Occupational Mortality in Northern Ireland (1960-62)

By A. T. PARK

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INTRODUCTION

It is generally accepted that the environment in which a man spends the greater part of his working hours may have an important influence upon his health. In England and Wales it has been customary since 1851 to relate the deaths of persons in various occupations as indicated at death registration, about the time of each census, to the number of persons in the population engaged in these occupations as enumerated at the census.

Delay is inevitable in the preparation of detailed occupational mortality analyses, because it is necessary to wait until routine coding of cause of death, occupation and social class has been completed on the death registrations for the years concerned, and also to await the basic occupation and social class analysis from the census. As a result, the occupational mortality reports do not normally appear until several years after the census, for instance, those relating to the 1951 census in England and Wales were not published until 1958.

In Northern Ireland there had not been any similar attempt to relate deaths by occupational groups to census data until it was decided to do so for the 1961 census. No official report has been published and I am grateful to the Registrar General for allowing me to use the data for the purpose of this paper. As in the case of most statistics collected by the General Register Office, the detailed tabulations will be made available to any research worker who is interested in this field.

DATA

The paper deals with deaths registered in the three calendar years 1960 to 1962, inclusive, and their analyses are based upon the particulars of age, occupation and cause of death at registration. In the case of married women, the occupation characteristic used is that of the husband, the woman's own occupation, if she had one other than housewife, being entirely disregarded.

The occupation groups identified in this analysis cover the active, out of work and retired. The occupational information collected at the census was in respect of persons aged 15 years and over and related to the activity during the week ended 22nd April, 1961, that is, the week preceding census

day. For a person in employment, particulars were required of his main gainful employment during the week, irrespective of whether he was following his usual occupation or of the hours actually worked; if not in employment or wholly retired at the end of the week, the reference was to his last full-time employment. The coding of occupation was done on the basis of the revised occupational classifications used for the 1961 census throughout the United Kingdom, viz., The Classification of Occupations 1960 (H.M.S.O.). The appropriate population exposed to risk to which the deaths have been related in the calculation of death rates, was the corresponding census population multiplied by three, the date of the census being regarded as sufficiently close to the centre of the three years 1960–62 to be accepted as a satisfactory mean without adjustment. The occupations have been grouped into the 27 main categories listed in Table 2 and other tables. The occupations have also been regrouped into the five social categories

I Professional occupations
II Intermediate occupations
III Skilled occupations
IV Partly-skilled occupations
V Unskilled occupations

with groups II, III and IV subdivided as between manual, non-manual and agricultural. The social class analysis applies only to occupied and retired persons and excludes members of the armed forces and persons with inadequately described occupations.

Deaths in the three years have been coded by cause according to the Abbreviated Lists contained in the "Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death, 1955". Where more than one cause of death is reported, the death is classified according to the underlying cause, that is, the disease or injury which initiated the train of morbid events leading directly to death.

The aim of this paper is to show such mortality differences as there may be among the occupational groups indicating those occupations where death rates are high and those diseases where mortality shows some association with occupational or related circumstances. However, it must not be assumed that the mortality statistics here reflect the true mortality risks of a particular occupational group; rather, in cases where the specific rates are significantly different from those of the total population it should be taken as an indication for more detailed research into possible reasons.

It is generally accepted from past experience of similar mortality analyses, that high mortality rates associated with particular occupations do not always arise from adverse circumstances directly related to the occupation itself or with environmental conditions associated with the occupation. The mortality rates of men in a particular occupation and of their wives and children are often determined much less by the occupation than by the interaction of such considerations as the standard of living, geographical location, housing, clothing, education, recreation, and dietary habits of those concerned.

LIMITATIONS OF THE DATA

The mortality rates given in this paper are subject to a number of limitations and perhaps it would be appropriate to mention some of them at this stage.

Although the mortality experience covers a period of three years, the number of cases in some of the cells, when analysed by cause of death, occupation and age, is small and subject to errors of a random character due wholly to the small numbers involved.

There are inevitably errors in occupational statements accentuated by the fact that the quite different circumstances of census reporting and of death registration may lead to different descriptions of the same individual's occupation on the two records, and may indeed affect some occupations more than others. In completing the census schedule, the individual is asked to record his present occupation, or if retired, his occupation prior to retirement; this seems straightforward enough, but human nature being what it is, the precise occupation is not always entered. At death registration, the Registrar asks the person notifying the death, the deceased's occupation at the time of death, or, if retired, his last occupation; in some cases the informant may genuinely enter the wrong occupation through ignorance of the deceased's actual occupation, or for other reasons.

In England and Wales a special investigation was carried out by the General Register Office in which, in a sample of 10,000 deaths registered some three weeks after the census on 8th April, 1951, various details were compared with the corresponding details about the same persons in the census schedules. The broad conclusion drawn was that there were discrepancies between the occupational descriptions given on census schedules and in death registers, that these discrepancies did not balance out but left a net error which tended, in males, to exaggerate the apparent mortality ascribed to social class I and to diminish that of social class V, intermediate classes being affected in lesser degree. As regards individual occupational groups, the chances of discrepancy were greater, and may in some instances have produced appreciable distortion of the true situation. There is no reason to suppose that similar distortions have not occurred in the Northern Ireland figures discussed in this paper.

Even if such discrepancies were not present, it does not follow that a high mortality rate must be the result of unfavourable aspects of the occupation concerned and conversely a low mortality rate does not necessarily imply a healthy occupation. Several occupations where good physique and/or a medical examination is required before entry will have low mortality rates, and conversely, some occupations where no great physical effort is required may attract the less robust worker and thereby have a high mortality rate.

In the same way, as recruitment may be by selection, so too workers may be discharged from some types of work on medical grounds and be forced into the more sedentary occupations. As it is with the latest

occupation that this paper deals, it may well be that some of the mortality attributed to one occupation may rightly belong to another.

In the normal course of events, some men change their job from time to time, even apart from medical reasons, and these changes may involve change of social status with all its attendant environmental changes, so that mortality rates based on latest occupation are less sensitive than they ought to be to real occupational mortality differences. This will apply more to the skilled and intermediate occupations than to the professions where entry is by professional qualification usually at the younger ages and whose members tend to remain actively in their chosen occupation during most of their working life.

STANDARDIZED MORTALITY RATIOS

In this paper, the mortality experience of each occupational group has been summarized by means of a Standardized Mortality Ratio (S.M.R.) for the age range 15–64 years inclusive. The S.M.R. is the number of deaths registered in 1960–62 among men aged 15–64 years in a given occupation, expressed as a percentage of the number that would have been expected if the death rate in each separate 10-year age group from 15–64 had been the same in that occupational group as it is for all occupied males in Northern Ireland.

As already stated, many of the rates and ratios in this paper are based on small numbers of deaths and are liable to be unstable and caution should be exercised in these cases. The statistical significance of the ratios has been calculated on the following basis.

Assuming that deaths are independent of one another, and that the probability of dying is small, as it is at all but advanced ages, then if R be the number of deaths registered in a given occupational group, the standard error of R may be taken as approximately $\sqrt{R}$. If the corresponding number of deaths in the standard population be S, then the S.M.R. can be expressed as 100R/S and its standard error as approximately $100\sqrt{R}/S$. If the difference between the S.M.R. and 100 is greater than twice the standard error, the difference is significant at the 5% level; that is, a significant difference is unlikely to arise by chance more than one in 20 times and this represents a sufficiently rare event to warrant further investigation of the occupational group concerned in that its low or high mortality (compared with the average for all occupied males) is unlikely to be due to chance.

OCCUPATIONAL MORTALITY FOR ALL CAUSES

The proportion of the total male population aged 15–64, who were covered by this analysis was 95.2% the proportion in each group being as in the following table:

TABLE 1

MALES IN NORTHERN IRELAND (1961)

1 Age group	2 Economically active, out of work and retired	3 Total population	4 Percentage col. 2/col. 3
15–24	90,233	107,162	84.2
25–34	82,081	83,200	98.7
35–44	84,839	85,545	99.2
45–54	80,991	81,691	99.1
55–64	63,192	63,792	99.1
15–64	401,336	421,390	95.2

The analysis of mortality of adult men in relation to census population has been confined to the ages 15–64, at which ages omission of statement of occupation on the census schedule is relatively infrequent and where some of the difficulties of interpretation due to change of occupation are less serious than at older ages. At age 65, and over too, occupational mortality differences must to some extent be discounted owing to the high death rate to which elderly men are subject, whatever their occupation.

The actual numbers of male deaths in the three years 1960–62 are shown in Appendix Table A for each of the 27 occupational groups in 10-year age groups. It can be seen from this table that more than half the deaths of males aged 15–64 occur at ages 55 to 64 and this is common to most occupational groups.

In Table 2 overleaf are shown the Standardized Mortality Ratios and the standard errors of the S.M.R.s for each occupational group for all causes of death.

The S.M.R. for the following occupation groups was not significantly different from that for all males included in the age groups 15–64:

Miners and quarrymen
Glass and ceramic workers
Furnace and foundry workers
Electrical and electronic workers
Clothing workers
Food, drink and tobacco workers
Paper and printing workers
Painters and decorators
Transport and communication workers
Sales workers
Service, sport and recreation workers.

TABLE 2

STANDARDIZED MORTALITY RATIOS FOR ALL CAUSES OF DEATH BY OCCUPATION FOR MALES AGED 15–64 (1960–62)

Occupation	Number of males	Actual deaths	Standard deaths	S.M.R.	Standard error of S.M.R.
1. Farmers, foresters and fishermen	69,844	1,225	1,575	78	2.2*
2. Miners and quarrymen ...	1,321	27	29	93	17.9
3. Gas, coke, chemical workers	1,467	4	22	18	9.1*
4. Glass, ceramics workers ...	840	7	9	78	29.4
5. Furnace, foundry workers ...	2.004	47	47	100	14.6
6. Electrical, electronic workers	9,411	115	108	106	9.9
7. Engineering workers ...	42,561	758	671	113	4.1*
8. Woodworkers	12,727	109	188	58	5.6*
9. Leather workers	1,473	53	29	183	25.2*
10. Textile workers	8,776	121	150	81	7.3*
11. Clothing workers	2,784	50	47	106	15.1
12. Food, drink, tobacco workers	9,204	135	137	99	8.5
13. Paper, printing workers ...	2,448	37	32	116	19.1
14. Makers of other products ...	2,004	21	27	78	16.9
15. Construction workers ...	13,095	188	225	84	6.1*
16. Painters, decorators	6,075	99	98	101	10.2
17. Drivers of stationary engines and cranes	5,070	81	106	76	8.5*
18. Labourers	51,148	1,405	1,076	131	3.5*
19. Transport, communication workers	34,741	653	610	107	4.2
20. Warehousemen, storekeepers	9,685	142	174	82	6.9*
21. Clerical workers	18,540	369	318	116	6.0*
22. Sales workers	34,485	586	627	94	3.9
23. Service and recreation workers	21,013	467	444	105	4.9
24. Administrators and managers	7.303	151	188	80	6.5*
25. Professional and technical workers	22,181	293	342	86	5.0*
26. Armed forces	6,681	57	37	154	20.4*
27. Inadequately described occupations	4,455	191	71	269	19.4

* The S.M.R. is significant in these groups.

Occupations where the S.M.R. was significantly higher than for all males were:

Engineering and allied workers
Leather workers
Labourers
Clerical workers
Armed forces.

Occupations where the S.M.R. was significantly lower than for all males were:

Farmers, foresters and fishermen
Gas, coke and chemical workers
Woodworkers
Textile workers
Construction workers
Drivers of stationary engines, cranes, etc.
Warehousemen, storekeepers
Administrators and managers
Professional and technical workers.

(The two miscellaneous groups (14 and 27) have been excluded from these lists.)

MARRIED WOMEN'S MORTALITY FOR ALL CAUSES

It would have been valuable to have had a table for married women's mortality, based on the husband's occupation, on similar lines to Table 2, but an age analysis of married men by occupation is not available for 1961. If the wives show the same excess mortality as the husbands for a particular occupation it is implicit that a general environmental or social-economic factor is involved rather than a true occupational hazard. In order to give a very rough idea of the relationship between the mortality of men and married women, the crude mortality rates have been calculated for each occupation and are given in Table 3. For the purpose of this table the mortality rates cover the ages 15–64 inclusive; in the case of married men the numbers are estimates based on the number of married men in each occupational group; in view of the relatively small number of occupied married men over age 65, the errors in the mortality rates due to estimation are unlikely to be appreciable, although the rates quoted should not be regarded as the true rates.

In Table 3 overleaf are shown the crude mortality rates per 10,000 for males and married women in each occupational group, together with the rankings for all groups excluding the miscellaneous group 27, the highest rate being ranked Number 1.

TABLE 3

COMPARISON OF THE CRUDE MEAN ANNUAL MORTALITY RATES FOR MALES AND MARRIED WOMEN BY OCCUPATION FOR AGES 15–64 BASED ON DEATHS IN 1960–62

Occupation	Crude mortality rates per 10,000			
	Males		Married women	
	Rate	Ranking	Rate	Ranking
1. Farmers, foresters, fishermen	58.5	11	30.8	14
2. Miners and quarrymen	68.1	6	57.0	2
3. Gas, coke, chemical workers	8.9	26	18.6	25
4. Glass, ceramics workers	27.7	25	—	26
5. Furnace, foundry workers	78.2	3	53.8	3
6. Electrical, electronic workers	40.7	21	27.6	16
7. Engineering workers	59.4	10	30.9	13
8. Woodworkers	28.5	23	31.5	12
9. Leather workers	120.0	1	32.7	9
10. Textile workers	46.0	19	31.7	10
11. Clothing workers	60.2	9	69.4	1
12. Food, drink, tobacco workers	48.9	16	21.1	23
13. Paper, printing workers	50.4	15	24.5	18
14. Makers of other products	34.9	22	21.8	21
15. Construction workers	47.9	18	22.5	20
16. Painters and decorators	54.3	13	33.4	6
17. Drivers of stationary engines, cranes ...	53.3	14	32.9	8
18. Labourers	91.6	2	50.7	4
19. Transport and communication workers	62.7	8	31.6	11
20. Warehousemen, storekeepers	48.9	17	27.8	15
21. Clerical workers	66.3	7	33.2	7
22. Sales workers	56.6	12	26.0	17
23. Service and recreation workers ...	74.1	4	34.5	5
24. Administrators and managers	68.9	5	23.3	19
25. Professional and technical workers ...	44.0	20	21.5	22
26. Armed forces	28.4	24	20.6	24
27. Inadequately described occupations ...	21.8	—	—	—
	61.4	—	36.7	—

These rankings give a rank correlation coefficient of 0.73, indicating a fairly close contingency between the two sets of mortality rates. The crude death rates could be highly misleading and too much should not be read into the figures in the table.

SOCIAL CLASS MORTALITY FOR ALL CAUSES

The deaths for males have also been analysed in the broad social class groups as listed in Table 4, which shows the population exposed to risk, the actual deaths, standard deaths and S.M.R.s, together with the standard errors of the S.M.R.s for each group. The actual deaths in the three years are shown in Appendix Table B for each social class group in 10-year age groups.

TABLE 4

STANDARDIZED MORTALITY RATIOS FOR ALL CAUSES OF DEATH BY SOCIAL CLASS FOR MALES AGED 15–64 (1960–62)

Social class	Number of males	Actual deaths	Standard deaths	S.M.R.	Standard error of S.M.R.
I. *Professional occupations*	9,671	142	162	88	7.3
II. *Intermediate occupations*					
Manual	172	8	3	267	94.3
Non-manual ...	37,101	725	788	92	3.4*
Agricultural	43,391	846	1,110	76	2.6*
III. *Skilled occupations*					
Manual	120,066	1,917	1,840	104	2.4
Non-manual ...	39,896	652	585	111	4.4*
Agricultural	259	5	5	100	44.7
IV. *Partly-skilled occupations*					
Manual	47,800	784	859	91	3.3*
Non-manual ...	10,439	229	246	93	6.1
Agricultural	23,462	292	354	82	4.8*
V. *Unskilled occupations*	57,943	1.528	1,176	130	3.3*

* The S.M.R. is significant in these groups.

These S.M.R.s do not reveal a uniform gradient of mortality by social class, the main apparent inconsistency being the rates for the partly-skilled occupations. This is not peculiar to the Northern Ireland experience and it arises from the type of occupations that constitute this class; in England and Wales, for example, the S.M.R.s for the years 1949–53 were as follows (the Northern Ireland figures are shown in parenthesis):

Professional workers	98 (88)
Intermediate workers	86 (83)
Skilled workers	101 (106)
Partly skilled	94 (89)
Unskilled workers	118 (130)

For some reason one expects to find a social class gradient for all causes combined, but when you consider the different gradients contributed by different diseases, why should they result in a nice linear pattern when they are put together?

Some indication of the differences in social class gradients both in steepness and in direction for different causes of death are given by the figures for England and Wales, 1949–53, where the larger numbers allow a more detailed analysis.

Causes for which mortality rose steeply with social class (i.e., with less favourable economic circumstances) included:

S.M.R.s (males aged 20–64)

	Social Class				
	I	II	III	IV	V
Respiratory tuberculosis	58	63	102	95	143
Bronchitis	34	53	98	101	171
Pneumonia	53	64	92	105	150
Other myocardial degeneration	68	82	94	101	135
Ulcer of stomach	53	71	98	104	144
Malignant neoplasm, stomach	57	70	101	112	130

While the following are examples of causes apparently associated with comparative affluence:

Acute poliomyelitis	295	171	90	63	42
Leukemia	123	98	104	93	89
Coronary disease, angina	147	110	105	79	89
Cirrhosis of liver	207	152	84	70	96
Diabetes	134	100	99	85	105
Vascular lesions of nervous system	124	104	101	88	101
Suicide	140	113	89	92	117

and some show very little gradient at all, for example:

Nephritis and nephrosis	102	98	100	94	105

In Northern Ireland, the S.M.R.s for the following social groups were not significantly different from that for all males included in the social class groupings aged 15–64:

Professional occupations
Intermediate manual occupations
Skilled agricultural occupations
Skilled manual occupations
Partly-skilled non-manual occupations.

Social groups where the S.M.R. was significantly higher than for all males were:

Skilled non-manual occupations
Unskilled occupations.

Social groups where the S.M.R. was significantly lower than for all males were:

Intermediate agricultural occupations
Intermediate non-manual occupations
Partly-skilled agricultural occupations
Parly-skilled manual occupations.

OCCUPATIONAL MORTALITY FOR SELECTED CAUSES

So far, the occupational mortality analysis for Northern Ireland has been confined to all causes of death; figures for all the abbreviated list numbers are available, but as the number of deaths in the three years in many cases is too small for detailed analysis, the four causes with the

greatest number of deaths have been selected for closer analysis by occupation and social class.

The following Table 5 shows the actual and standard number of deaths and, when there were more than 20 deaths, the S.M.R.s and standard errors for cancer (B.18(*a*)), vascular lesions affecting the central nervous system (B.22), arteriosclerotic and degenerative heart disease (B.26) and bronchitis (B.32).

The comments on this table refer only to those groups for which S.M.R.s were calculated. Even in some of these cases, the very small numbers in some groups may result in non-significant differences which might easily obscure real differences.

Mortality from cancer was not significantly different from the experience of all males included in the age group 15–64 in the following occupations:

Electrical and electronic workers
Food, drink and tobacco workers
Construction workers
Painters and decorators
Warehousemen
Clerical workers
Sales workers
Service and recreation workers
Professional and technical workers.

The S.M.R. was significantly higher among engineering workers, labourers and transport and communication workers and significantly lower among farmers, etc., and administrators and managers.

Mortality from vascular lesions affecting the central nervous system was not significantly different from that expected from the experience of all males in the following occupations:

Farmers, foresters, fishermen
Engineering workers
Labourers
Transport and communication workers
Clerical workers
Sales workers
Professional and technical workers.

It was significantly lower than for all males for service and recreation workers.

Occupations where the S.M.R. for arteriosclerotic heart disease was not significantly different from that for all males in the age group 15–64 were:

Electrical and electronic workers
Textile workers
Food, drink and tobacco workers
Construction workers
Painters and decorators
Transport and communication workers
Warehousemen and storekeepers

TABLE 5

STANDARDIZED MORTALITY RATIOS FOR SELECTED CAUSES OF DEATH BY OCCUPATION FOR MALES AGED 15–64 (1960–62)

Occupation	Cancer				Vascular lesions				Art. heart disease				Bronchitis			
	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.
1. Farmers, foresters, fishermen	244	316	77	4.9*	117	120	98	9.2	327	532	61	3.5*	46	104	44	6.5
2. Miners and quarrymen	5	—	—	—	2	—	—	—	7	—	—	—	—	—	—	—
3. Gas, coke and chemical workers ...	1	—	—	—	—	—	—	—	2	—	—	—	1	—	—	—
4. Glass and ceramics workers	1	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—
5. Furnace, foundry workers	9	—	—	—	3	—	—	—	16	—	—	—	5	—	—	—
6. Electrical and electronic workers ...	21	20	105	23.1	10	—	—	—	43	32	134	20.5	3	—	—	—
7. Engineering workers	167	130	128	9.9*	50	48	104	14.8	253	213	119	7.5*	43	41	105	16.0
8. Woodworkers	13	—	—	—	11	—	—	—	37	58	64	10.5*	8	—	—	—
9. Leather workers	10	—	—	—	5	—	—	—	15	—	—	—	2	—	—	—
10. Textile workers	18	—	—	—	11	—	—	—	43	48	90	13.7	10	—	—	—
11. Clothing workers	8	—	—	—	2	—	—	—	19	—	—	—	—	—	—	—
12. Food, drink and tobacco workers ...	24	26	92	18.9	9	—	—	—	44	43	102	15.4	7	—	—	—
13. Paper and printing workers	8	—	—	—	1	—	—	—	15	—	—	—	2	—	—	—
14. Makers of other products	3	—	—	—	4	—	—	—	4	—	—	—	3	—	—	—
15. Construction workers	40	44	91	14.5	12	—	—	—	64	73	88	11.0	5	—	—	—
16. Painters and decorators	22	19	116	24.7	6	—	—	—	35	31	113	19.1	11	—	—	—
17. Drivers of stationary engines and cranes	18	—	—	—	3	—	—	—	21	36	58	12.8*	6	—	—	—
18. Labourers	276	215	128	7.7*	99	81	122	12.3	424	359	118	5.7*	136	70	194	16.7
19. Transport and communication workers	148	120	123	10.2*	42	44	95	14.8	213	199	107	7.3	35	37	95	16.0
20. Warehousemen, storekeepers	28	34	82	15.6	11	—	—	—	56	57	98	13.1	12	—	—	—
21. Clerical workers	79	62	127	14.4	29	23	126	23.5	146	103	142	11.8*	25	20	125	25.0
22. Sales workers	106	124	85	8.3	50	46	109	15.4	217	205	106	7.2	34	39	87	15.0
23. Service and recreation workers	98	89	110	11.1	22	34	65	13.9*	161	148	108	8.6	45	29	155	23.1*
24. Administrators and managers	24	38	63	12.9*	11	—	72	—	72	65	111	13.1	5	—	—	—
25. Professional and technical workers ...	63	67	94	11.8	22	24	92	19.6	124	108	115	10.3	6	—	—	—
26. Armed forces	2	—	—	—	1	—	—	—	16	—	—	—	4	—	—	—
27. Inadequately described occupations ...	21	—	—	—	11	—	—	—	39	—	—	—	11	—	—	—
Total	1457	—	—	—	544	—	—	—	2418	—	—	—	465	—	—	—

* S.M.R. is significant in these groups.

NOTE: A.D.—Actual deaths. S.D.—Standard deaths. S.E.—Standard error.

Sales workers
Service and recreation workers
Administrators and managers
Professional and technical workers

Occupations where the mortality experience was significantly below that expected from the experience of all males in the age group 15–64 were farmers, foresters and fishermen, woodworkers and drivers of stationary engines and cranes; it was significantly higher among engineering workers, labourers and clerical workers.

In the fourth disease considered, bronchitis, there was no significant difference in experience from that expected, among engineering workers, transport and communication workers, clerical workers and sales workers. Mortality from bronchitis among farmers, foresters and fishermen was significantly lower than for all males while that for labourers and service and recreation workers was significantly higher.

In considering bronchitis, it is interesting to note the main conclusions of the committee set up by the Medical Research Council to advise whether or not there was a case for relating the development of chronic bronchitis to occupation. Concern had been expressed that, whilst miners suffering from pneumoconiosis and other dust diseases are eligible for industrial insurance benefit, those with chronic bronchitis are not. From the figures contained in the mortality data for England and Wales (1949–53) it was noted that mortality from bronchitis in men and single women was almost six times as high among the unskilled manual workers as among farmers and professional people. It was evident, however, from the similar tendencies displayed by married women (classified by husband's occupation) that these large differences in mortality owe little to direct occupational effects, and must be attributed to more general socio-economic or environmental factors. The report concludes, chronic bronchitis displays the same clinical characteristics irrespective of the occupation of the individual affected. In consequence—even if epidemiological data were to establish an association between the incidence of chronic bronchitis and occupation in a particular industry—it would not be possible in the individual case to determine the extent to which engagement in a particular occupation had contributed to the development of the illness.

SOCIAL CLASS MORTALITY FOR SELECTED CASES

When the deaths for the same four causes are analysed by social class, the numbers in most cells are larger and so less liable to random fluctuations; in view of the small numbers in the intermediate manual group it has been combined with the intermediate agricultural group and similarly the small skilled agricultural group has been combined with the skilled manual group. The armed forces and the inadequately described occupations groups have been excluded from the social class analysis.

The actual and standard number of deaths, the S.M.R.s and standard errors for the four selected causes of death are given in Table 6 below:

TABLE 6

STANDARDIZED MORTALITY RATIOS FOR SELECTED CAUSES OF DEATH BY SOCIAL CLASS FOR MALES AGED 15–64 (1960–62)

Social class	Cancer				Vascular lesions				Art. heart disease				Bronchitis			
	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.	A.D.	S.D.	S.M.R.	S.E.
Professional occupations	27	32	84	16.3	14	12	117	31.2	56	53	106	14.1	2	10	20	14.3*
Intermediate Agricultural occupations ...	166	230	72	5.6*	82	88	93	10.3	245	388	63	4.0*	26	75	35	6.8*
Intermediate Non-manual occupations ...	148	161	92	7.6	55	60	92	12.4	290	269	108	6.4	34	51	67	11.5*
Skilled Manual occupations	393	365	108	5.4	128	133	96	8.5	664	594	112	4.3*	110	110	100	9.5
Skilled Non-manual occupations	133	115	116	10.0	48	42	114	16.5	256	186	138	8.6*	36	35	103	17.1
Part.y-skilled Agricultural occupations ...	56	70	80	10.7	28	26	108	20.4	66	113	58	7.2*	15	22	68	17.6
Partly-skilled Manual occupations ...	160	173	92	7.3	56	64	88	11.7	246	285	86	5.5*	49	54	91	13.0
Partly-skilled Non-manual occupations ...	45	50	90	13.5	13	19	68	18.9	78	84	93	10.5	25	17	147	29.4
Unskilled occupations	306	239	128	7.3*	108	90	120	11.6	468	397	118	5.5*	152	76	200	16.2*

* The S.M.R. is significant in these groups.

The only groups in the cancer mortality experience where the S.M.R. was significantly different from the expected experience were the intermediate agricultural group which was lower and the unskilled group which was higher. The S.M.R.s for the partly-skilled groups, as in the case of all causes of death, were lower than either the skilled or unskilled groups.

None of the social class groups in the vascular lesions group was significantly different from that expected on the basis of the experience of all males covered by the analysis.

The differential between S.M.R.s was most marked in the arteriosclerotic heart diseases mortality experience where three groups, professional occupations, industrial non-manual and partly skilled non-manual occupations had experiences not significantly different from that expected. The intermediate agricultural, partly-skilled agricultural and partly-skilled manual occupations were lower while the skilled-manual, the skilled non-manual and unskilled occupations were higher than for all males. The S.M.R.s for the partly-skilled groups again conformed to the pattern for all causes.

Mortality from bronchitis was not significantly different from the overall experience in each of the skilled and partly-skilled groups. It was lower among the professional and intermediate groups and higher for the unskilled occupations.

AGE SPECIFIC DEATH RATES FOR SELECTED OCCUPATIONS

The mean annual death rates for all causes per 10,000 males by age groups were calculated for those occupations where there were about 500 or more deaths in the three years under review; the details are given in Table 7 below:

TABLE 7

MEAN ANNUAL DEATH RATES FOR ALL CAUSES PER 10,000 MALES BY AGE AT DEATH FOR SELECTED OCCUPATIONS (1960–62)

Occupation		Age groups				
		15–24	25–34	35–44	45–54	55–64
1. Farmers, foresters, fishermen	rate	13.0	11.3	19.8	61.8	167.8
	%	125	85	78	80	75
7. Engineering workers	rate	11.8	16.7	25.4	100.9	239.8
	%	113	127	100	131	106
18. Labourers	rate	13.9	19.2	36.4	100.9	287.8
	%	134	145	143	131	128
19. Transport and communication workers	rate	7.8	14.2	24.2	87.6	242.6
	%	75	108	95	114	108
22. Sales workers	rate	6.3	9.8	25.1	64.4	227.9
	%	61	74	99	84	101
All occupations		10.4	13.2	25.4	76.8	225.2

NOTE: The percentages quoted are the rates for each group as a percentage of the rate for all occupations within each age group.

The mortality rates for the younger age groups are based on relatively few deaths and so are more subject to random fluctuation than from ages 35 onwards. Apart from the youngest age group the rates for farmers, foresters and fishermen were consistently lower than for all males. Both the engineering workers and labourers had consistently higher rates than all males for each age group. Transport and communication workers had lower rates for the age groups 15–24 and 35–44 but higher for the other three age groups. Sales workers had lower rates for each age group except the oldest. Apart from the farmers, foresters and fishermen there was some evidence that the rates for the age group 55–64 tended to be closer to the rate for all occupations than in most other age groups. The greatest divergence from the rates for all occupations among the five groups studied occurred among labourers in the two age groups 25–34 and 35–44. While there was a tendency for the mortality rate for farmers, etc., to become a smaller proportion of the age specific rate for all occupations as age increased the opposite was the case for sales workers.

COMMENT

In considering the implications of the differential standardized mortality ratios as between occupations or social class, it cannot be emphasized enough that any research based on census and registration data must by its nature be lacking in the depth and detail essential for worthwhile medical research. The stated occupations in both census and death registration are what the person providing the information believes to be the occupation required, while even uniformity in diagnostic standards is unlikely among the 800 doctors in Northern Ireland. The analysis here like similar investigations in other countries can only give rough indications of likely profitable lines of enquiry for further research where occupation is only one of several variables that can have a bearing on mortality. As Benjamin (1959) has stated it is probable that, in the future, longitudinal studies (viz., following up groups of workers throughout their period of employment) in particular industries under the close supervision of medical field workers will be more efficient in revealing true occupational risks. Such studies would not be confined to mortaility risks but would embrace also sickness absence, that is, they would begin at a point nearer the onset of the occupational influence on health.

The relatively low standard mortality ratios for agricultural workers in Northern Ireland is worthy of more research. To the layman the low ratio for bronchitis seems reasonable in view of the lack of continuous contact with air pollution in built-up areas; this possibly also applies to some extent to the cancer ratio, but is this a factor in heart diseases and what other factors can be responsible for the relatively low mortality ratios of farming occupations at working ages from arteriosclerotic and degenerative heart diseases? Or is it that rural dwellers generally have lower mortality rates?

The relatively high standard mortality ratios for labourers and unskilled workers generally is probably a result of environmental and other factors

and related more to the effects of the low remuneration of the job rather than the physical aspects of the work done. Here again the high bronchotis mortality ratio can be associated with the poor social conditions, but to the layman the association between living conditions and heart disease is not too apparent unless dietary habits are important here.

However, this paper has been set out to give a factual report on occupational mortality and I leave it to the medical people present to conjecture the reasons for some of the figures. It is to be hoped that this analysis may have sown enough seed to lead to a fruitful discussion and perhaps also act as a catalyst for more detailed research in this interesting field.

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APPENDIX

TABLE A

DEATHS OF MALES AGED 15–64 IN NORTHERN IRELAND BY OCCUPATION AND AGE (1960–62)

Occupation group	Age groups					
	15–24	25–34	35–44	45–54	55–64	15–64
1. Farmers, forresters, fishermen	48	39	88	305	745	1,225
2. Miners, quarrymen ...	1	—	3	7	16	27
3.Gas, coke, chemical workers	—	—	—	—	4	4
4. Glass, ceramics workers...	—	—	2	4	1	7
5. Furnace, foundry workers	1	2	2	14	28	47
6. Electrical and electronic workers	4	9	24	33	45	115
7. Engineering workers ...	42	46	72	199	399	758
8. Woodworkers	10	3	2	5	89	109
9. Leather workers	2	—	5	11	35	53
10. Textile workers	4	2	14	41	60	121
11. Clothing workers ...	4	5	5	7	29	50
12. Food, drink and tobacco workers	7	8	13	34	73	135
13. Paper, printing workers ...	2	—	1	10	24	37
14. Makers of other products	1	1	1	5	13	21
15. Construction workers ...	2	14	16	55	101	188
16. Painters, decorators ...	3	6	9	27	54	99
17. Drivers of Stationary engines and cranes ...	4	4	6	21	46	81
18. Labourers	43	56	109	341	856	1,405
19. Transport and communication workers ...	15	32	63	193	350	653
20. Warehousemen, storekeepers	8	3	16	44	71	142
21. Clerical workers	11	10	27	94	227	369
22. Sales workers	13	22	57	145	349	586
23. Service, recreation workers	10	20	36	101	300	467
24. Administrators, managers	2	4	8	40	97	151
25. Professional and technical workers	9	14	35	75	160	293
26. Armed forces	19	4	4	5	25	57
27. Inadequately described occupations	16	21	30	51	73	191
Totals	281	325	648	1,867	4,270	7,391

TABLE B

DEATHS OF MALES AGED 15–64 IN NORTHERN IRELAND BY SOCIAL CLASS AND AGE (1960–62)

Social class	Age groups					
	15–24	25–34	35–44	45–54	55–64	15–64
I. Professional occupations	3	7	19	31	82	142
II. Intermediate occupations						
(*a*) Agricultural ...	26	24	65	207	524	846
(*b*) Manual	—	—	—	3	5	8
(*c*) Non-manual ...	9	24	55	190	447	725
III. Skilled occupations						
(*a*) Agricultural ...	—	—	—	3	2	5
(*b*) Manual	89	107	197	501	1,023	1,917
(*c*) Non-manual ...	27	33	52	145	395	652
IV. Partly skilled occupations						
(*a*) Agricultural ...	21	12	18	73	168	292
(*b*) Manual	23	27	74	221	439	784
(*c*) Non-manual ...	3	6	19	57	144	229
V. Unskilled occupations						
Manual	45	60	116	379	928	1,528
Totals	246	300	615	1,810	4,157	7,128