Reported incidence of occupational asthma in the United Kingdom, 1989–90

Sarah Meredith

Abstract

Study objective—To estimate the incidence of occupational asthma seen by respiratory and occupational physicians in the UK in 1989 and 1990.

Design—New cases of occupational asthma were taken from a national reporting scheme, the Surveillance of Work-related and Occupational Respiratory Disease Project (SWORD). Estimates of the working population from the Labour Force Survey were used to calculate reported incidence by age group, sex, occupation, and region.

Setting—The SWORD project is a scheme for the reporting of new cases of work-related respiratory disease by thoracic and occupational physicians from throughout the UK which began in 1989.

Patients—In 1989 and 1990, of 4229 cases reported, 1085 (26%) were in patients with occupational asthma.

Main results—Only half the reported cases were attributed to agents prescribed under the Industrial Injuries Scheme. There was considerable diversity in risk by occupation, with highest annual rates in welders, solderers, and electronic assemblers (175/million), laboratory workers (188/million), metal treaters (267/million), bakers (334/million), plastics workers (337/million), chemical processors (364/million), and spray painters (658/million). Crude rates in men were higher than in women, but rates within occupations were similar in both sexes. Rates of disease rose with age; adjustment for occupation increased the gradient. Regional differences were only partly explained by diversity of industry and were probably mainly due to variation in levels of ascertainment and reporting.

Conclusions—Asthma is the most commonly reported occupational lung disease in the UK. The incidence in the general population is unknown, but it was estimated that the incidence of new cases seen by respiratory and occupational physicians was about three times that reported. High relative risks were found in a number of occupations in which effective control of the work environment is urgently required.

Methods

The SWORD project, its background, and methods have been described previously.2 Briefly, new cases of work-related respiratory disease seen by participating chest and occupational physicians from throughout the UK are reported on a regular basis. In 1989 and 1990, the first two years of the project, there were over 700 participating physicians equally divided between the two specialities. Chest physicians represented 83% of consultants listed in the handbook Thoracic Medical Services in the United Kingdom,3 and included at least one physician in 90% of the country’s chest clinics. Contributing and non-contributing clinics were fairly evenly distributed apart from a few areas of relatively poor participation, mainly in the south east. Most cases newly diagnosed and reported were by most chest physicians in the UK, and so considered against estimates of the population at risk, rates for particular groups could be calculated.

Altogether 4229 cases of work-related respiratory disease were reported in the first two years of the project, 1118 (26%) of which were of occupational asthma. After removal of 33 (3%) duplicates, 1085 cases remained—540 reported in 1989 and 545 in 1990; 824 (76%) were reported by chest physicians. Occupation was coded according to the Office of Population Censuses and Surveys (OPCS) 1980 classification,4 and the place of residence according to the standard administrative regions. In 62 cases (5.7%) no place of residence was specified; these were allocated to the region in which the reporting physician worked.

The 404 occupation groups of the 1980 OPCS classification were aggregated in two ways (table I). The first was the standard grouping which combines occupations into 16 “orders”; the second, referred to as “occupational sets” we developed to study occupational rates in more detail while minimising misclassification. An occupational set covered all possible codes for the same occupation. For instance, someone described as a laboratory worker might be a
Table I Occupational classifications

<table>
<thead>
<tr>
<th>Order</th>
<th>Group code</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>1</td>
<td>Professional &amp; related supporting management</td>
</tr>
<tr>
<td>(2)</td>
<td>2</td>
<td>Professional &amp; related in education, welfare &amp; health</td>
</tr>
<tr>
<td>(3)</td>
<td>3</td>
<td>Nurses</td>
</tr>
<tr>
<td>(4)</td>
<td>4</td>
<td>Laboratory technicians</td>
</tr>
<tr>
<td>(5)</td>
<td>5</td>
<td>Remainder</td>
</tr>
<tr>
<td>(6)</td>
<td>6</td>
<td>Clerical &amp; related</td>
</tr>
<tr>
<td>(7)</td>
<td>7</td>
<td>Security &amp; protective services</td>
</tr>
<tr>
<td>(8)</td>
<td>8</td>
<td>Catering, cleaning, hairdressing &amp; other personal services</td>
</tr>
<tr>
<td>(9)</td>
<td>9</td>
<td>Hairdressers, Cleaners</td>
</tr>
<tr>
<td>(10)</td>
<td>10</td>
<td>Farming, fishing, &amp; related</td>
</tr>
<tr>
<td>(11)</td>
<td>11</td>
<td>Materials processing, making, &amp; repairing (excluding metal &amp; electrical)</td>
</tr>
<tr>
<td>(12)</td>
<td>12</td>
<td>Metal making &amp; treating</td>
</tr>
<tr>
<td>(13)</td>
<td>13</td>
<td>Painting, repetitive assembling etc</td>
</tr>
<tr>
<td>(14)</td>
<td>14</td>
<td>Construction, mining &amp; related</td>
</tr>
<tr>
<td>(15)</td>
<td>15</td>
<td>Transport operating, materials moving &amp; storing</td>
</tr>
<tr>
<td>(16)</td>
<td>16</td>
<td>Miscellaneous labourers &amp; unskilled workers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chemical processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bakers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other food processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plastics workers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wood workers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remainder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metal making &amp; treating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Welders, solderers &amp; electrical assemblers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remained metal &amp; electrical processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spray painters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other painters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Welders, solderers &amp; electrical assemblers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Laboratory technicians &amp; assistants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Remainder painting, assembly &amp; packaging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction &amp; mining</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Remainder non-metal electrical processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Chemical workers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Metal making &amp; treating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Remainder metal &amp; electrical processors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>in Construction &amp; mining</td>
</tr>
</tbody>
</table>

Results

SUZPECTED AGENTS

The suspected causal agents are shown in table II. For half the cases the suspected agent was one of the 14 officially prescribed at that time; the nine additional agents recommended in October 1990 for prescription accounted for a further 59 cases (5.4%), in 9% the cause was unknown or not specified, leaving 381 cases (35%) attributed to a wide variety of other agents. Some of these, such as the paints and glues, should perhaps have been classified with prescribed agents, but could not be because of inadequate information; others were clearly not included. Of note were the 52 cases attributed to organic materials such as spices (six cases), poultry (five cases), cotton (four cases), and wool (3 cases). Cases attributed to metals other than stainless steel welding fume formed another important group, in particular those associated with aluminium potroom emissions (16 cases).

Isocyanates were the most commonly suspected cause of occupational asthma and were implicated in many occupational sets. Of the 241 patients, 68 (28%) were painters, 40 (17%) plastic manufacturers, 11 (5%) chemical processors, and 81 (34%) were in other manufacturing occupations.
Table II  Cases in relation to the agent suspected of causing their asthma

<table>
<thead>
<tr>
<th>Agents</th>
<th>Cases (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribed agents*</td>
<td></td>
</tr>
<tr>
<td>Isocyanates</td>
<td>241 (22.2)</td>
</tr>
<tr>
<td>Platinum salts</td>
<td>7 (0.6)</td>
</tr>
<tr>
<td>Hardening agents</td>
<td>20 (1.8)</td>
</tr>
<tr>
<td>Soldering flux</td>
<td>69 (6.4)</td>
</tr>
<tr>
<td>Proteolytic enzymes</td>
<td>5 (0.5)</td>
</tr>
<tr>
<td>Laboratory animals insects</td>
<td>49 (4.5)</td>
</tr>
<tr>
<td>Flour grain</td>
<td>81 (7.5)</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>15 (1.4)</td>
</tr>
<tr>
<td>Wood dusts</td>
<td>47 (4.3)</td>
</tr>
<tr>
<td>Azodicarbonamide</td>
<td>10 (0.9)</td>
</tr>
</tbody>
</table>

*Agents not specified

Male

<table>
<thead>
<tr>
<th>Occupation</th>
<th>All (104)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardised rate</td>
<td>249 (23)</td>
</tr>
<tr>
<td>Expected rate (95% CI)</td>
<td></td>
</tr>
<tr>
<td>Standardised rate ratio</td>
<td></td>
</tr>
<tr>
<td>Standardised rate rate/mil</td>
<td></td>
</tr>
<tr>
<td>Male 16-29</td>
<td>84 (11)</td>
</tr>
<tr>
<td>Female 16-29</td>
<td>104 (15)</td>
</tr>
<tr>
<td>Male 30-44</td>
<td>245</td>
</tr>
<tr>
<td>Female 30-44</td>
<td>286*</td>
</tr>
<tr>
<td>Male 45-64</td>
<td>167</td>
</tr>
<tr>
<td>Female 45-64</td>
<td>249</td>
</tr>
<tr>
<td>Male 65+</td>
<td>245</td>
</tr>
<tr>
<td>Female 65+</td>
<td>709*</td>
</tr>
</tbody>
</table>

* Age and sex unknown in 00 cases

Table III  Incidence rates of occupational asthma in relation to sex and age group*—crude and standardised for occupational order

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age group</th>
<th>Observed cases</th>
<th>Observed rate/mil</th>
<th>(95% CI)</th>
<th>Expected cases</th>
<th>Standardised rate/mil</th>
<th>Standardised rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>16-29</td>
<td>84</td>
<td>(9.13)</td>
<td>104.82</td>
<td>0.80</td>
<td>9</td>
<td>0.97 (0.5)</td>
</tr>
<tr>
<td></td>
<td>30-44</td>
<td>98</td>
<td>(10.15)</td>
<td>97.50</td>
<td>1.01</td>
<td>12</td>
<td>1.24 (0.74)</td>
</tr>
<tr>
<td></td>
<td>245</td>
<td>104</td>
<td>(12.18)</td>
<td>83.68</td>
<td>1.24</td>
<td>19</td>
<td>1.36 (0.88)</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>286*</td>
<td>(11.14)</td>
<td>202.00</td>
<td>0.64</td>
<td>11</td>
<td>1.23 (0.78)</td>
</tr>
<tr>
<td>Male</td>
<td>16-29</td>
<td>167</td>
<td>(15.20)</td>
<td>236.97</td>
<td>1.05</td>
<td>24</td>
<td>1.24 (0.88)</td>
</tr>
<tr>
<td></td>
<td>30-44</td>
<td>249</td>
<td>(27.14)</td>
<td>210.03</td>
<td>1.40</td>
<td>43</td>
<td>1.48 (1.02)</td>
</tr>
<tr>
<td></td>
<td>All</td>
<td>709*</td>
<td>(22.25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Age and sex unknown in 00 cases

Discussion

Once acquired, occupational asthma may cause respiratory illness for years to come, even after removal from the exposure that caused it. Prevention therefore depends on the earliest possible identification of occupations at risk and of causal agents, and in the effective control of the work environment.

The number of people with occupational asthma awarded disablement benefit in 1989 and 1990 under the Industrial Injuries Scheme was slightly lower than the number of cases attributed to prescribed agents reported to SWORD in the same period. Although any resemblance of the figures is to some extent coincidental because they are unlikely to include the same people, the distribution of cases by cause was broadly similar, apart from a larger number attributed to isocyanates and laboratory animals in SWORD. More importantly, the agents officially prescribed in 1989 and 1990 accounted for only half the cases in the present analysis. The legislative change which now permits occupational asthma from other causes to be compensated is recognition of the much wider list of respiratory sensitisers, but the additional agents now specified cover only a further 5% of SWORD cases.

No systematic steps were taken to validate the diagnoses of occupational asthma. However, as these were made by specialists in respiratory or occupational medicine they are likely to have been reasonably reliable. Useful evidence on the question was obtained from a study of reported cases of asthma in workers in the chemical and plastics industry. Of 95 cases studied, 85 had respiratory symptoms which improved on days away from

REGIONAL DIFFERENCES

Considerable geographical variation in incidence was apparent (table V), from 9/ml (95% CI 5, 14/ml) in West Yorkshire to 65/ml (95% CI 55, 76/ml) in the West Midlands Metropolitan County. Rates for Yorkshire and Humberside, the East Midlands, and the South East fell well below the national average of 20/ml, and those for the West Midlands, the North, and Scotland were clearly higher than elsewhere. The standardised rate ratios, which took age, sex, and occupation into account, were raised in the regions with high crude rates, and low in those with low rates, although the variability of the standardised rate ratios was less than that of the crude rates. Thus, the diversity in regional rates was only partially explained by differences in population distribution, which suggests that much of it was probably due to different levels of case ascertainment and reporting.

An intensive surveillance scheme for occupational asthma in the West Midlands Metropolitan County by Gannon and Burge underscored the high level of reporting to SWORD in that region. To provide an estimate based on a comparable level of ascertainment from other regions, rates by occupational order in the West Midlands Metropolitan County from SWORD were applied to the UK population. The estimated total number of cases was 2903 (55/ml), 2.7 times the number reported to the SWORD project in the same period.

Prescription of formaldehyde fume welding fume, use of insecticides, and occupational exposure to other chemicals, such as solvents, were also suggested. The differences were significant in nearly half of the comparisons but are likely to be fortuitous given the small numbers. However, the overall rate of formaldehyde fume welding fume was raised in those cases prescribed formaldehyde.

The crude incidence of occupational asthma in men (24/ml) was nearly twice that in women (13/ml). In both sexes the rate seemed to increase with age (table III). A similar trend was also apparent within occupational orders (data not tabulated here). The rates standardised for occupational order rose more steeply with age than the crude rates (table III) because young people of both sexes tended to work in jobs with higher rates of occupational asthma than those in older age groups.

Annual incidence rates by occupational set and sex (table IV) ranged from 3/ml for all those in orders one to 10 (excluding cleaners, hairdressers, farmers, and laboratory technicians) to 658/ml for coach and other spray painters, with little difference between men and women in the same occupational set. Therefore, the sex differences in crude rates were largely explained by differences in the distribution of occupations between men and women.

SWORD
order, and in 11 bronchial challenge or specific IgE tests had been performed. In only two cases was there no corroboration of the diagnosis, in one of which the patient had left his job before any investigations could be undertaken. As such, no conclusion is possible.

Correct identification of the causal agent may have been less reliable, however, as few chest physicians are able to investigate the work environment, and facilities for challenge tests are limited. There may, therefore, have been a tendency to blame agents known to cause asthma rather than other exposures in the work place.

The rates in this analysis provide only the relative frequency of work related asthma by occupation in the UK so far available. To our knowledge the only other national estimates of the risk of asthma by occupation are from Finland.4 Although it is possible that in certain occupations work related asthma has a greater chance of being recognised, and so reported to SWORD, any such bias would only tend to underestimate the incidence in occupations in which the risk was less widely known. Despite underestimation, reporting schemes such as SWORD can draw attention to agents and occupations insufficiently recognised as a source of disease.

Some of the highest rates were in occupational groups well known to be associated with asthma such as laboratory animal workers,11,15 solderers,16 bakers,17 chemical processors, plastics workers,18 and spray painters.19 The latter had a relative risk of occupational asthma that was over 30 times that of the general population; clearly preventative measures for this group are a matter of urgency.

High rates were also found in more unexpected occupations such as food processors (other than bakers) and metal treatment workers. Most cases in the latter set were attributed to various metals, in particular aluminium potroom fume. Although a subject of controversy, aluminium smelting has been associated previously with asthma20,21 as has foundry work.22 However, the relative importance of metal treatment was surprising, although based on fairly small numbers, the set had the fifth highest rate.

The increasing incidence with age, made even greater by standardisation for occupation, was an unexpected finding. Part of the explanation may be patient selection: (i) patients may be more likely to be referred to a chest physician if they develop symptoms later on in life or if they have been ill for some time, and (ii) older employees may wish, despite symptoms, to stay in jobs where they have security and experience and so seek medical help only at a late stage, whereas younger people simply change jobs. On the other hand, susceptibility may increase with age, possibly because of previous occupational exposures or personal habits such as smoking.

The regional variation in rates could not be explained by geographical differences in the age, sex, and occupational distribution of the working population. The relatively small numbers reported from Yorkshire and Humberside, the East Midlands, and South East England were consistent with the areas of the country with fewer cooperating chest clinics, and the relatively large numbers reported from the West Midlands, the North and Scotland were probably due to more complete reporting.

Cases of occupational lung disease reported to SWORD are the “tip of an iceberg”. To be
included in our statistics a patient must be seen by
a participating physician who must not only
recognise the occupational aetiology but
remember to report the case. Many patients with
respiratory symptoms do not seek medical advice,
some for fear of losing their job. Others are seen by
a general practitioner, but are not referred to a
specialist. Those reported to SWORD represent
only a fraction of the actual number of new cases of
occupational asthma in the United Kingdom, and
therefore all the incidence rates in this analysis are
underestimated.

Although rates for the West Midlands Metropolitan
County were no doubt underestimated for the
reasons mentioned, the presence of a regional
surveillance scheme which increased local awareness
of occupational asthma was probably responsible
for the relatively high reported incidence
due to the region. If the same occupational
rates had been achieved for the whole of the UK,
the number of new cases seen by chest and
occupational physicians during the two years would have been nearly three times that reported.
This rough calculation gives only some indication
of the degree of underascertainment, but it is the
best estimate available.

I gratefully acknowledge contributions to this project by
all participating physicians and in particular the
members of our advisory panels: Drs P S Burge, JI Couats, A G Davison, P G Harries, D J Hendrick, J Osman, M G Pearson, C A C Pickering, and J E Stark, and Professors P C Elmes, AJ Newman Taylor, and A Seaton. Professor Corbett McDonald supervised the project and much help has been given by other unit staff (Linda Cronbie, Elizabeth Paul, and Vivien Taylor).

The SWORD project is supported by a grant from the
Health and Safety Executive.


