

Case-control study of occupation and cancer of the prostate in New Zealand

NEIL E PEARCE,^{1 2} RAEWYN A SHEPPARD,¹ AND JAMES FRASER³

From the Department of Community Health,¹ Wellington Clinical School of Medicine, Wellington Hospital, Wellington, New Zealand; Department of Epidemiology,² School of Public Health, University of North Carolina, Chapel Hill, NC 27514, USA; and National Health Statistics Centre,³ Wellington, New Zealand

SUMMARY A New Zealand Cancer Registry based case-control study involved 617 male patients with prostate cancer registered during 1979 and aged 20 years or more at the time of registration. Controls were also males chosen from the Cancer Registry with two controls per case, matched on age and year of registration. There was an elevated risk in the upper social class groupings. The data did not support the findings, from other countries, of elevated risks in agricultural workers (odds ratio = 1.08, 90% confidence limits 0.86–1.36). The only occupational groups showing elevated risks were sales and service workers (odds ratio = 1.29, 90% confidence limits 0.99–1.69) and teachers (odds ratio = 2.44, 90% confidence limits 1.05–5.70). The New Zealand data do not in general suggest that occupational factors—or lifestyle factors associated with occupation—are of major direct importance in the aetiology of prostate cancer.

The major causes of prostate cancer are unknown, and relatively few epidemiological studies have been carried out to date.¹ The best documented occupational hazard is exposure to oxides of cadmium, but the findings are inconsistent.² Few other occupational risk factors have been identified. Henry *et al.*³ examined mortality in England and Wales during the period 1921–8 and found excess risks for agricultural occupations, french-polishers, engine drivers, firemen, and cleaners. The British Registrar-General's studies⁴ have found elevated risks for employers, foremen, farmers, and members of the armed forces; and Ernster's study of prostate cancer mortality in two California counties found excess risks for farmers, compositors, shipfitters and jobs involving chemical exposure.⁵ The United States Third National Cancer Survey⁶ found that prostate cancer was associated with ministers, farmers, plumbers, rubber workers, coal miners, and retailers. The association with rubber workers has also been found in specific studies of rubber industry workers.⁷ Other studies have found associations with chemists,⁸ policemen, farmers, and labourers,⁹ and farmers.¹⁰

Finally, a Los Angeles study found the incidence of prostatic cancer to be higher in the upper social class groupings.¹¹ This pattern was also observed in England and Wales at the beginning of this century but the gradient has now declined and the most recent studies in England and Wales,⁴ Italy,¹² and New

Zealand¹³ have found no significant social class gradient.

Hence the most consistent findings regarding occupations at high risk of prostate cancer involve cadmium workers, rubber workers, and farmers. The latter association is of particular interest since the agricultural industry is of major importance in New Zealand, and a series of case-control studies has found elevated risks for farmers for several other cancer sites.^{14 15} Elevated risks were also found for meat workers who may be exposed to common risk factors. These studies involved the use of other cancer patients as controls, and an examination of the control patient data suggested that farmers and meat workers may also be at risk of prostate cancer. Accordingly, two further case-control studies were initiated and we here report the findings for the prostate cancer study.

Methods

The case group comprised all male patients registered with the New Zealand Cancer Registry during 1979 who were classified under code 185 of the International Classification of Diseases (ICD)¹⁶ and who were aged 20 years or more at the time of registration. The control group was selected from other cancer patients appearing on the Cancer Registry. The main advantage of this approach lies in the minimisation of information bias, since cases and

controls are drawn from the same registry.¹⁷ Two controls were chosen for each case who were within two years of age, were registered in the same year, and were not registered as a case of testis cancer (ICD 186), this latter group being included as a case group in a concurrent study.

New Zealand cancer registrations and death registrations include current or most recent occupation coded according to the New Zealand Standard Classification of Occupations.¹⁸ This information was used to compare the occupational distributions of the case group and the control group. The social class distributions were compared using the British Registrar-General's classification,¹⁹ which has shown a moderate gradient for cancer mortality in a recent New Zealand study.²⁰

Odds ratios were computed using the Mantel-Haenszel method,²¹ and Miettinen's approximate method was used to calculate confidence limits.²² Tests for trend with social class were performed using the Mantel-Haenszel extension test.²³ The matched and unmatched (crude) analyses gave very similar results, and adjustment for social class did not affect the occupational comparisons. Hence the crude analysis was used throughout.

Results

A total of 617 cases of prostate cancer were included in the study and 2-1 matching yielded 1234 controls. Table 1 demonstrates that there was a tendency for the cases to include more men with occupations belonging to the upper social classes ($p < 0.01$).

The occupational distributions of the cases and controls are presented in table 2. The largest excess risk was for sales and service workers, and was largely due to excesses for sales and service managers, and

Table 2 Odds ratios for prostate cancer by major occupational categories

| Occupational group | Cases | Controls | Odds ratio | 90% limits |
|------------------------------------|-------|----------|------------|------------|
| Professional/technical | 57 | 108 | 1.20 | 0.90-1.60 |
| Administrative/ managerial | 29 | 51 | 1.29 | 0.87-1.91 |
| Clerical | 32 | 91 | 0.77 | 0.54-1.09 |
| Sales/service | 70 | 125 | 1.29 | 0.99-1.69 |
| Managers (sales and service) | 6 | 4 | 3.38 | 1.24-9.22 |
| Working proprietors (sales) | 15 | 22 | 1.54 | 0.88-2.68 |
| Commercial travellers | 12 | 10 | 2.72 | 1.38-5.39 |
| Insurance, real estate | 4 | 10 | 0.89 | 0.34-2.37 |
| Salespersons, shop workers | 10 | 18 | 1.25 | 0.65-2.40 |
| Working proprietors (service) | 2 | 8 | 0.56 | 0.15-2.01 |
| Cooks, waiters, bartenders | 1 | 10 | 0.22 | 0.05-1.07 |
| Caretakers, cleaners | 5 | 15 | 0.74 | 0.32-1.74 |
| Protective service workers | 5 | 18 | 0.62 | 0.27-1.41 |
| Sales and service NEC | 10 | 10 | 2.26 | 1.10-4.65 |
| Agriculture/forestry/fishing | 94 | 197 | 1.08 | 0.86-1.36 |
| Farmers/farm managers | 79 | 158 | 1.14 | 0.90-1.46 |
| Agricultural workers | 13 | 30 | 0.97 | 0.56-1.68 |
| Forestry/fishing | 2 | 9 | 0.49 | 0.14-1.75 |
| Labourers/production/ transport | 177 | 452 | 0.79 | 0.66-0.96 |
| Unknown/unemployed/ student* | 158 | 210 | — | — |
| Total | 617 | 1234 | — | — |

*Excluded from analysis

commercial travellers. There was only a very modest excess risk for agricultural occupations, and table 2 suggests that the relative risk for this category is unlikely to be larger than 1.4. The very modest excess risk was confined to farmers and farm managers.

Other occupational groups were also examined. The only group with an elevated odds ratio was teachers (odds ratio = 2.44, 90% limits = 1.05-5.70). There was no excess risk for meat workers, and none of the cases or controls was identified as a rubber worker.

Discussion

The epidemiology of prostate cancer is of increasing interest since the aetiology is largely unknown, and age standardised incidence and mortality from prostate cancer have increased markedly in New Zealand during the last 30 years (unpublished data). The increase has been consistent across age groups, and the annual increase has averaged 2.3% for incidence and 0.4% for mortality. An increase in incidence in the older age groups has also occurred in England and Wales and is likely to be due, in part, to diagnostic factors.²⁴ The increase in mortality has not been observed in England and Wales although mortality increased in the older age groups earlier this century before levelling off.

This study has provided further evidence of a weak social class gradient in prostate cancer risk. The

Table 1 Odds ratios for prostate cancer by Registrar General's social class

| British Registrar-General's social class | Cases | Controls | Odds ratio | 90% Confidence limits |
|--|-------|----------|------------|-----------------------|
| I | 25 | 55 | 1.01 | 0.67-1.52 |
| II | 177 | 315 | 1.41 | 1.16-1.71 |
| IIIN | 50 | 106 | 1.06 | 0.78-1.42 |
| IIIM | 127 | 311 | 0.87 | 0.71-1.07 |
| IV | 46 | 137 | 0.72 | 0.53-0.97 |
| V | 32 | 92 | 0.76 | 0.53-1.07 |
| Unknown/ unemployed/ student/army* | 160 | 218 | — | — |
| Total | 617 | 1234 | — | — |

*Excluded from analysis

occupational findings are largely negative but still, of course, merit being placed on record. There was no excess risk for farmers or for workers processing agricultural products, and the data suggest that the relative risk for farmers is most unlikely to be greater than 1.4. This is puzzling in the light of the positive findings from other studies, although these have not been completely consistent and have not revealed any compelling associations with specific agricultural agents.¹⁰ A New Zealand mortality study did find an excess risk for farmers, but the number of deaths involved was small.¹³

The positive findings for sales and service workers and teachers are also inconsistent with findings in previous work and should be regarded with considerable reservation due to the multiple comparisons involved and the lack of any obvious common risk factors.

In general, it appears that occupational factors are not of major importance in the aetiology of prostate cancer, although a few specific associations may warrant further scrutiny. Further study of non-occupational risk factors would clearly be valuable, given that prostate cancer is an increasingly important source of mortality in New Zealand men.

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