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Occupation and male lung cancer: a case-control study in northern Sweden

L A DAMBER, L G LARSSON

From the Centre of Oncology, University of Umeå, 901 85 Umeå, Sweden

ABSTRACT Using a case-control study comprising about 600 men with lung cancer in northern Sweden the potential risk of different occupations and groups of occupations was studied. Longitudinal data concerning occupation, employment, and smoking habits were obtained by questionnaires. Some occupational groups (underground miners, copper smelter workers, electricians, and plumbers) exposed to previously known lung carcinogenic agents such as radon daughters, arsenic, and asbestos, had considerably increased odds ratios, which persisted after adjustment for smoking. A slightly raised odds ratio was observed in a group of blue collar workers potentially exposed to lung carcinogenic agents; this rise in the group as a whole mainly disappeared after adjustment for smoking. Farmers and foresters had strikingly low odds ratios, which could only partly be explained by their more moderate smoking habits. The population aetiological fraction attributable to occupation was estimated as 9%.

There is at present little doubt that tobacco smoking is a dominant aetiological factor for lung cancer. In several Western countries such as the United States, United Kingdom, and Sweden it has been estimated that smoking accounts for 80–90% (population aetiological factor) of lung cancer in men.[1–3]

Several other chemicals and industrial processes, however, increase the risk for lung cancer and may be of considerable importance for limited populations. They include radon daughters in uranium and non-uranium mines, asbestos, chromium, arsenic, nickel, mustard gas, bischloromethyl ether, and polycyclic hydrocarbons in soots, tars, and oils.[3] There are also some other chemicals suspected to be carcinogenic to the lung but not yet adequately verified, such as beryllium, vinyl chloride and others.

Smoking and other carcinogenic exposures often seem to interact in a synergistic way. This type of interaction has been observed for smoking and asbestos,[4] smoking and arsenic[5] and smoking and radon daughters.[6–8] Some data also suggest a multiplicative type of interaction between smoking and exposure to polycyclic hydrocarbons.[9 10]

The background of the present study was the finding that the incidence of lung cancer in men in northern Sweden showed large geographic variations.[11] Most communities in the inner, western part of the region had low incidence rates compared with the more urban coastal communities and two districts with extensive iron ore mining. It was thought that a large case-control study in this region including occupational and smoking data could yield information of interest about occupational aetiological factors and interaction between such factors and tobacco smoking. Results from the study have previously been reported concerning underground miners and professional drivers.[6 10] In another report the observed effects of smoking have been specifically described.[2]

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Material and methods

The study region included the three northernmost counties of Sweden, with a total male population of about 390 000. The region contains both urban municipalities with different industrial activities (mines, smelters, steel factories, paper mills, and mechanical workshops) and rural municipalities with forestry and agriculture as dominating industries. The more rural municipalities, however, contain only about 15–20% of the total population.

For the present study all male cases of lung cancer reported to the Swedish Cancer Registry during the six year period 1972–7 and dead before the start of the study (May 1979) were selected. The study originally

contained 604 cases. Copies of the original reports to the cancer registry and of the cytological and histopathological reports were collected and, in questionable cases, copies of the hospital records also. Only five cases lacked microscopic verification and in a further five cases the diagnosis of primary lung cancer was doubtful. These cases were nevertheless included in the study. From information in the reports, the cases were classified as small cell carcinoma, squamous cell carcinoma, adenocarcinoma, and other types (or unclassified). To each case, a control who had died was drawn from the National Registry for Causes of Death, matched by sex, year of death, age, and municipality. Cases of lung cancer and suicides were not accepted as controls. For each case a living control was also drawn from the National Population Registry and matched against the cases by sex, year of birth, and municipality. Only living controls with an age not exceeding 80 (467 controls) were drawn in order not to disturb the very old by the questionnaire procedure. Longitudinal data concerning municipalities, type of residence, occupation, employment, and smoking habits were collected from postal questionnaires sent to close relatives of the cases and the dead controls and to the living controls themselves. For the living controls, data were registered up to the year the lung cancer was diagnosed in the respective case. Answers were obtained in 589 cases (98%), 582 dead controls (96%), and 453 living controls (97%).

The questionnaires were designed to yield information about each occupation or employment, or both, held for at least one year concerning type of industry, company name, task, and duration of employment. A five digit code was used to classify occupations[12] and special codes were used for specific companies. One question concerned occupational exposure to asbestos irrespective of specific occupation or employment. If occupational data were lacking for any period between age 20 and the time of diagnosis (or corresponding time for the controls) a supplementary telephone interview was performed.

The information concerning smoking habits included approximate year of start of smoking, daily number of cigarettes, other type of smoking, and year of possible cessation of smoking. Pipe smoking was as common as cigarette smoking and a combination of pipe and cigarettes was also frequent, whereas cigar smokers were rare.[2] For estimation of life time tobacco consumption and for stratification according to smoking intensity, 1 g of pipe or cigar tobacco was considered equivalent to one cigarette. Incomplete smoking data were always supplemented by telephone interviews. Individuals who had smoked at least one cigarette or the equivalent amount of tobacco daily for one year or more at any time were classified as smokers.

STATISTICAL METHODS

The presented results are based on comparison between cases and controls with dissolved matching. All the essential results, however, were also checked with preserved individual matching which gave similar estimates. For the calculation of confidence intervals for the odds ratio (OR), the "exact" method based on the hypergeometric distribution was used.[13] To study the relation between risk occupation and lung cancer, taking into account potential confounding by smoking habits, a linear logistic regression model was used in the analysis.[14] The analyses were performed with three discrete levels of occupational exposure and four levels of life time tobacco consumption. The population aetiological fraction (EF pop) for "risk occupation" was calculated according to the formula:

$$EF\ pop = CF_E \times (RR\text{-}1)/RR,$$

where CF_E is case fraction (proportion of cases exposed) and RR relative risk.[15]

Results

It was possible to obtain information about occupation and employment from age 20 for an average of 38·9 years in the cases, 38·4 years in the dead controls, and 38·1 years in the living controls. A person who had been active for at least one year in a specific occupation was in the analyses assigned to this occupation. One person could therefore be counted for more than one occupation. Some occupations were pooled in the analyses to form larger groups. One of these was "white collar workers" (including teachers, clerks, and salesmen). Another group called "mechanics" included employees in mechanical industry, workshops, metal industry, garages, and machine shops, including engineers in such places of work. Plumbers and electricians, who are often exposed to asbestos, were combined to form one group. Several occupations were not separately analysed because of the low number of subjects. These occupations included insulators, chimney sweeps, painters, and workers in the chemical industry, groups that could have been of considerable interest.

The odds ratio for a specific occupation was estimated relative to all the remaining subjects. Separate analyses were performed with dead and living controls. The analyses with dead controls included 589 cases and 582 controls, and the analyses with living controls 456 cases and 453 controls. Table 1 gives the number of cases and dead controls in different occupations with corresponding estimates of the odds ratios; the person-years in the occupations are also shown. Table 2 gives the corresponding data for cases and living controls.

Table 1 *Number of cases and dead controls, odds ratios (OR), and person-years in different occupations*

Occupation	Years	No		OR (unadjusted)	95% CI	OR (adjusted for smoking)	95% CI	Person-years	
		Cases	Controls					Cases	Controls
Farmers	⩾ 1	90	140	0·6	(0·4–0·8)	0·7	(0·5–1·0)	2759	4537
	⩾20	59	105	0·5	(0·3–0·7)	0·6	(0·4–1·0)	2397	4219
Foresters	⩾ 1	94	125	0·7	(0·5–0·9)	0·7	(0·5–0·9)	1797	2192
	⩾20	34	38	0·8	(0·5–1·4)	0·7	(0·4–1·4)	1222	1405
Carpenters	⩾ 1	65	80	0·8	(0·5–1·1)	0·8	(0·5–1·3)	1163	1463
	⩾20	26	32	0·8	(0·4–1·4)	0·8	(0·4–1·5)	861	1072
Navvies	⩾ 1	18	31	0·6	(0·3–1·0)	0·5	(0·2–1·0)	280	494
	⩾20	7	11	0·6	(0·2–1·7)	0·8	(0·2–2·8)	225	377
Administrative workers, including teachers, clerks and salesmen (white collar workers)	⩾ 1	98	84	1·2	(0·9–1·7)	1·2	(0·8–1·8)	2542	2004
	⩾20	60	51	1·2	(0·8–1·8)	1·3	(0·8–2·2)	2182	1694
Plumbers and electricians	⩾ 1	36	21	1·7	(1·0–3·2)	1·5	(0·8–3·1)	1011	375
	⩾20	24	7	3·5	(1·4–9·6)	2·6	(1·0–7·8)	899	242
Enginemen, boilermen, repairmen, welders, stokers, mechanics, turners, engineers (mechanics)	⩾ 1	74	57	1·3	(0·9–2·0)	1·0	(0·7–1·5)	1457	1056
	⩾20	33	24	1·4	(0·8–2·5)	1·1	(0·6–2·1)	1084	809
Concrete and asphalt workers	⩾ 1	28	12	2·4	(1·2–5·2)	2·2	(1·0–5·3)	460	109
	⩾20	10	0	—		—		324	0
Professional drivers	⩾ 1	72	58	1·3	(0·9–1·9)	1·0	(0·7–1·5)	1461	1125
	⩾20	37	25	1·5	(0·9–2·6)	1·2	(0·6–2·2)	1172	871
Pulp workers	⩾ 1	24	14	1·7	(0·9–3·6)	1·7	(0·7–4·2)	462	285
	⩾20	9	7	1·3	(0·4–4·1)	0·9	(0·3–3·3)	310	247
Underground miners	⩾ 1	25	10	2·5	(1·2–6·0)	2·7	(1·0–8·1)	645	136
	⩾20	16	2	8·1	(1·9–73·0)	9·8	(1·5–414)	552	77
Copper smelter workers	⩾ 1	22	8	2·8	(1·2–7·3)	2·8	(1·0–9·6)	540	120
	⩾20	15	3	5·1	(1·4–27·4)	9·7	(1·5–413)	498	97
Occupational asbestos exposure according to questionnaires	⩾ 1	99	45	2·4	(1·6–3·6)	2·6	(1·6–4·3)	2658	974
	⩾20	64	22	3·2	(1·9–5·5)	3·6	(1·9–7·2)	2232	722

Table 2 *Number of cases and living controls, odds ratios (OR), and person-years in different occupations*

Occupation	Years	No		OR (unadjusted)	95% CI	OR (adjusted for smoking)	95% CI	Person-years	
		Cases	Controls					Cases	Controls
Farmers	⩾ 1	64	134	0·4	(0·3–0·5)	0·5	(0·3–0·8)	1738	3955
	⩾20	40	90	0·4	(0·2–0·5)	0·5	(0·3–0·8)	1462	3515
Foresters	⩾ 1	70	101	0·6	(0·4–0·9)	0·7	(0·5–1·1)	1283	2017
	⩾20	24	41	0·5	(0·3–0·9)	0·7	(0·3–1·3)	854	1453
Carpenters	⩾ 1	50	60	0·8	(0·5–1·2)	0·7	(0·5–1·2)	899	1016
	⩾20	19	22	0·8	(0·4–1·6)	0·9	(0·4–1·9)	632	722
Navvies	⩾ 1	14	19	0·7	(0·3–1·5)	0·9	(0·3–2·4)	198	409
	⩾20	5	12	0·4	(0·1–1·3)	0·7	(0·2–2·9)	152	355
Administrative workers, including teachers, clerks and salesmen (white collar workers)	⩾ 1	81	60	1·4	(1·0–2·1)	1·2	(0·8–1·9)	2172	1736
	⩾20	53	42	1·3	(0·8–2·1)	1·2	(0·7–2·0)	1908	1603
Plumbers and electricians	⩾ 1	32	20	1·6	(0·9–3·1)	1·5	(0·7–3·2)	925	431
	⩾20	23	10	2·4	(1·1–5·6)	1·8	(0·7–4·7)	852	333
Enginemen, boilermen, repairmen, welders, stokers, mechanics, turners, engineers (mechanics)	⩾ 1	54	48	1·1	(0·7–1·7)	1·0	(0·6–1·6)	923	772
	⩾20	21	17	1·2	(0·6–2·5)	1·5	(0·6–3·7)	654	556
Concrete and asphalt workers	⩾ 1	24	27	0·9	(0·5–1·6)	0·8	(0·7–2·5)	402	354
	⩾20	8	7	1·1	(0·4–3·7)	1·0	(0·3–4·1)	279	185
Professional drivers	⩾ 1	63	44	1·5	(1·0–2·3)	1·0	(0·7–1·6)	1299	810
	⩾20	33	20	1·7	(0·9–3·2)	1·1	(0·6–2·2)	1050	607
Pulp workers	⩾ 1	22	15	1·5	(0·7–3·1)	1·5	(0·6–3·8)	422	206
	⩾20	8	3	2·7	(0·6–15·8)	2·3	(0·4–23·2)	281	137
Underground miners	⩾ 1	22	10	2·3	(1·0–5·4)	1·5	(0·6–3·8)	577	165
	⩾20	15	4	3·8	(1·2–16·0)	2·2	(0·7–9·2)	507	107
Copper smelter workers	⩾ 1	20	9	2·3	(1·0–5·7)	1·5	(0·6–4·1)	473	112
	⩾20	12	2	6·1	(1·4–56·4)	3·7	(0·8–34·3)	411	63
Occupational asbestos exposure according to questionnaires	⩾ 1	77	66	1·2	(0·8–1·7)	1·1	(0·7–1·7)	2016	1611
	⩾20	46	40	1·2	(0·7–1·9)	1·1	(0·7–2·0)	1680	1383

Table 3 *Cell types of lung cancer in different occupations*

Occupation	Total No	Squamous cell carcinoma		Small cell carcinoma		Adenocarcinoma		Other types or unclassified	
		No	%	No	%	No	%	No	%
Farmers, foresters, carpenters, navvies	267	122	46	68	25	36	13	41	16
White collar workers	98	45	46	25	26	16	16	12	12
Mechanics, concrete and asphalt workers, professional drivers, pulp workers	198	104	53	39	20	21	11	34	17
Underground miners	25	11	44	11	44	3	12	0	0
Copper smelter workers, plumbers, electricians, occupational asbestos exposure according to questionnaires	157	98	62	26	17	15	10	18	11

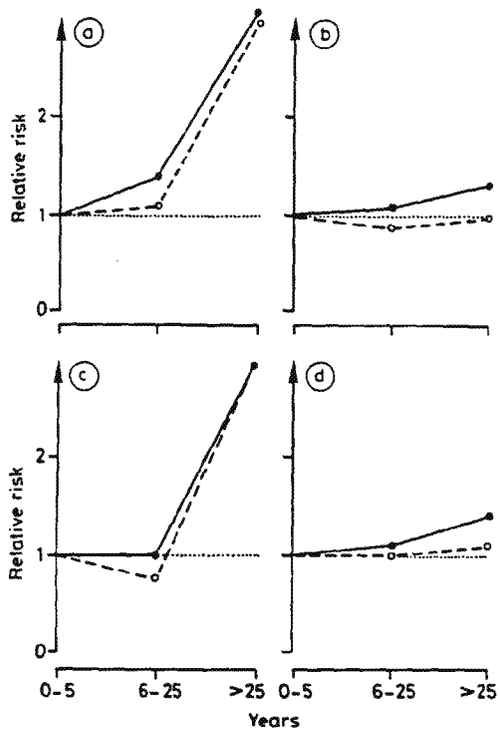
On the whole, the odds ratios obtained with dead and living controls were in good agreement. Farmers, foresters, carpenters, and navvies (railroad workers) thus had low odds ratios and underground miners, copper smelter workers, and electricians and plumbers had high odds ratios. An intermediate group included "white collar workers," "mechanics," professional drivers, and pulp workers who had a tendency towards slightly, but not significantly, increased odds ratios. Adjustment for smoking (smokers/non-smokers) did not change the odds ratios substantially for most occupations; exceptions were professional drivers and mechanics for which adjustment reduced the odds ratios considerably (tables 1 and 2). A more detailed adjustment with consideration of life time tobacco consumption gave similar results.

Table 3 shows the distribution between different cell types of carcinoma; this is commented on further in the discussion.

A linear logistic regression model was used to study the possible relation between "risk occupations" and lung cancer with adjustment for smoking. This analysis included adjustment for smoking and was performed for three different groups.

(1) Workers with more than five years employment in occupations known or definitely suspected from previous studies to increase the risk of lung cancer. This group included miners, copper smelter workers, plumbers, electricians, insulators, and chimney sweeps.

(2) Workers with more than five years employment in occupations suspected of increased risk for lung cancer either due to the character of the work—for instance, exposure to polycyclic aromatic hydrocarbons or asbestos—or from epidemiological stud-



Relative risks estimated by a linear logistic regression model: (a) known risk occupations, dead controls; (b) suspected risk occupations, dead controls; (c) known risk occupations, living controls; (d) suspected risk occupations, living controls. ———— *without adjustment for smoking;* — — — — *with adjustment for smoking.*

ies: enginemen, boilermen, welders, mechanics, stokers, turners, professional drivers, painters, building workers, stevedores, printers, workers in the chemical industry (including pulp workers), and concrete and asphalt workers.

(3) All remaining subjects.

In the analyses group 3 was used as the reference from which the relative risks (RR) were estimated.

In group 1 those with more than 25 years in the occupation ran a substantially increased risk of lung cancer. The excess risk persisted after adjustment for smoking (figure). In group 2 also those with more than 25 years in the occupation seemed to run a slightly increased risk; no excess risk was observed, however, after adjustment for smoking.

Quantitatively, group 2 was strongly dominated by mechanics and professional drivers. The choice of boundaries for time in an occupation in the figure was not critical and similar results were obtained if the same boundaries were used as in tables 1 and 2.

If workers with more than five years employment in any of the occupations in group 1 (figure) were regarded as employed in risk occupations the population aetiological fraction was 9% regardless of whether dead or living controls were used. This figure, which included adjustment for smoking, did not increase if group 2 was also regarded as a risk group. Without adjustment for smoking, however, the estimated population aetiological fraction became 17% with dead controls and 18% with living controls if both groups 1 and 2 were included as risk groups.

Discussion

Several types of epidemiological investigations may be used to find or elucidate occupational cancer risks. Studies of occupational mortality or morbidity in registers, achieved by reports of occupation in connection with cause of death or incidence of cancer reporting[16] or by linkage of different registers,[17] may give crude indications. This type of study is often based on extensive material but has shortcomings because of uncertainties in the occupational data and a lack of information on smoking habits.

Important information about risks of occupational lung cancer derives from cohort studies, often initiated by clinical or experimental observations. Cohort studies are mainly useful for the study of specific groups. Examples from northern Sweden are cohort studies on miners and copper smelter workers.[18 19] Individual smoking data are usually lacking in this type of study.

Case-control studies have often been used to explore specific factors of suspected aetiological importance. Large case-control studies may also be performed with a more general purpose such as a screening procedure in the search for possible risk factors, analysis of interaction between different exposures, and estimation of population aetiological fractions. The latter type of study has been advocated by Doll and Peto.[3] A few case-control studies of this type have recently been reported.[20-22]

The study reported here may be regarded in some ways as a systematic screening for possible occupational risk factors for lung cancer. Looked on from this point of view it was of interest to study how efficiently occupational exposure was registered. One group could be specifically studied from this aspect—namely, employees at a copper smelter (Rönnskärsverken). The risk of lung cancer among these employees has previously been analysed in a cohort study.[18] The original cohort comprised about 4000 male workers, employed for at least three months at this copper smelter at any time between 1928 and 1966. Of the total number of 76 cases of lung cancer found in the cohort, 26 were included in the present study. In 25 of these cases the employment at the smelter was obvious from the questionnaires. Three of these 25 cases, however, were employed for less than one year and therefore were not classified as copper smelter workers in the present study. The questionnaire information thus had high validity in this specific group.

In the present study obvious excess risks for lung cancer were found in some occupations previously shown (or highly suspected) to give such risks: these included underground miners, copper smelter workers, and electricians and plumbers (who are often exposed to asbestos). In underground miners (especially iron ore miners) the risk is in all probability caused by exposure to radon daughters in poorly ventilated mines. Data from the present case-control study concerning underground miners have been presented in more detail elsewhere.[6] This study, and an extended case-control study conducted in two municipalities with large iron ore mines,[7] suggested a multiplicative interaction between smoking and underground mining. The copper smelter workers, who were concentrated in only one factory (Rönnskäsverken), have previously been analysed in a large cohort study which showed an increased risk of lung cancer associated with working at sites with heavy exposure to arsenic.[18] A case-control study within this cohort study suggested a multiplicative effect of this exposure and smoking.[5] Electricians and plumbers in the present study showed similar excess risks and were combined in the analyses to form one group; both types of workers are often exposed to asbestos, which is a probable explanation for the observed increase in risk.

According to many studies smoking is especially associated with small cell and squamous cell car-

cinoma and, to a much lesser degree, adenocarcinoma. Exposure to radon daughters probably increases the risk of all types of lung cancer but has the strongest association with small cell carcinoma and squamous cell carcinoma; furthermore, small cell carcinoma seems to develop after a shorter latency and at a younger age and is therefore overrepresented in some series of underground miners (cf ref 6). There are some indications that other lung carcinogens such as asbestos and aromatic hydrocarbons are most strongly associated with squamous cell carcinoma.[23] In the present study small cell carcinoma was obviously overrepresented among underground miners (table 3). There was also a tendency towards overrepresentation of squamous cell carcinoma in the suspected or proved risk occupations compared with farmers/foresters and white collar workers.

Farmers and foresters had significantly low odds ratios (even after adjustment for smoking). A low risk of lung cancer in these rural groups has been reported in several studies[24 25] but the reasons for this are not fully known. It is tempting to compare farmers and foresters with the group "white collar workers" (administrative workers, clerks, and teachers). In the latter group no specific occupational risk exposures were suspected; nevertheless, this group had almost twice the relative risk of lung cancer as farmers and foresters. There were definite quantitative and qualitative differences in the smoking habits of the two groups (table 4). There were more non-smokers and pipe smokers among the farmers/foresters than the white collar workers. Pipe smoking in the present population gave about the same relative risk as cigarette smoking.[2] Detailed adjustment for smoking, taking into account different levels of lifetime tobacco consumption, however, only slightly reduced the difference among the odds ratios. It is still possible that even a detailed adjustment for smoking was inadequate and that the smoking habits mainly explained the disparity observed between the two groups. Other more speculative explanations may be environmental tobacco smoke, indoor radon, and general air pollution.

As in many reported cohort studies and occupational mortality (or morbidity) studies slight but statistically not significantly increased odds ratios were found in several other "blue collar jobs" such as mechanics, concrete and asphalt workers, and pulp workers. In the logistic regression analysis, however, no increase in risk persisted in this group as a whole after adjustment for smoking. This indicates that the occupational exposures in this group had minor quantitative importance. A real excess risk cannot be excluded, however, in small specific subgroups—for instance, due to polycyclic aromatic hydrocarbons or other chemical pollutants. Two such groups were pulp workers (commented on below) and asphalt and concrete workers. For the latter group, high odds ratios were obtained only after comparison with dead controls; it was striking that 10 cases had had this exposure for more than 20 years compared with none among the dead controls. No increase of the odds ratios was observed, however, if the ratios were estimated with living controls. This might have been a "healthy worker effect" explained by the fact that asphalt and concrete work is heavy and therefore overrepresented among living controls, who might have been positively selected concerning health.

Asbestos exposure may illustrate some of the problems connected with a questionnaire study, when an exposure is not exclusively associated with some specific occupations. Occupational asbestos exposure (according to questionnaires) gave a high odds ratio with use of dead controls but not with use of living controls. A possible explanation might be that the living controls more adequately reported asbestos exposure than the surrogate respondents for cases and dead controls. It seems natural that the exposed workers themselves should have better knowledge about this type of exposure than close relatives. Simi-

Table 4 *Smoking habits among farmers/foresters and white collar workers*

	No	*Non-smokers* %	*Pipe smokers* %	*Cigarette smokers* %	*Pipe and cigarette smokers* %	*< 20 cig/d* %	*≥ 20 cig/d* %	*OR after simple adjustment for smoking*	*OR after detailed adjustment for smoking*
Farmers/foresters:									
Cases	184	14	46	18	22	34	52	0·65	0·71
Dead controls	265	43	31	12	12	33	23		
White collar workers:									
Cases	98	4	21	52	20	31	65	1·22	1·13
Dead controls	84	36	13	35	15	31	33		

*Smoking/non-smoking.
†Three levels of life time tobacco consumption.

lar experience has previously been reported.[26]

The odds ratios presented in tables 1 and 2 are estimated over all ages. If an occupation is heterogeneously distributed over age due, for instance, to changing access to different jobs, the odds ratio is not constant over age groups. In professional drivers this was shown to be the case[10] and a more detailed analysis of the data suggested an association between the occupation and the risk of lung cancer in the older age groups. In table 5 odds ratios are given for some other occupational groups with stratification according to age (< 70 and ⩾ 70). For farmers and foresters the OR for the two age groups were similar. For plumbers and electricians and for mechanics an increased OR was found in the older age group but not in the younger, whereas in white collar workers and pulp workers the opposite was observed. Deviations obtained after this subgrouping must be evaluated with great caution due to random errors and problems of mass significance. Some of these findings might, however, have been caused by a changing risk over time due to environmental changes in the workplaces. The rather high OR obtained for pulp workers in the younger age group may indicate the need for further studies, especially as an increased prevalence of respiratory disease (chronic bronchitis) has previously been described among this type of worker.[27]

In published reports varying proportions of male lung cancer have been attributed to occupation. Percentages between 5 and 35 have been reported.[2 28 29] In the present material the population aetiological fraction attributed to occupation was, with adjustment for smoking, about 9% regardless of whether a more limited definition (group 1) or a wider definition (groups 1 and 2) for risk occupations was used. Without adjustment for smoking, however, the estimated population aetiological fraction became 17–18% if both groups 1 and 2 were included as risk occupations. Several investigations lack adjustment for smoking which may explain the higher population aetiological fractions reported. Another explanation may be different occupational patterns within the studied populations.

Table 5 *Odds ratios for lung cancer in some occupations after stratification according to age and estimated with dead controls*

Occupation	*Age at diagnosis years*			*OR*
Farmers	< 70	Cases	36	0·5
		Controls	63	
	⩾ 70	Cases	54	0·6
		Controls	77	
Foresters	< 70	Cases	48	0·6
		Controls	73	
	⩾ 70	Cases	46	0·9
		Controls	52	
White collar workers	< 70	Cases	65	1·4
		Controls	49	
	⩾ 70	Cases	33	0·9
		Controls	35	
Plumbers and electricians	< 70	Cases	20	1·2
		Controls	16	
	⩾ 70	Cases	16	3·3
		Controls	5	
Mechanics	< 70	Cases	32	0·9
		Controls	35	
	⩾ 70	Cases	36	2·0
		Controls	19	
Pulp workers	< 70	Cases	17	2·8
		Controls	6	
	⩾ 70	Cases	7	0·9
		Controls	8	

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[1] International Steering Committee of Medical Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Br Med J* 1979;1:532-5.
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