Northern Ireland at death registration.

SUMMARY

It seems advisable to consider the notifications of males with respiratory tuberculosis in two parts; cases with few or no symptoms (Stage 1), and cases with symptoms usually noticed by the patients themselves (Stages 2 and 3). For the former, the maximum rates occurred between the ages of 15 and 24 years for all social classes, the rates in this age range being the lowest of all for Social Class V.

Maximum morbidity occurred much later in life for moderate or advanced cases (Stages 2 and 3), except for Social Class II which had the greatest notification rate between the ages of 15 and 24 years. Social Classes III, IV, and V all experienced their maximum notification rate between the ages of 55 and 64, and there was evidence of a minor peak in each of these classes between the ages of 20 and 24

years. After the age of 35, the males of Social Class V consistently experienced a greater morbidity than those of the other social classes, except at age 65-69.

The proportion of male notifications of moderate or advanced disease increases with age and this is true of all social classes. This suggests that fewer diagnoses of Stage 1 disease are being made from radiological findings in the older age groups. Social Class V also had a greater proportion of advanced cases of respiratory tuberculosis in the youngest age groups (*i.e.* 15-34 years) than the other social classes.

The differences noted above may be indications of the true morbidity of the social classes in Northern Ireland, but they may also reflect the present policy of the mass radiography units in this country to concentrate on the young adults in industry. In view of the present findings, if the morbidity from respiratory tuberculosis in the Northern Ireland population is to be deduced from notification rates, it would seem advisable to examine radiologically a sample of the population more representative with regard to age and social class.

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