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Mortality of army cooks

by David Coggon, FRCP, Graham Wield, BSc¹

COGGON D, WIELD G. Mortality of army cooks. *Scand J Work Environ Health* 1993;19:85–8. The possible hazard of lung cancer among cooks was studied in a cohort of 1798 cooks who had retired from the Army Catering Corps and 1310 referents retired from the Royal Army Pay Corps. During the follow-up from 1974 to 1989 the mortality of the referents was similar to that of the national population, apart from a moderate increase in lung cancer [standardized mortality ratio (SMR) 1.38]. Mortality from lung cancer among the cooks was significantly higher than among the national population [SMR 1.82, 95% confidence interval (95% CI) 1.25–2.57], as was mortality from cancer of the large intestine (SMR 3.03), ischemic heart disease (SMR 1.42), cerebrovascular disease (SMR 2.05), and digestive disease (SMR 2.27). The high rate of lung cancer among the cooks supports the hypothesis of an occupational hazard, although at least part of the excess was probably due to smoking. Possible explanations for the elevated mortality from other diseases include poor nutrition in early life, smoking, and high consumption of alcohol.

Key terms: cerebrovascular disease, colon cancer, ischemic heart disease, lung cancer.

Routine analyses of occupational mortality in Great Britain (1–3) and Denmark (4), and of cancer incidence by occupation in California (5), have indicated high rates of lung cancer in cooks. These observations are supported by the results of two case-referent studies (6, 7). To explore further the risk of lung cancer associated with work as a cook, we have carried out a cohort study of retired members of the Army Catering Corps.

Subjects and methods

The study cohort comprised all retired cooks from the Army Catering Corps who were on the reserve list (ie, members of the regular army reserve, the Territorial Army, or the Ulster Defence Regiment) at any time between 1 January 1974 and 31 December 1984. As an internal control we took retired members of the Royal Army Pay Corps who were on the reserve list during the same 11-year period. All of the subjects were men. Most of the soldiers studied would have joined the Army soon after leaving school, entry to a particular Corps being determined by personal choice and aptitude. They would then have received training in their chosen trade. The work of the Pay Corps is largely clerical. While in regular service, members of both the Catering and

the Pay Corps undertake physical training, and both groups are required to work irregular hours.

The study and reference cohorts were identified from computerized pension records which included surname, initials, date of birth, last known address, National Insurance number, and dates of last entering and leaving regular service. Full first names were obtained from social security records by linkage through the National Insurance number, surname, and date of birth, and with this additional information subjects were traced through the National Health Service Central Register up to 31 December 1989. For those men who had died, death certificates were obtained with the underlying cause of death coded to the ninth revision of the International Classification of Diseases.

In the analysis, the subjects were considered to be at risk from 1 January 1974 or their date of entry to the reserve list, whichever was later. The mortality of the study and reference cohorts was compared with that of the national population by the person-years method, the expected numbers of deaths being calculated for five-year age and calendar intervals, and the 95% confidence intervals (95% CI) for standardized mortality ratios (SMR) being based on the Poisson distribution. In addition, the death rates of the two cohorts were compared directly by Poisson regression analysis (8).

From the pension records we identified 1798 retired cooks and 1310 referents. At least 74.6% of the cooks and 78.2% of the referents had completed more than 20 years of regular service. (The exact proportions were unknown because, for men who had left the army and then reenlisted, information was only available for the most recent period of service.)

Table 1 summarizes the outcome of the tracing exercise. Altogether, 92.4% of the cooks and 93.6%

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Table 1. Outcome of the tracing.

	Cooks	Referents
Untraced in social security records	—	1
Untraced at the National Health Service Central Register	136	83
Emigrated before 1 January 1974	22	11
Emigrated during follow-up period	20	12
Died during follow-up period	227	150
Alive at end of follow-up	1393	1053
Total	1798	1310

of the referents were successfully traced through the National Health Service Central Register. The untraced subjects were excluded from further analysis, together with 33 men who had emigrated before the start of the follow-up period. Another 32 subjects who emigrated during follow-up were considered at risk up to the date of their migration.

Results

By the end of 1989, 227 deaths had occurred among the cooks and 150 among the referents. Table 2 shows the mortality of the cooks and referents as compared with that of the national population. The overall death rate of the reference group was close to expectation (SMR 1.06, 95% CI 0.89–1.24), as was mortality from most of the common causes of death. The exception was lung cancer, for which mortality was moderately elevated, although not to the point of statistical significance (SMR 1.38, 95% CI 0.88–2.07). In contrast, the cooks had significantly elevated death rates from all causes (SMR

1.48, 95% CI 1.30–1.69), all cancers (SMR 1.41, 95% CI 1.09–1.80), cancer of the large intestine (SMR 3.03, 95% CI 1.39–5.75), lung cancer (SMR 1.82, 95% CI 1.25–2.57), ischemic heart disease (SMR 1.42, 95% CI 1.13–1.76), cerebrovascular disease (SMR 2.05, 95% CI 1.22–3.24), and digestive disease (SMR 2.27, 95% CI 1.04–4.30). When the analysis was restricted to those men who were known to have completed at least 20 years of service, the risk estimates were much the same.

Table 3 shows the mortality of the cooks relative to that of the referents for selected causes of death. In comparison with the death rates of the referents, those of the cooks were significantly elevated for all causes combined [risk ratio (RR) 1.41, 95% CI 1.14–1.73] and, specifically, for cancer of the large intestine (all nine cases occurred among the cooks) and circulatory disease (RR 1.45, 95% CI 1.07–1.96). The last-mentioned category reflected excesses of both ischemic heart disease (RR 1.43) and cerebrovascular disease (RR 2.17). Mortality from lung cancer was higher among the cooks, but the difference was not statistically significant (RR 1.29, 95% CI 0.76–2.21). A similar increase in risk was observed for other smoking-related cancers (RR 1.24), but not for respiratory disease (RR 1.04). The nine deaths from digestive disease among the cooks (RR 2.93) included four from peptic ulcer, four from cirrhosis or alcoholic liver disease, and one from intestinal obstruction.

Discussion

The proportion of untraced subjects was higher in this investigation than in most industrial cohort stud-

Table 2. Mortality of the cooks and referents as compared with that of the national population. (SMR = standardized mortality ratio, 95% CI = 95% confidence interval)

Cause of death ^a	Cooks			Referents		
	Observed deaths (N)	SMR	95% CI	Observed deaths (N)	SMR	95% CI
All causes (0–999)	227	1.48	1.30–1.69	150	1.06	0.89–1.24
All cancers (140–208)	65	1.41	1.09–1.80	50	1.16	0.86–1.53
Esophagus (150)	4	2.10	0.57–5.39	4	2.26	0.62–5.79
Stomach (151)	5	1.37	0.44–3.20	2	0.58	0.07–2.11
Large intestine (153)	9	3.03	1.39–5.75	—	0.00	0.00–1.34
Rectum (154)	2	0.95	0.12–3.42	3	1.53	0.31–4.47
Larynx (161)	2	3.96	0.48–14.31	1	2.13	0.05–11.86
Lung (162–164)	32	1.82	1.25–2.57	23	1.38	0.88–2.07
Melanoma (172)	—	0.00	0.00–7.41	2	4.68	0.57–16.92
Prostate (185)	1	0.70	0.02–3.91	2	1.42	0.17–5.14
Bladder (188)	3	2.21	0.46–6.46	1	0.77	0.02–4.31
Kidney (189)	2	1.68	0.20–6.07	3	2.76	0.57–8.06
Circulatory disease (390–459)	110	1.45	1.19–1.75	70	0.99	0.77–1.25
Ischemic heart disease (410–414)	83	1.42	1.13–1.76	53	0.98	0.73–1.27
Cerebrovascular disease (430–438)	18	2.05	1.22–3.24	8	0.97	0.42–1.91
Respiratory disease (460–519)	12	1.22	0.63–2.13	11	1.17	0.58–2.09
Digestive disease (008–009, 520–579)	9	2.27	1.04–4.30	3	0.84	0.17–2.46
Injuries and poisoning (800–999)	6	0.71	0.26–1.54	7	0.97	0.39–2.00

^a Code of the International Classification of Diseases, ninth revision, in parentheses.

ies, probably because some of the men went to live abroad soon after leaving the regular army and never registered with a physician in the National Health Service. If so, the incomplete tracing would not be expected to produce any serious bias, especially in internal comparisons with the referents from the Pay Corps.

Overall mortality in the reference group was similar to that in the national population. Given that entry to the study was through registration on the reserve list, it is perhaps surprising that a healthy worker effect was not apparent. Chronically disabled soldiers are excluded from entry to the reserve, but this selection does not seem to have any strong long-term impact on mortality.

The only common cause of death with markedly increased incidence in the reference group was lung cancer (SMR 1.38). It seems likely that this excess is attributable, at least in part, to high rates of smoking. No data are available on the prevalence of smoking in the Pay Corps specifically, but, in the Army as a whole, the habit has been common. In a survey of 15- to 18-year-old entrants to the Army in 1959, 76% had smoked during the previous four weeks and 53% smoked at least 20 cigarettes per week (9). Smoking habits may also have accounted for the referents' increased mortality from respiratory disease. Members of the Pay Corps are not exposed to any known occupational causes of lung cancer.

Mortality from lung cancer among the cooks was even higher than among the referents, and it was significantly elevated in comparison with national rates (SMR 1.82). Again, smoking may have contributed to this excess, although it would be unusual to observe such a high mortality ratio solely through the confounding effect of smoking (10). Certainly, the finding would be compatible with an occupational hazard, as suggested by earlier studies (1-7). Most of the cooking in the Army is carried out in permanent rather than field kitchens, mainly using gas rather than electricity, and includes a lot of frying. A hazard of lung cancer might arise from the fumes generated during cooking, particularly when food is fried. Such fumes are known to be mutagenic (11, 12), and in two Chinese case-referent studies frequent frying and smokiness during cooking were associated with an increased risk of lung cancer (13, 14).

The high mortality from other causes among the cooks, particularly from circulatory and digestive disease, is also compatible with the findings of other studies (1-3). Four of the nine observed deaths from digestive disease were ascribed to cirrhosis or alcoholic liver disease, and it seems likely that cooks drink more heavily than the average — perhaps because alcohol is more readily available to them.

The death rates from circulatory disease were significantly elevated not only in comparison with the national population, but also relative to the internal reference group. Cooking fumes do not contain any known cardiotoxins which would explain this excess.

Table 3. Mortality of the cooks relative to that of the referents, as estimated by a Poisson regression analysis. (95% CI = 95% confidence interval)

Cause of death	Risk ratio	95% CI
All causes	1.41	1.14—1.73
All cancers	1.20	0.83—1.74
Cancer of the large intestine	All 9 cases were cooks	0.76—2.21
Cancer of the lung		
Other smoking-related cancers ^a		
	1.24	0.52—2.96
Circulatory disease	1.45	1.07—1.96
Ischemic heart disease	1.43	1.01—2.02
Cerebrovascular disease	2.17	0.94—4.99
Respiratory disease	1.04	0.46—2.35
Digestive disease	2.93	0.79—10.82

^a Cancers of the lip, tongue, mouth, esophagus, pancreas, larynx, bladder, and kidney.

Smoking may contribute, but it would be unlikely to account fully for such a large increase in cardiovascular mortality. Another possibility is that recruits to the Catering Corps come from a different social background from those entering the Pay Corps. Evidence is mounting that nutrition in early life has an important influence on later risk of circulatory disease, acting through a variety of pathogenetic mechanisms (15-18). A cross-sectional survey of cardiovascular risk factors among current members of the Catering Corps might help to clarify the reasons for the high mortality from vascular disease in our study.

In contrast to the findings on other causes of death, the high mortality of the cooks from colonic cancer was unexpected. No similar increase in risk has been found in routine analyses of occupational mortality (2, 3), and no aspect of cooking is suspected of strongly influencing the risk of large bowel cancer. The observation may, therefore, be a chance phenomenon. If so, the excess should diminish with continued follow-up.

In summary, this study supports the hypothesis that work as a cook increases the risk of lung cancer, although a spurious association from a confounding effect of smoking cannot be totally ruled out. It also indicates that retired members of the Catering Corps have unusually high mortality from circulatory disease. A survey of risk factors for vascular disease among current members of the Catering Corps might help to explain this observation and allow appropriate preventive measures to be instituted.

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