Testicular cancer mortality in England and Wales 1971–80: variations by occupation

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SUMMARY The occupations of all males aged 15 and over dying of cancer of the testis in England and Wales from 1971 to 1980 (2434 cases) have been examined in a case control study. Significant excess mortality was found in farmers (although not farm workers), food manufacture and preparation workers, and draughtsmen, although the results show little evidence of a major role for occupation in the aetiology of this cancer. The results may, however, aid the search for those factors in modern life that may have contributed to the sharp rise in incidence of this cancer in recent years.

The incidence of testicular cancer in young men has been rising in England and Wales over the last 50 years.¹ Other developed countries, notably Denmark, Japan, and the USA, have shown similar increases.^{2–5} The reasons for this increase, and the aetiology of this cancer, remain largely obscure, but there is no evidence to suggest that diagnostic changes could have contributed much to the increased mortality.⁶ Certain medical conditions, in particular cryptorchidism and atrophic testes, have been shown to be associated with increased risk of this cancer,^{7–9} but it is not clear that changes in these factors could fully account for the rising incidence.¹⁰ Trauma¹¹ and excessive heat¹² have also been associated with testicular cancer. Case-control analyses¹³ and studies of routine incidence¹⁴ and mortality¹ data have shown a social class gradient with higher risks for professional workers. Increased risk has also been suggested for sawmill and other mill workers,¹⁵ agricultural workers^{9 16} and for employment in the oil and natural gas extraction industries.⁹ However, the characteristics of testicular cancer incidence suggest that occupation as such is unlikely to have more than a minor role in its aetiology.¹ A study of mortality by occupation may nevertheless assist consideration of those features of modern life that may be associated with increased risk.

Materials and methods

A death certificate case control study of mortality from testicular cancer in England and Wales was

conducted to identify any occupations apparently at raised risk. Cases were all deaths to males aged 15 and over from 1971 to 1980 in England and Wales where the underlying cause of death was recorded as cancer of the testis (ICD 186)—2434 deaths. There were no known changes in diagnostic or certification practice during the period 1971 to 1980 that could have influenced the outcome of the study. Deaths from 1971 to 1978 were coded according to the 8th Revision of the International Classification of Diseases (ICD), and deaths in 1979 and 1980 according to the 9th Revision. However, the classification change did not affect the coding of cancer of the testis. One control for each case was randomly chosen from male deaths aged 15 and over from all other cancers, matching for year of death and age to within five years of the case. Mortality rates from cancer of the testis peak in the age group 25–34,¹ and at these ages there is a particularly disproportionate mortality from accidents.¹⁷ Several occupations are associated with high accident mortality so the inclusion of accidental deaths in the controls would have produced a bias in the results for such occupations. In addition, several lesser causes of death (eg, diabetes, epilepsy, congenital anomalies) are also proportionately more common at younger ages,¹⁷ and sufferers from such conditions may have selected themselves into specific, perhaps physically non-demanding, occupations. Selection of the controls from all other cancers should avoid these more obvious biases but does not, of course, guarantee that other unsuspected biases are not in operation.

Death certificates for all cases and controls were extracted, and the occupational data were noted and reclassified by OPCS staff. It has been shown that such reclassification can greatly increase the ability of death certificate data to examine a particular area compared with use of the precoded data.¹⁸ Specific guidelines were produced for the inclusion of occupation descriptions in the respective categories which should have reduced, if not eliminated, any possibility of bias in the reclassification through knowledge of case or control status.

The occupation recorded on England and Wales death certificates is the last full-time occupation followed by the deceased (even if retired at time of death). It would clearly be preferable to have an occupation history but the effect of any occupational mobility is most likely to be a diffusion of the measured association between an occupation and mortality from this cause. Relative risks were calculated with 95% confidence intervals.

Results

Table 1 presents the results for selected occupations. Occupations with 15 or more cases are included plus one or two whose results may throw light on

Table 1 *Cases and relative risks for testicular cancer for selected occupations: England and Wales 1971–80*

Occupation	Number of cases	Relative risk	95% confidence interval
Fitters, millwrights, etc	71	0.97	0.50–1.89
Welders	15	0.83	0.30–2.33
Steelworkers	28	0.68	0.40–1.14
Foundry, furnace workers, boiler operator, etc	8	0.57	0.20–1.29
Engineering nec	217	0.88	0.72–1.08
Painters and paint manufacturers	37	0.92	0.47–1.82
Printers	25	1.48	0.73–2.98
Food manufacture and preparation	38	1.82	1.04–3.19
All agricultural workers	62	1.42	0.94–2.14
Farmers, farm managers	44	1.85	1.10–3.11
Farm workers	18	0.90	0.25–3.23
Butchers, slaughtermen	15	0.83	0.30–2.33
Electricians, electrical engineers, etc	71	0.90	0.62–1.30
Telecommunications engineers	25	0.93	0.31–2.76
Masons, bricklayers	31	1.15	0.58–2.30
Woodworkers, carpenters	58	0.88	0.58–1.32
Building workers, nec	34	0.69	0.43–1.10
Miners	28	0.85	0.45–1.59
Draughtsmen	26	2.62	1.23–5.55
Road vehicle drivers	124	0.95	0.70–1.29
Clerks	82	0.95	0.70–1.29
Retail and wholesale distribution (excluding butchers)	42	1.08	0.56–2.08
Labourers nec	91	0.71	0.54–0.94
All professional workers	132	1.44	1.09–1.90
Accountants	29	1.26	0.65–2.44
Teachers, lecturers	49	1.14	0.70–1.88
Managers and company directors	76	0.90	0.63–1.29
Armed forces	53	1.21	0.77–1.90
Police	20	1.18	0.45–3.12
Merchant seamen	16	0.84	0.31–2.99
Firemen	6	6.01	0.59–61.43

nec=not elsewhere classified.

previously hypothesised associations. The table reinforces the evidence of previous studies of raised risks for professional workers and lower risks for manual workers (engineering workers, labourers). Significant excess risks are noted for three occupations which do not immediately fit this pattern, however—food manufacture and preparation workers (1.82), farmers (1.85), and draughtsmen (2.62). The classification of food manufacture and preparation workers excludes retail and wholesale distribution, butchers, farmers, and all managers. Although it is a diverse group of workers, the raised risk is maintained across its major components (table 2) but, because of small numbers, none of the risks is statistically significant.

The excess risk for farmers (R/R 1.85) and the contrasting lack of excess risk for farm workers (R/R 0.90) have been noted in a preliminary report¹⁹ of this study following an earlier reported association with agricultural employment.⁹

The excess risk for draughtsmen (R/R 2.26 on 26 deaths) is apparently previously unreported.

Discussion

This study has used data from mortality rather than incidence of testicular cancer because of the relative completeness and accuracy of the occupation data collected at death as opposed to cancer registration during the 1970s in England and Wales.²⁰ Five year survival from registrations of this cancer in the period 1971–75 was between 65 and 70%,²¹ and the possibility of bias due to differing relative survival must be considered. However, cancer registration data²² for 1971–80 shows similar overall patterns to that suggested by this study with raised proportional registration ratios for professional workers and reduced ratios for unskilled workers. It seems unlikely, therefore, that any differences in survival between occupations would be sufficient to seriously bias the results of this mortality study.

The results of this study tend to confirm the conclusion that occupation by itself has a minor role at most in the aetiology of testicular cancer.¹ The association with social class is confirmed with raised risks for professional workers and lower risks for manual workers, but clearly class here is acting as a

Table 2 *Relative risk for food manufacture and preparation workers*

Occupation	Number of cases	Relative risk
Chefs/cooks, etc	13	1.63
Bakers/flour mill workers, etc	10	1.67
Other food manufacture	9	2.25
Other food preparation	6	2.00

vague marker for other environmental, genetic, and/or behavioural factors. However, since occupation can influence both behaviour and environment, variations in mortality between occupations may be usefully studied.

A sedentary life style has been suggested as a risk factor for testicular cancer.¹ The excess mortality for professional workers, and particularly for draughtsmen, may support this view, but the lack of any excess for road vehicle drivers and clerks does not concur. An alternative hypothesis of car driving¹ as a contributory factor is also not supported. Several of the occupation groups in table 1 may be exposed to considerable heat in the course of their occupation, notably foundry and furnace workers, firemen, welders, and steelworkers. Out of these, only firemen show a relative risk greater than one, but none of the risks is statistically significant. The hypothesis of heat as a contributory factor in testicular cancer¹² is therefore not supported by this study, but since the degree and consistency of heat exposure experienced by these occupations is unknown, this negative finding is not conclusive. The only identifiable occupation which might have some consistent experience of trauma¹¹ would be professional sportsmen—our study produced two such cases and one control.

Mills and Newell have noted several studies which suggest farming and agriculture to be associated with an increased risk of testicular cancer,¹⁶ but other studies have failed to find this association.²³⁻²⁴ In the present study an overall non-significant excess for all agricultural workers is clearly divisible into a significant excess for farmers and farm managers (R/R 1.98) and a slight deficit for other farm workers (R/R 0.90).

Despite an increasing concentration of farm units in Britain, most farms in the country are still relatively small: it is estimated that in 1981 nearly half the farms would not fully occupy one person full-time.²⁵ The number of large 'agribusiness' farms is still relatively small²⁶ so most farmers are working farmers and might be expected to experience exposures to any occupational hazards of agriculture relatively similar to those of other farming workers.

The ability of death certificate occupation descriptions consistently to separate these two occupations may be questioned, but even so no ready explanation for this difference is available. Mills *et al* speculate on the role of an infectious agent in the aetiology of cancer of the testis, hypothesising that farm children may be exposed to a greater range of zoonotic viruses or may be more vulnerable to common childhood infections in later childhood through relative preschool isolation.⁹ Neither of these hypotheses, however, seems to account for the

present study evidence of an excess mortality for farmers but not for farm workers, and the answer may be more in the social and behavioural differences between farmers and farm workers.

A possible association between testicular cancer and employment in food manufacture and preparation has been suggested by this study and is not readily amenable to explanations of selection of susceptible individuals into these occupations or common behavioural or environmental factors. The apparent consistency of the excess across cooks, bakers, and mill workers and other food manufacturing and preparation workers is of little help in reaching an explanation and requires further investigation. Further studies of the aetiology of testicular cancer will need to investigate a wide range of environmental and behavioural factors.

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