

SHORT COMMUNICATION

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Non-Hodgkin's lymphomas and occupation in Sweden

Received: 3 August 2000 / Accepted: 30 March 2001

Abstract Objectives: To investigate whether there is a risk excess of non-Hodgkin's lymphoma among Swedish workers associated with particular occupations. **Methods:** The base population was made up of Swedish men (1,779,646) and women (1,101,669) who were gainfully employed at the time of the 1970 census, had also been present in the 1960 census and were still alive and older than 24 years as of 1 January, 1971. They were followed up for 19 years until the end of 1989. Age-period standardised incidence ratios were computed in a dataset linking cancer diagnoses from the Swedish national cancer register to occupational and demographic data obtained in the census of 1970. Log-linear Poisson models were fitted, allowing for geographical area. Risk estimators per occupation were also computed for workers reporting the same occupation in 1960 and 1970, a more specifically exposed group. **Results:** There were 7,610 non-Hodgkin's lymphomas reported in the study cohort, 5,391 cases in men and 2,219 in women. A relative risk of over 1.20 and statistically significant was observed in men among accountants and auditors, secretaries and typists, auctioneers, non-specified rail and road transport workers, telecommunications traffic officers, telegraph and radio operators, photographic-laboratory workers and other production and related work. The risk excess was confirmed in men with the same occupation in both censuses. In women, only three occupations achieved statistical significance: metal platers and coaters, truck and conveyor operators and store and warehouse workers. **Conclusions:** The risk excess observed in telecommunication and transport workers could be explained by electromagnetic radiation exposure. We did not find a risk excess in agricultural occupations, that has been largely documented by other study groups.

Key words Non-Hodgkin's lymphoma · Occupation**Introduction**

Non-Hodgkin's lymphomas (NHL) are a heterogeneous collection of lympho-proliferative malignancies with different behaviours and responses to treatment.

There is no consensus about the causes of the dramatic rise in the incidence rates during the past years. Improvements in diagnostic techniques, changes in disease classification and the upsurge of AIDS-related lymphomas account for only a small percentage of the increase (Palackdharry 1994).

In general, rates for NHL are positively related to socio-economic level and are more frequent among occupations held by people in high social classes (Pearce and Bethwaite 1992; Pollán and Gustavsson 1999).

NHL have also been associated with exposure to phenoxy herbicides (Hardell and Eriksson 1999), chlorinated phenols (Rothman et al. 1997), and dioxins during the manufacturing process or after accidental exposure. A high risk has been found in farmers and other agricultural workers, although other potential risk factors, such as other agricultural chemicals, zoonotic viruses, and solvents, may be involved. (Kogevinas et al. 1995).

The principal aim of this paper was to investigate whether there is a risk excess of non-Hodgkin lymphoma among Swedish workers associated with particular occupations, in order to suggest occupational factors that could contribute to the growing trend in the incidence of these tumours, which still remains unexplained (Linnet et al. 1993; Devesa and Fears 1992).

Material and methods

The base population for this historical cohort study was made up of Swedish men and women who were gainfully employed at the time of the 1970 census, had also been present in the 1960 census and were still alive and older than 24 years as of 1 January, 1971.

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The cohort included 1,779,646 men and 1,101,669 women who were aged 25 to 64 years at the beginning of the study and who were subsequently followed up for 19 years until the end of 1989.

Information was drawn from two linked data sets: (1) the Swedish cancer environment register, providing information on incident cancer cases, including a number of demographic variables from the 1960 and 1970 censuses. This register was used to compute specific rate numerators; and (2) a background population register comprising all individuals in the 1970 census, with information on occupation and residence in 1970, occupation in 1960, and, if applicable, date of death. This register was used to calculate specific rate denominators. The record linkage between these two registers has been described in detail elsewhere (Wiklund and Eklund 1986).

Person-years in each of 278 occupations in men and 263 in women were accumulated from 1971 until the date of death or up to 1989. After incident non-Hodgkin's lymphoma, persons were considered to be still at risk of a new episode of this kind of tumour, so they were counted as person-years for the denominators. This would imply a very slight overestimation of denominators. The overall person-time that each person contributed to the study was allocated to the corresponding cells of the variables of stratification. These variables were occupation, county of residence in 1970, age group and calendar time period. The variables of occupation and county, drawn from the 1970 census, were regarded as fixed, while age and period were time dependent. Clayton's algorithm was used in calculating the exact number of person-years. Occupation was classified according to the Nordic Classification of Occupations (Cancer-Miljöregistret 1994).

Age-standardised incidence rates per occupation for the whole period were computed using the standard European population as reference. Standardised incidence ratios (SIR) were calculated for men and women in each of all occupations, stratifying for 5-year age-classes and 5-year calendar-year periods, and using the cancer incidence among cohort member to calculate expected numbers of cases. SIR were also computed for the ten major occupational sectors.

On the assumption that the observed number of cases was distributed in each stratum as a Poisson variable, we fitted log-linear Poisson models, comparing occupations against others in the general cohort, adjusting for geographical risk area. Relative risks (RRs) were adjusted for geographical area categorised in five levels by grouping counties with similar SIRs as follows: lower than 0.90, from 0.90–0.95, from 0.95–1.05, from 1.05–1.10 and greater than 1.10. In these models, the number of expected cases was introduced as an offset. Given that the expected number was computed on the basis of the age- and period-specific reference rates, the RR for each occupation was likewise age- and period-adjusted. Only those occupations with at least two observed cases were analysed.

To take into account the relationship between social class, life-style and occupation, we also computed RRs for other occupations of the same occupational sector (i.e., those with the same first digit) as reference. In addition, RRs per occupation were also calculated separately considering as exposed only those men who reported that occupation in 1970 and in 1960.

Results

During the follow-up, 7,610 non-Hodgkin's lymphomas were reported in the study cohort, 5,391 cases in men and 2,219 in women. The overall standardised rate was 17.95 cases per 100,000 person-years in men and 11.60 in women.

Table 1 presents, for men, the number of cases, the SIR and the RRs for the ten occupational sectors and the 53 occupations with at least two observed cases and a SIR equal to or greater than 120. In general, RRs from Poisson models taking geographical area into account were similar to the corresponding SIRs, and we were not

able to demonstrate a positive confounding effect of this variable. The county with the lowest SIR was Jämtland (SIR = 0.79, 95% CI 0.62–0.99), and that with the highest one was Gotland (SIR = 1.29, 95% CI 0.94–1.72) (data available by the authors on request).

There were no substantial differences in risk across occupational sectors. For particular occupations, a relative risk over 1.30, statistically significant or nearly significant, was observed among physicians, teachers of music, art or crafts, ministers and priests, accountants and auditors, staff officers, bookkeepers, secretaries and typists, auctionists, non-specified rail and road transport workers, telecommunications traffic officers, telegraph and radio operators, radio and television repairmen, photographic-laboratory workers, other production and related work, and launderers and dry-cleaners. On the right-hand side of Table 1, SIRs and RRs for the same occupations are presented, but taking into account only those workers reporting such occupations in both censuses (1960 and 1970). Risk estimators are higher than 1.40 for all the above-mentioned job codes, except in the case of telecommunications traffic officers and photographic-laboratory workers, that only included 12 and 53 workers in 1960 and 1970, respectively. In addition, a significant RR in this subgroup, based on more than five cases, was found for rolling-mill workers and prison and reformatory officials.

Table 2 depicts the same analysis for female workers. There was also a geographical variation in non-Hodgkin's lymphomas for women, with Jämtland again as the county with the lowest incidence (SIR = 0.69, 95% CI 0.43–1.04), and Kalmar with the highest one (SIR = 1.27, 95% CI 1.00–1.60) (data available on request).

Once more, occupational sectors did not show a different risk pattern, with the exception of sales work, which presented an almost significant 10% excess risk. Among the 29 occupations with a SIR greater than or equal to 120 and based on two or more cases, only three achieved statistical significance: metal platers and coat-ers, truck and conveyor operators, and store and warehouse workers, and only the risk for the last-mentioned was based on a substantial number of cases. None of these job codes showed a statistically significant increase of risk in the subcohort of women with the same occupation in the 1960 and 1970 censuses. In this subcohort, the occupation of catering supervisors depicted a significant high risk based on 14 cases.

Intra-sector analyses, taking as reference only workers in the same occupational sector were also conducted in both general cohort and subcohort with the same occupation in both censuses, but the results were very similar and are not presented here.

Discussion

After adjustment for age, period of diagnosis and geographical area, twelve occupations were identified with a statistically significant risk in men, either in the general

Table 1 NHL risk in men included in the 1960 and 1970 Swedish censuses (general cohort) and men reporting the same occupation in both censuses, for occupations with a minimum of 20% excess risk, adjusted for age, period and county

Occupational code	Men in general cohort				Men reporting the same occupation in both censuses, 1960 and 1970			
	Cases	SIR ^a (per 100)	RR ^b	95% CI	Cases	SIR ^a (per 100)	RR ^c	95% CI
Group 0: Professional and technical work	932	102	1.02	0.95–1.10	414	104	1.04	0.94–1.15
011 Chemists	10	126	1.23	0.66–2.30	1	37	–	–
013 Geologists, meteorologists	3	156	1.55	0.50–4.82	3	308	3.07	0.99–9.53
031 Physicians and surgeons	28	141	1.39	0.96–2.01	23	151	1.49	0.99–2.24
043 Practical nurses	6	131	1.29	0.58–2.86	0	–	–	–
047 Physiotherapists	4	146	1.46	0.55–3.89	0	–	–	–
050 Principals, headmasters	17	122	1.22	0.76–1.97	8	171	1.73	0.86–3.45
052 Teachers of theoretical subjects	46	121	1.21	0.91–1.62	15	98	0.97	0.59–1.62
054 Teachers of music, arts or crafts	22	143	1.44	0.95–2.19	12	139	1.41	0.80–2.48
061 Ministers, priests	22	142	1.44	0.95–2.19	19	152	1.53	0.97–2.4
091 Accountants and auditors	19	173	1.71	1.09–2.69	9	182	1.80	0.93–3.46
094 Economists, statisticians	7	175	1.72	0.82–3.61	2	542	5.37	1.34–21.47
096 Staff officers	38	131	1.31	0.95–1.80	0	–	–	–
098 Other professional, technical work	3	173	1.69	0.55–5.25	2	404	3.95	0.99–15.81
Group 1: Administrative and managerial	186	88	0.87	0.75–1.01	71	98	0.97	0.76–1.22
Group 2: Bookkeeping and clerical work	252	109	1.08	0.95–1.22	61	110	1.09	0.84–1.40
201 Bookkeepers and office cashiers	46	131	1.30	0.98–1.74	21	163	1.62	1.06–2.49
208 Debt collectors	4	135	1.36	0.51–3.63	0	–	–	–
290 Secretaries, typists	15	214	2.11	1.27–3.51	2	237	2.32	0.58–9.30
292 Bank employees	14	138	1.36	0.80–2.30	4	124	1.22	0.46–3.24
297 National insurance office employees	4	132	1.34	0.50–3.56	2	140	1.43	0.36–5.73
Group 3: Sales work	411	104	1.03	0.93–1.14	168	110	1.09	0.94–1.27
301 Working proprietors	21	135	1.34	0.87–2.05	7	138	1.35	0.64–2.84
311 Insurance representatives	9	124	1.23	0.64–2.36	5	135	1.35	0.56–3.23
318 Auctioneers	4	401	3.95	1.48–10.52	2	1406	13.4	3.35–53.59
Group 4: Agriculture, forestry, fishing	609	95	0.96	0.88–1.04	447	98	0.98	0.89–1.09
404 Horticultural managers	9	131	1.29	0.67–2.47	4	136	1.34	0.50–3.56
405 Livestock breeders	4	160	1.63	0.61–4.34	2	272	2.80	0.70–11.19
418 Other agricultural work	3	207	2.03	0.65–6.29	0	–	–	–
Group 5: Mining and quarrying	29	94	0.99	0.68–1.42	14	124	1.29	0.76–2.18
Group 6: Transport and communications	459	103	1.03	0.94–1.14	277	109	1.09	0.97–1.24
602 Ship pilots	3	164	1.63	0.53–5.05	3	186	1.84	0.59–5.72
639 Other rail and road transport work	6	319	3.08	1.38–6.87	2	603	5.91	1.48–23.65
652 Telecommunication traffic officers	3	323	3.22	1.04–9.98	0	–	–	–
655 Telegraph and radio operators	5	244	2.43	1.01–5.83	3	234	2.32	0.75–7.19
661 Sorting clerks and postmen	37	128	1.27	0.92–1.76	27	137	1.36	0.93–1.99
Group 7: Production I	1,558	100	1.00	0.95–1.06	796	104	1.04	0.96–1.12
701 Textile workers	22	115	1.23	0.81–1.87	12	100	1.09	0.62–1.91
712 Fur tailors	3	124	1.25	0.40–3.86	3	164	1.64	0.53–5.07
714 Upholsterers	16	126	1.27	0.78–2.07	11	134	1.34	0.74–2.42
715 Patternmakers and cutters	8	158	1.67	0.83–3.34	4	133	1.40	0.53–3.74
718 Other sewing work	4	211	2.07	0.78–5.53	0	–	–	–
722 Shoe cutters, lasters and sewers	7	159	1.53	0.73–3.22	5	166	1.59	0.66–3.82
726 Leather goods makers	5	170	1.70	0.71–4.08	4	264	2.66	1.00–7.09
731 Furnacemen	25	115	1.20	0.81–1.78	7	97	1.02	0.48–2.13
733 Rolling-mill workers	17	141	1.43	0.89–2.30	9	223	2.23	1.16–4.28
741 Precision toolmakers	19	128	1.26	0.80–1.98	4	85	0.83	0.31–2.22
742 Watchmakers	7	154	1.54	0.73–3.23	7	180	1.80	0.86–3.77
764 Radio and television repairmen	25	145	1.46	0.98–2.16	8	146	1.46	0.73–2.92
778 Other wood work	28	123	1.27	0.88–1.85	7	113	1.17	0.56–2.46
Group 8: Production II	683	100	0.99	0.92–1.08	250	100	0.99	0.87–1.13
812 Potters	4	144	1.36	0.51–3.63	2	199	1.87	0.47–7.50
824 Brewery, distillery workers	5	120	1.20	0.50–2.89	2	145	1.46	0.36–5.83
827 Dairy workers	14	156	1.57	0.93–2.65	10	168	1.69	0.91–3.15
852 Plastic products workers	20	126	1.25	0.81–1.95	1	46	–	–
854 Photographic-laboratory workers	3	330	3.19	1.03–9.90	0	–	–	–
858 Other production and related work	40	143	1.44	1.06–1.97	13	181	1.82	1.06–3.14
872 Crane and hoist operators	26	135	1.35	0.92–1.99	5	72	0.72	0.30–1.73

Table 1 (Contd.)

Occupational code	Men in general cohort				Men reporting the same occupation in both censuses, 1960 and 1970			
	Cases	SIR ^a (per 100)	RR ^b	95% CI	Cases	SIR ^a (per 100)	RR ^c	95% CI
Group 9: Services and military work	272	98	0.97	0.86–1.09	132	96	0.96	0.80–1.14
904 Prison and reformatory officials	10	145	1.43	0.77–2.66	7	244	2.41	1.15–5.06
911 Catering supervisors	12	127	1.26	0.72–2.22	3	114	1.12	0.36–3.48
933 Chimney sweeps	5	127	1.28	0.53–3.07	3	90	0.90	0.29–2.80
943 Launderers and dry-cleaners	11	176	1.76	0.97–3.17	6	186	1.85	0.83–4.12

^a Using age- and period-specific rates for the whole cohort as standard

^b Adjusted for age, period and geographical category, taking other occupations in the general cohort as reference

^c For groups with at least two cases

cohort – accountants and auditors, secretaries and typists, actionists, rail and road transport workers, telecommunication traffic officers, telegraph and radio operators, photographic-laboratory workers and other production and related workers – or in the subgroup of workers reporting the same occupation in both censuses: economists and statisticians, bookkeepers and office cashiers, rolling-mill workers and prison and reformatory officials. We also found an almost significant relative risk in physicians and surgeons, teachers, priests, staff officers, bookkeepers and office cashiers, radio and television repairmen and launderers and dry cleaners. Relative risks in women were statistically significant only in metal platers and coaters, truck and conveyor operators, and store and warehouse workers in the general cohort, and catering supervisors in the subcohort of women reporting the same occupation in both censuses.

The large population size of this study should have allowed us to obtain more-precise risk estimators than those based on smaller specific cohorts of a particular type of worker. Conversely, the definition of exposure is rather limited in this kind of study and may result in misclassification of the exposure status, diluting risk estimates and diminishing the opportunity to identify high-risk occupations. In our case, the availability of additional information about the 1960 census permitted us to increase the specificity of this definition by considering the subcohorts of men and women reporting the same occupation in both censuses. This subcohort has been used to confirm the results obtained in the general cohort. We are conscious about the limits of occupation data because they are based on self-reported information, but we rely on the accuracy of the data collection in the census procedure.

A major problem of this type of study is that a large number of associations studied could produce some spurious significant results, the so-called mass-significance phenomenon. It is possible to calculate the number of statistically significant results expected by chance. In our case tumour, chance could explain only 1.3 of the increased RRs that attained statistical significance in men and less than 1 in women (0.7).

We were unable to take into account other potential risk factors that could explain or alter the associations found. However, in an attempt to consider the possible confusing effect of socioeconomic factors, we carried out intra-sector analyses, but the results did not change very much, as it was expected given the lack of risk differences across occupational sectors. Recently, ultraviolet radiation has been proposed as a possible risk factor (McMichael and Giles 1996). The geographical differences in our study could be partly related to ultraviolet radiation. As we have taken geographical area into account, our results would be less influenced by this potential risk factor.

An increase of risk was observed in men in rail and road transport work, in telecommunication traffic officers and in telegraph and radio operators. The exposure to electromagnetic fields in these occupations is largely documented in the literature (Floderus et al. 1996; Goldsmith 1995, 1997), and there is some evidence for its relationship with the development of this kind of tumour (Milham 1985; Feychting et al. 1995; Villeneuve et al. 2000).

Launderers and dry-cleaners were exposed to chlorinated organic solvents, which could explain the high incidence found in this group (Weiss 1995). As has been reported in recent cohort studies in Sweden (Axelson et al. 1994) and Finland (Anttila et al. 1995), workers exposed to trichloroethylene showed an elevated incidence and mortality from NHL, although sometimes the results were not significant (Blair et al. 1998a, 1998b; Morgan et al. 1998; Boice et al. 1999). Nevertheless, we must note that we have not found a risk excess in other occupations where this exposure is well documented, such as painters or construction workers (Blair et al. 1992, 1993).

We also detected a significant increase of risk in male accountants and auditors, secretaries and typists and other male administrative workers. There is no clear explanation and this high risk might be related to life-style or environmental factors or might be caused by chance.

Results for women were very sparse, and did not show the same pattern as those found in men. For

Table 2 NHL risk in women included in the 1960 and 1970 Swedish censuses (general cohort) and women reporting the same occupation in both censuses, for occupations with a minimum of 20% excess risk, adjusted for age, period and county

Occupational code	Women in general cohort				Women reporting the same occupation in both censuses, 1960 and 1970			
	Obs	SIR ^a (per 100)	RR ^b	95% CI	Obs	SIR ^a (per 100)	RR ^c	95% CI
Group 0: Professional and technical work	418	100	0.99	0.89–1.10	142	97	0.96	0.81–1.14
014 Laboratory technicians	10	143	1.40	0.75–2.61	0	–	–	–
031 Physicians and surgeons	4	148	1.45	0.54–3.87	4	238	2.33	0.87–6.21
042 Psychiatric care attendants	19	143	1.43	0.91–2.25	9	164	1.63	0.85–3.14
044 Dental nurses	10	121	1.21	0.65–2.25	6	144	1.44	0.64–3.20
045 Medical technicians	10	146	1.45	0.78–2.70	3	199	1.97	0.64–6.12
058 Other educational workers	4	160	1.59	0.60–4.24	0	–	–	–
082 Designers	3	166	1.64	0.53–5.09	0	–	–	–
Group 1: Administrative and managerial	26	106	1.05	0.71–1.55	3	100	0.98	0.32–3.04
101 Government, legislative work	12	136	1.34	0.76–2.36	3	254	2.49	0.80–7.71
Group 2: Bookkeeping and clerical work	382	101	0.99	0.89–1.11	83	107	1.05	0.85–1.31
292 Bank employees	16	137	1.35	0.83–2.21	4	178	1.77	0.66–4.71
298 Cost accountants, estimating clerks	3	229	2.24	0.72–6.97	1	336	–	–
Group 3: Sales work	321	109	1.10	0.97–1.23	99	105	1.06	0.87–1.30
302 Working proprietor, retail trade	28	122	1.23	0.84–1.78	13	156	1.57	0.91–2.72
332 Shop managers	19	126	1.26	0.80–1.97	6	170	1.70	0.76–3.79
Group 4: Agriculture, forestry, fishing	116	90	0.92	0.76–1.11	11	78	0.80	0.44–1.45
Group 5: Mining and quarrying	1	384	4.07	0.57–28.89	0	–	–	–
Group 6: Transport and communications	67	90	0.89	0.70–1.14	18	73	0.72	0.46–1.15
633 Motor-vehicle drivers, tramdrivers	6	127	1.27	0.57–2.82	0	–	–	–
635 Delivery women	10	143	1.42	0.76–2.64	0	–	–	–
662 Messengers	4	181	1.78	0.67–4.75	0	–	–	–
Group 7: Production I	152	96	0.98	0.83–1.16	39	77	0.80	0.58–1.10
726 Leather goods makers	4	176	1.85	0.69–4.94	1	153	–	–
757 Metal platers and coaters	3	642	6.36	2.05–19.73	0	–	–	–
758 Engineering and building metalwork	20	137	1.35	0.87–2.10	1	39	–	–
768 Electrical and electronic work	19	135	1.32	0.84–2.08	4	119	1.17	0.44–3.12
772 Bench carpenters and cabinet makers	5	122	1.25	0.52–3.01	0	–	–	–
778 Other wood work	4	222	2.24	0.84–5.96	0	–	–	–
Group 8: Production II	126	104	1.04	0.87–1.25	26	107	1.07	0.73–1.57
801 Typographers, lithographers	5	185	1.82	0.76–4.37	0	–	–	–
857 Paper and paperboard product work	5	124	1.22	0.51–2.95	0	–	–	–
858 Other production and related work	7	166	1.70	0.81–3.56	1	145	–	–
875 Truck and conveyor operators	3	422	4.15	1.34–12.89	0	–	–	–
883 Store and warehouse workers	28	153	1.54	1.06–2.23	4	159	1.61	0.60–4.28
Group 9: Services and military work	610	99	0.98	0.90–1.08	122	100	0.99	0.83–1.20
908 Other civilian, protective service	4	172	1.70	0.64–4.53	0	–	–	–
911 Catering supervisors	31	124	1.25	0.88–1.78	14	174	1.75	1.04–2.97
917 Pursers, stewardesses	3	222	2.21	0.71–6.86	1	916	–	–

^a Using age- and period-specific rates for the whole cohort as standard^b Adjusted for age, period and geographical category, taking other occupations in the general cohort as reference^c For groups with at least two cases

example, no excess risk was seen for telephone workers, one of the occupational activities where women are in a higher proportion. There can be two possible explanations: differences in exposure in men and women in the same occupation, and differences in the comparison group. In Sweden, as is the case in most developed countries, there is an irregular distribution of work categories by gender: women tend to work in jobs with higher level of qualification or in administrative ones, while agricultural and production sectors are mostly occupied by men. Thus, the different composition of the reference group for men and women could explain the

difference in relative risks in both genders in the present study.

A high incidence of NHL was detected in women working as metal platers and coaters, who are exposed to solvents and heavy metals. (See previous comments for this risk factor in men). Furthermore, a high risk was observed in women working as store and warehouse workers and catering supervisors. People working in catering are exposed to dust, fungi and viruses. Some studies carried out in food industries, such as bakeries or dairies, have shown a considerable fungal and organic-dust pollution in their environments, which could imply

a continuous stimulation of the immune system (Palmas et al. 1989; Godnic et al. 1999; Amano et al. 1998). In addition, propylene oxide used in the chemical and food industries has been related to different kinds of tumours, due to its strong cytotoxic and proliferative component, as has been shown in some experimental studies (Eldridge et al. 1995).

In spite of the large number of studies investigating the association between pesticides and blood malignancies, there seems to be no agreement about the role of this exposure in the aetiology of NHL. Early case-control studies from Sweden suggested an association between phenoxy herbicides and risk of malignant lymphoma (Hardell et al. 1981), but many later reports, based on cohort studies of pesticide applicators in Finland and Sweden (Wiklund et al. 1987; Asp et al. 1994), failed to find an elevated risk of NHL; nor did a recent meta-analysis (Acquavella et al. 1998) suggest that farmers are at a higher risk for NHL. These results are in agreement with our findings, as we have not found any risk excess in farmers, male or female.

In summary, we have identified a few occupations with an increased risk of NHL, but these results did not suggest a clear explanation for the current trend in the incidence of these tumours. The fact that some results were confirmed in people reporting the same occupation in both censuses, especially in men, supports the hypothesis of a dose-response relationship, since almost all statistically significant risk estimates increased with better exposure assessment. Additional knowledge is required to understand the observed rise, and to prevent the growing number of cases that are expected in years to come.

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