

# Respiratory cancers in furniture workers

MARIA R GERHARDSSON,<sup>1</sup> S E NORELL,<sup>1,2</sup> H J KIVIRANTA,<sup>1</sup> A AHLBOM<sup>2</sup>

*From the Department of Social Medicine,<sup>1</sup> Huddinge University Hospital, S-141 86 Huddinge, and Department of Epidemiology,<sup>2</sup> National Institute of Environmental Medicine, S-104 01 Stockholm, Sweden*

**ABSTRACT** In a 19 year follow up study of 8141 furniture workers nasal adenocarcinoma was 63.4 times more common than expected. The findings also indicate an excess risk of adenocarcinoma of the maxillary sinus. No increase in risk was found for laryngeal cancer, lung cancer, or sinonasal cancers other than adenocarcinoma.

Although several papers have been published on sinonasal cancer and previous exposure to wood dust, the evidence of a causal association is largely based on case-control studies and case reports. Hence, attempts to quantify this association in terms of relative risk rest mainly on case-control data.<sup>1-9</sup> We found only one cohort study on the association between exposure to wood dust and sinonasal adenocarcinoma.<sup>10</sup> In that study, however, the calculations were based on eight cases in the exposed group. We present here data from a cohort study of sinonasal adenocarcinoma and other respiratory cancers among 8141 furniture workers during a 19 year follow up period.

## Methods

The 1960 census in Sweden provides information about occupation, age, sex, and domicile for a population of about 7.5 million. All cases of cancer diagnosed in that population may be obtained from the Swedish cancer register. Each inhabitant living in the country has an individual identification number that is used in both registers. A cancer environment register has been created by a record linkage between the 1960 census and the 1961-79 cancer register.<sup>11</sup> The present study is based on 8141 men, aged 20-64 in 1960 and classified as furniture workers in the 1960 census. The reference group of 1.4 million consists of all employed men, except those classified as furniture workers, aged 20-64 in 1960. Only blue collar workers are included in the study. Expected numbers were calculated based on the number of furniture workers and on the cumulative incidences in the reference group. Stratification was made by year of birth (five year group) and county. To quantify the increase in risk, if any, the standardised

morbidity ratio (SMR) was calculated as the observed number of cases divided by the expected number. Assessment of confidence limits were performed according to the methods of Rothman and Boice.<sup>12</sup>

## Results

The observed and expected numbers of different respiratory cancers are presented in the table. Among the furniture workers sinonasal carcinoma was 7.1 and sinonasal adenocarcinoma 44.1 times more common than expected. For adenocarcinoma in the nasal cavity the observed number was 63.4 times higher than expected. The remaining three adenocarcinomas were all located in the maxillary sinus (expected: 0.1). The observed number of sinonasal carcinoma other than adenocarcinoma was 1 (expected: 1.8). No increase in risk was found for laryngeal or lung cancer.

Of the 14 cases of adenocarcinoma in furniture workers, eight were diagnosed between 1961 and 1968 and six between 1973 and 1976. There was no obvious difference in age distribution of adenocarcinoma between furniture workers and the reference population. Of the 17 cases of adenocarcinoma of the nasal cavity in the reference population, five were in woodworkers (other than workers in the furniture industry). Hence of the 28 cases of adenocarcinoma of the nasal cavity that occurred between 1961 and 1979 (11 in furniture workers and 17 in the reference population), no less than 16 had been classified as woodworkers in the 1960 census.

## Discussion

An unusually high proportion of woodworkers among patients with adenocarcinoma was reported

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*Standardised morbidity ratio (SMR) for different respiratory cancers among 8141 male furniture workers during a 19 year follow up*

<i>Tumour site (ICD code, 7th rev)</i>	<i>Histological type</i>	<i>Obs</i>	<i>Exp</i>	<i>SMR</i>	<i>90% Confidence limits</i>
Sinonasal (160)	All types	15	2.1	7.1	4.4-10.9
Sinonasal (160)	Adenocarcinoma	14	0.3	44.1	26.6-68.9
Nasal cavity (160.0)	Adenocarcinoma	11	0.2	63.4	35.5-104.9
Laryngeal (161)	All types	5	7.7	0.6	0.3-1.4
Lung, primary (162)	All types	57	66.2	0.9	0.7-1.1

from England in 1965-8.<sup>13-15</sup> Since then, case-control studies have been the main source of information on the association between occupational exposure to wood dust and adenocarcinoma of the nose and paranasal sinuses.

Acheson *et al* performed a case-control study with sinonasal adenocarcinoma (cases) and other nasal cancers (controls).<sup>1</sup> Occupational histories showed that 19/80 cases and 5/85 controls had woodworking in the furniture industry as their main occupation. It was estimated, however, from census data that only about 0.2/80 of the general population were woodworkers in the furniture industry. Estimates of the relative risk of sinonasal adenocarcinoma for this occupational group would be quite different if cases were compared with controls or with the census data.

Estimates of the relative risk varies widely between different case-control studies, from 2.5<sup>6</sup> to more than 100.<sup>1</sup> This may be due partly to differences in exposure between different types of woodwork<sup>1,5,6</sup> and between different countries.<sup>2,6</sup> Nevertheless, as indicated by Acheson *et al*<sup>1</sup> and others, bias in the selection of controls may account for differences in relative risk estimates of this magnitude. Furthermore, there may be systematic differences in the collection of information on previous occupation or exposure between the groups compared.<sup>1,2,6</sup> Finally, sinonasal adenocarcinoma is rare, and with few exceptions the published case-control studies have only included one to five exposed cases,<sup>2-8</sup> allowing for considerable random variation. The International Agency for Research on Cancer has published a review of publications up to 1981.<sup>16</sup>

In Sweden the occupational background of patients with sinonasal adenocarcinoma has been described by Engzell *et al*.<sup>17,18</sup> Predominant occupational groups were joiners and cabinet makers. In a case-control study Hardell *et al* examined 44 cases of sinonasal cancer and found a relative risk of 2.0 in woodworkers.<sup>7</sup> Only one of the three cases with adenocarcinoma was exposed to wood dust, however. In another Scandinavian case-control study, Hernberg and his collaborators interviewed 18 cases

of sinonasal adenocarcinoma and matched controls and found that 9:0 pairs were discordant for wood dust exposure.<sup>9</sup>

In the present study we found a relative risk of 44.1 for sinonasal adenocarcinoma and 63.4 for nasal adenocarcinoma in furniture workers. This is higher than the findings of most case-control studies but somewhat lower than the only previous cohort study where an estimated relative risk of 133.33 (57.57-262.73) was based on eight cases of sinonasal adenocarcinoma in furniture workers in England.<sup>10</sup>

Our findings were based on a record linkage, and the accuracy of the data provided by the registers was checked in different ways. Comparing the cancer register with death certificates, the total loss of cases was estimated to be 3.4%.<sup>19</sup> Only 1.2% of people in the cancer register were not identified in the census.<sup>20</sup> Random sample quality control disclosed that in the linkage between the cancer register and the 1960 census 0.5% of the hits were inaccurate owing to incorrect personal identification numbers.<sup>21</sup> More important, considerable variations in exposure could be expected among the furniture workers depending on the type and duration of job experience in the furniture industry. Hence, some of those registered as furniture workers in the 1960 census may have little or no exposure to wood dust, particularly when the latent period is taken into account.<sup>15</sup> Conversely, some of the reference population are likely to have been exposed to wood dust in other occupations (among those with adenocarcinoma in the reference population, five were found to have been woodworkers in the 1960 census) or as furniture workers before 1960. These sources of error, however, would lead to an underestimation of the relative risk. If differences in smoking habits had any effect this is likely to be in the same direction, since the furniture workers had a low relative risk for lung cancer.

Some studies, including the one described here, suggest that the excess risk of sinonasal cancer in woodworkers is confined to adenocarcinoma.<sup>2,4</sup> There are other studies, however, indicating that there is also an increased risk of sinonasal cancer of

other histological types.<sup>1 5 6 7 9</sup> For example, Elwood found an equal increase in the risk of adenocarcinoma and squamous cell carcinoma in woodworkers.<sup>6</sup> One explanation could be that different types of wood dust induces different types of cancer. Recent findings by Hernberg *et al*<sup>9</sup> suggest that exposure to hardwood dust is associated with adenocarcinoma and exposure to softwood dust with other sinonasal cancers.

Analysis by tumour site has been performed in only a few studies. We found an increased risk for adenocarcinoma in the nasal cavity and the maxillary sinus. Previous studies have indicated an increase in tumours of the nasal cavity and ethmoid sinus<sup>15</sup> or of the nasal cavity and ethmoid and maxillary sinus.<sup>6 8</sup> Acheson *et al* suggested that there may be a trend towards a decrease of sinonasal cancer in furniture workers after 1965.<sup>15</sup> Our findings suggest that there has been no such decrease.

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