

SWORD '98: surveillance of work-related and occupational respiratory disease in the UK

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The SWORD surveillance scheme, now 10 years old, uses systematic reporting from physicians to provide a picture of the incidence of occupational respiratory disease in the United Kingdom. An estimated total of 2966 incident cases was derived from reports by chest and occupational physicians during the 1998 calendar year. Occupational asthma continues to be the most-reported respiratory condition, with an estimated 822 cases (27% of total cases). The proportion of cases of mesothelioma (23%), benign pleural disease (21%) pneumoconiosis (7%) and inhalation injuries (6%) remain similar to those estimated in past years, although fewer cases overall were reported. The most commonly identified agents causing asthma in 1998 were enzymes, isocyanates, laboratory animals and insects, colophony and fluxes, flour, latex, and glutaraldehyde. An increased incidence of respiratory diseases of short latency was seen in mining, whilst cases in chemical, mineral products and motor vehicle manufacture remained high; lower rates were noted in wood products and textile manufacture when compared with 1997 figures. Inhalation accidents over the past 3 years were reviewed; gaseous agents and combustion products accounted for nearly half of cases. High rates for inhalation injuries were seen in coal miners, fuel production, motor vehicle manufacturing, water purification, and chemical manufacturing.

Key words: epidemiology; inhalation injuries; occupational asthma; occupational respiratory disease; surveillance.

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INTRODUCTION

The SWORD surveillance scheme for occupational and work-related respiratory diseases has now been in operation for 10 years. The scheme uses systematic reporting from chest physicians to provide a picture of the incidence and patterns of occupational respiratory disease in the United Kingdom, along with information on industry, occupation, and suspected aetiology.^{1,2} Since April 1998, SWORD has been incorporated into the occupational disease surveillance project collectively titled ODIN (Occupational Disease Intelligence Network)

based at the University of Manchester. This now comprises surveillance for occupational skin disease, communicable diseases, musculoskeletal conditions, psychiatric illness, and hearing loss, in addition to the SWORD reporting scheme.³ Occupational physicians continue to report through the Occupational Physicians Reporting Activity (OPRA) from where details of respiratory illness are transferred to SWORD. Close coordination of the schemes helps to ensure uniformity of reporting and better capture of work-related cases. This paper reports on the 1998 SWORD results and findings.

METHODS

Details of surveillance procedures have been reported in previous articles.^{1,2} As in past years, a core group of 24 chest physicians were asked to report monthly to the

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scheme; an average of 71% within this core returned a card monthly through the 1998 reporting year. The remaining 405 chest physicians are randomly allocated to report in one of 12 monthly samples; figures for participation in this group were 69% on monthly average in 1998.

More than 90% of the 648 occupational physicians participating in OPRA responded in their allocated month. This includes 19 medical inspectors, employed by the Health and Safety Executive, who reported every month, and who, by analogy with the core group of chest physicians, are designated as 'core' in this report.

Data analysis has been standardized with the other components of the ODIN programme. Elimination of duplicate reports is performed by systematic searching for limited identifiers provided in the case report. Yearly and overall incidence rates of occupational respiratory diseases for SWORD and OPRA are calculated by combining monthly reports from core physicians with an estimate of cases reported by sampled physicians. Incidence rates of respiratory disease were calculated using employment data from the Winter 1996–1997 *Labour Force Survey* of the Office for National Statistics as denominator values.⁴

DATA SUMMARY

At the end of March 1999, SWORD and OPRA had received reports of 986 cases of occupational respiratory disease first diagnosed by physicians during the 1998 calendar year. Application of the sampling fraction yields an estimated total of 2966 incident cases for 1998. This rate compares with previous estimates of 3903 cases in 1997, 3322 in 1996, 2741 (1995), and 3267 (1994).¹ More than one diagnosis may be included on reporting forms, and thus these 986 cases represent 1008 diagnoses, or an estimate of 3043 diagnoses after application of the sampling fraction. Results of data analysis for 1998 cases are shown in Table 1.

Occupational asthma continues to be the most-reported respiratory condition, although its incidence is lower than previous years, with an estimated 822 cases. Reporting from previous years showed estimates of 1031 asthma cases in 1997 and 1136 in 1996. Mesothelioma remains proportionally the second most reported condition, with benign pleural disease third. Reporting of these conditions is lower as well this year, though cases still remain elevated over levels seen 2 years earlier (496 and 556 cases for mesothelioma and pleural disease, respectively, in 1996). Pneumoconiosis and inhalation injuries continue to be the fourth and fifth most reported conditions. The number of estimated lung cancer cases has remained constant over the past 3 reporting years (112 this year, compared with 111 cases in both 1996 and 1997).

An increase was seen this year in estimated cases of infectious diseases, although the comparison figure from last year represented a substantial decline from 1996 figures. Cases of infectious diseases reported to SWORD included tuberculosis (five cases; four in health care workers and one in a miner), two cases of Q fever (in a farmer and a slaughterhouse worker), and one case each of diphtheria, legionellosis, and *Serratia marcescens* pneumonia.

Under the category heading of 'Other' respiratory disease, 45 reports were received this year, which yields an estimate of 199 cases. As in past years, the majority in this category were reports of rhinitis (24 reported cases). Additional diseases with more than one report were of building related illness (three reports), bronchopulmonary aspergillosis (two), pneumonia from chemical sources (two), and metal fume fever (two). Other reported diseases of note included one case each of fibrosing alveolitis, nasal ulceration from chromic acid, and constrictive pericarditis from asbestos exposure. A single case of byssinosis was also reported this year; this condition had not been reported to SWORD since 1994.

Chest physicians in the core group are asked to classify incident asthma cases. This year's results are little

Table 1. Summary of diagnoses reported to SWORD in 1998, with estimated totals (actual cases = 986, estimated cases = 2966)

Group	Occupational physicians		Chest physicians		Total	Male (%)**	Mean age (years)*	Estimated total 1998	1997 total
	Core	Sample	Core	Sample					
Allergic alveolitis	0	0	5	2	7	86	60	29	59
Asthma	14	32	184	20	250	70	40	822	1031
Bronchitis/emphysema	1	1	9	3	14	93	60	58	89
Infectious disease	0	1	4	6	11	55	50	88	33
Inhalation accidents	4	6	57	4	71	99	42	181	233
Lung cancer	0	0	16	8	24	100	65	112	111
Mesothelioma	4	1	145	45	195	95	64	701	978
Benign pleural disease	1	2	279	27	309	99	63	628	794
Pneumoconiosis	13	1	56	12	82	96	66	225	336
Other	4	14	27	0	45	53	41	199	239
All reports	41	58	782	127	1008	88	55	3043	3903

* Based on 965 cases for which age or date of birth were specified.

** Based on 979 cases for which sex was specified.

changed from previous years, with 78% of asthma cases attributed to sensitization, 11% to irritant exposure, and 11% unspecified. As in past years, all reporting physicians were asked to give their opinion as to the suspected agent for cases of asthma. The most commonly identified sensitizing agents causing asthma in cases reported in 1998 were enzymes (14% of reported cases, the majority in detergent production), isocyanates (13%), laboratory animals and insects (12%), colophony, fluxes, and solders (9%), flour (7%), latex (6%), and glutaraldehyde (5%). A large group of cases from a single plant accounts for the increase in reports of enzyme sensitization in 1998; other agents causing asthma are similar to past years in their proportional contribution to asthma.

Incidence rates by industry and occupation

Since the outset, SWORD has collected data on patient occupation, and from 1996, on industry as well. In combination with information on suspected causative agents, this contributes to a clearer picture of workplace risks for diseases of short latency. Table 2 shows the industries and occupations having the highest rates of short-latency respiratory disease (excluding malignancy, pneumoconiosis, asbestos-related pleural disease, and bronchitis/emphysema) for which 25 or more cases were estimated for 1998 and information on employment was available.

Denominators were obtained from the winter 1996–1997 Labour Force Survey (LFS) and were applied as previously described.^{1,4} Although these figures may be sensitive to yearly fluctuations in reporting, over the course of time they provide a picture of specific occupations with increased risk for pulmonary illness.

An increased incidence of respiratory disease over 1997 figures was seen in mining, in particular in face-trained coal work. Inhalation accidents, predominately from carbon monoxide, comprised the majority of this year's cases among miners. Asthma accounted for most of the cases in chemical manufacture and mineral products manufacture; chemical and gas process workers, and glass and ceramic workers, respectively, were jobs heavily represented in the cases reported in these industries. High rates of asthma in motor vehicle manufacture were seen in workers employed as spray painters and assemblers. Asthma was also the most common respiratory illness in the food processing industry and was noted primarily in bakery workers as a result of flour and enzyme sensitization. Latex and glutaraldehyde exposures accounted for high rates of respiratory disease seen in health care workers, similar to patterns seen in previous years. Notable reductions compared with last year were seen in the incidence of short-latency respiratory diseases in several industries. Wood products manufacture, which had the highest rate among industries in

Table 2. Incidence of short-latency respiratory disease by industry and occupation: SWORD 1998. (Rates per million employed calculated using Labour Force Survey data, Winter 1996)

(a)

<i>Industry (SIC)</i>	<i>Estimated cases</i>	<i>Rate</i>
Mining and quarrying (10–14)	60	557
Chemical manufacture (24)	108	329
Non-metallic mineral products manufacture (26)	52	302
Motor vehicle manufacture (34)	82	269
Food manufacture (15)	125	233
Metal manufacture (27)	42	217
Electrical machinery manufacture (31)	26	107
Health care and social work (85)	240	84
Farming (1)	40	83
Textile, clothing, and leather products manufacture (17–19)	28	65
Overall industry	1288	49

(b)

<i>Occupation (SOC)</i>	<i>Estimated cases</i>	<i>Rate</i>
Face-trained coal workers (597)	40	4951
Glass/ceramic production (591)	38	2429
Scaffolders, staggers, riggers (505)	36	2025
Printers (561)	25	1414
Coach and spray painters (596)	32	912
Medical/dental technicians (346)	27	733
Bakery operatives (800)	26	672
Other scientific technicians (309)	37	616
Chemical/gas process plant workers (820)	36	543
Vehicle and metal goods assemblers (851)	31	398
Overall occupation	1288	49

1997 (506 cases per million workers) showed a drop to 34 cases per million this year, an incidence lower than the average across industries. Textile and clothing manufacture showed a similar reduction in incident cases (65 cases per million in 1998, contrasted with 397 per million in 1997).

Among other respiratory diseases in this category, allergic alveolitis remains almost exclusively reported in farming and related occupations; mushrooms, malt, and grain were indicated as suspected agents in these cases. Workers employed in health care continue to have the highest risk of infectious diseases, with tuberculosis again the most reported infectious illness in this population.

Inhalation accidents

Inhalation injuries comprise the second most common short-latency illness, and the fifth highest overall, reported to SWORD. Figures for responsible agents and industries involved in inhalation accidents were last compiled from 1990–1993 data.⁵ Substances implicated in inhalation injury over the past 3 years (1996–1998) are shown in Table 3. A total of 70 agents were reported, for an estimated 606 cases over this period. The categories of agents reported during this period were very similar to those from the 1990–1993 period; gaseous agents and combustion products accounted for 49.8% of cases (45% in 1990–1993), organic chemicals for 23% (24% in earlier period), and inorganic chemicals, including acids, for 15.1% (15%). Metals and metal fumes were responsible for 4.1% of cases in 1996–1998 (6% in 1990–1993), and miscellaneous agents were responsible for 8% of

Table 3. Agents responsible for inhalation injuries reported to SWORD: 1996–1998 (agents comprising 1% or more of inhalation injury cases)

Agent	Number of estimated cases	% of cases
Anaesthetic gases	72	11.1
Acids and caustics	70	10.8
Solvents	56	8.6
Carbon monoxide	44	6.8
Smoke	42	6.5
Sulphur dioxide	39	6.0
Aldehydes	28	4.3
Ammonia	28	4.3
Metals/metallic compounds	27	4.1
Ill-defined fumes/gases	26	4.0
Chlorine	24	3.7
Ozone	24	3.7
Drugs and medicaments	24	3.7
Cleaning materials, soaps and detergents	19	2.9
Amines	14	2.2
Bleach	13	2.0
Phosgene	13	2.0
Sterilizing agents and disinfectants	12	1.8
Isopropyl alcohol	12	1.8
Hypochlorites	12	1.8
Total estimated cases	606	100.0

Table 4. Incidence of inhalation accidents by industry: SWORD 1996–1998. (Rates per million employed per year calculated using Labour Force Survey data, Winter 1996, based on industries with >10 estimated cases)

Industry (SIC)	Estimated cases	Annual rate
Mining and quarrying (10–14)	31	411
Coke, petroleum products, and nuclear fuel production (23)	14	75
Motor vehicle manufacture (34)	62	68
Water collection, purification, and supply (41)	13	67
Chemical manufacture (24)	47	48
Electricity and gas supply (40)	13	35
Metal manufacture (27)	19	33
Rubber and plastic products manufacture (25)	26	33
Non-metallic mineral products manufacture (26)	14	27
Health care and social work (85)	153	18
Overall industry	606	7.7

cases in both periods. The most frequently identified single agents from 1996 to 1998 were halothane and the solvent diethyl benzene.

Rates of inhalation accidents by industry are shown in Table 4. As might be expected, specific inhalation hazards appear to closely parallel rates in certain industries. The highest rate was seen in coal miners, which reflects a large number of carbon monoxide inhalation cases reported in this industry, as noted earlier. Motor vehicle manufacturing workers are at high risk from solvent exposures; diethyl benzene was indicated as a responsible agent in many of these cases. Noxious gases, notably ozone, are responsible for injuries sustained in the water purification industry while acids were responsible for many of the cases reported in chemical manufacturing. A previous SWORD report indicated high rates of inhalation accidents (65 per million workers) in health care over a single (1997) reporting year.¹ This does not appear to be a sustained finding over a longer period, however; although the cases in this industry amount to one-quarter (153) of all inhalation accidents, the overall rate in health care for the 3-year period was 18 per million, placing it tenth among industries.

Cases of the month

Case descriptions of special interest continue to be circulated monthly to physicians participating in SWORD. Another eight cases were published this year. A case of emphysema arising in a copper–cadmium alloy caster was reported; detectable urinary cadmium levels 10 years after the worker left employment assisted with the diagnosis. A second case occurring in a demolition worker was presented as an example of the difficulty of attributing emphysema to work versus non-occupational factors such as smoking. Asthma cases were reported in which the responsible agents were field beans, cleaning materials, and a single large exposure to isocyanates, in effect an inhalation accident. Also published was a report

of a group of policemen who developed irritant-induced asthma from an exploded dry-powder fire extinguisher. The mixture of sodium bicarbonate and ammonium phosphate in the dry-powder extinguisher was considered not only to have induced asthmatic symptoms but the point was made as well that in a confined space this could be potentially life-threatening, as the aim of this extinguisher is to remove all available oxygen from a fire site. Haemoptysis in a machinist using coolant oils was reported; bronchoscopy showed diffuse erythema and contact bleeding throughout the bronchial tree, and improvement of symptoms and signs occurred when he was removed from coolant exposures. Finally a case of lung cancer in an electroplater was considered to have arisen from exposures in the course of work to hexavalent chromium or, less likely, to nickel.

COMMENT

SWORD has now completed a full decade as a national surveillance scheme. Its usefulness lies in extensive reporting coverage from occupational and chest physicians throughout the UK. Other surveillance schemes for respiratory disease are limited to smaller populations (such as the SENSOR programme in the United States) or are compiled through aggregate reports from a number of widely varying data sources.⁶ Registers of occupational diseases maintained in many European countries are based upon cases reported for compensation, and thereby may lose information regarding illness not covered under compensation statutes. Incorporation of SWORD with other surveillance schemes into the ODIN project at the University of Manchester also permits the inclusion of reports from occupational physicians into a wider variety of specialist surveillance schemes. At the same time, because of centralization and coordination with ODIN, individual cases are appropriately classified and duplication of reports can be eliminated.

A reduced estimate of occupational respiratory disease cases this year is noted when 1997 figures are compared. With the exception of infectious diseases and lung cancer, fewer cases of all illnesses across the scheme were reported. Comparisons between reporting years should be made with caution, and differences from year to year may not indicate larger trends over time. For example, 1997 figures were increased by a large number of mesothelioma reports in that year; this year's mesothelioma

cases, although reduced from 1997 levels, still remain above estimates reported from prior years.

Additional strengths of the SWORD project were noted in previous reports.^{1,2} Among the most notable changes has been the introduction into the scheme over the past several years of an increased amount of information on employment. Incorporation of data from the Labour Force Survey has enabled calculation of incidence rates for industry, and permitted examination of specific industries, jobs, and aetiological agents more closely. With continued collection of surveillance data, along with a stable level of reporting, the potential exists for closer examination of trends in the incidence of work related respiratory disease through the SWORD scheme.

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