Trends in pneumoconiosis and other lung diseases, as reported to a UK-based surveillance scheme for work-related ill-health

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Abstract: The changing nature of industries associated with exposure to hazardous dusts in manufacture or in use, as well as better control methods, might be expected to be associated with a reduction in incidence of pneumoconiosis and other lung diseases. Data collected by the University of Manchester’s ODIN/THOR network on work-related ill-health in the UK (as diagnosed by specialist physicians) can be used to estimate time trends in the lung diseases reported to the surveillance schemes. Reporters of work-related lung diseases in THOR (previously ODIN) mainly comprise two groups, namely clinical specialists in respiratory medicine and occupational physicians. These reporters return information on work-related cases of ill-health using postal reporting cards or an on-line web form. ‘Report cards’ are returned even if no new cases are seen, with responses recorded each month i.e. whether a card is returned and number of cases returned. Probabilities of a non response and, for returned cards, of a ‘zero’ return were modelled as a function of calendar time and/or membership time using 2-level logistic models. Annual change in disease incidence (all work-related respiratory disease and specific diagnoses) was estimated using 2-level Poisson models controlling for reporter characteristics, season, and whether or not a first report. The impact of membership time on reporting was also investigated. Case reports include information on patient demographics, diagnoses, industry, occupation, and suspected agents/exposures. These case details are coded and analysed using SPSS. Annual change in incidence of all work-related respiratory disease reported by specialist chest physicians (1999-2006) was -1.7% (95% CI: -3.1%, -0.2%). Specific diagnoses reported by chest physicians showed that the annual change in incidence for asthma was -3.1% (95% CI: -5.8%, -0.4%), for mesothelioma was -4.1% (95% CI: -6.7%, -1.5%), for benign pleural plaques was +1.1 (95% CI; -1.0%, +3.2%), and for pneumoconiosis was -2.6 (95% CI: -6.6, +1.5) over the same time period. Occupational physicians’ reporting showed a change in incidence of -6.1% (95% CI: -11.6%, -0.4%) for all respiratory disease, and -8.4% (95% CI: -15.3%, -0.9%) for asthma. Given variation between reporter groups, and according to model assumptions, time trends from surveillance data need to be interpreted with caution, but may have some place in planning interventions aimed at improving the health of a workforce. Further work to investigate case details (such as suspected agent/exposures) should also add to this knowledge base.
1. Background
The changing nature of industries associated with exposure to hazardous dusts in manufacture or in use, as well as better control methods, might be expected to be associated with a reduction in incidence of pneumoconiosis and other lung diseases. The ‘Revitalising Health and Safety’ (RHS) initiative announced in 1999 [2] set out a headline target to reduce the incidence rates of cases of work-related ill-health by 20% by 2010, and to achieve half the improvement by 2004. This was reaffirmed in ‘Securing Health Together’ [3]. National disease incidence data include sources such as the Self-reported Work-related Illness [10] survey, which reports information that is subjective (as it is dependent on the perceptions and beliefs of the sufferer), and voluntary surveillance schemes for occupationally related ill-health, which are based on medical reports.

In the UK, a pioneering scheme for work-related respiratory disease reporting (SWORD) was set up in 1989 [6]. Following this, sister schemes to cover other work-related diagnostic areas were developed (such as skin disease, psychological ill-health and musculoskeletal disorders), and collectively formed the Occupational Disease Intelligence Network (ODIN) which existed until 2002, when the schemes were relaunched as The Health and Occupation Reporting (THOR) network [11].

In THOR, occupational respiratory disease is reported by clinical specialists in respiratory medicine, by occupational physicians, (on a smaller scale) by consultants in communicable disease control, and by general practitioners (since 2005). Data collected on work-related respiratory disease in the UK by the University of Manchester’s ODIN/THOR networks have been studied in detail in order to estimate true rates of change in incidence of work-related respiratory diseases from 1996-2005 [5]. In this study, reporting to SWORD by clinical specialists in respiratory disease showed a fall in incidence for pneumoconiosis of -5.7% (95% CI: -10.5, -0.5) per year. More recent data are now available from THOR which can be used to extend the trends in incidence study period. In addition, information on specific diagnoses, for example pneumoconiosis and non-malignant pleural disease (NMPD), and analysis of causal agents can be undertaken.

2. Aims
To investigate time trends for lung diseases reported to a UK wide surveillance scheme for work-related ill-health.

3. Methods
Reporters of lung diseases in SWORD comprise clinical specialists in respiratory medicine who return information on work-related cases of ill-health using postal reporting cards or an on-line web form. Reporting cards or web forms are returned even if no new cases are seen, with responses recorded each month i.e. whether a card is returned and the number of cases returned. There are two groups of reporters within SWORD; ‘core’ reporters who are asked to return a reporting card (or web form) every month, and ‘sample’ reporters who return a card (or web form) for one randomly allocated month each calendar year. The ‘core’ reporting group mainly comprises respiratory specialist physicians with a specific interest in work-related lung disease, while the ‘sample’ group also consists of respiratory specialist physicians but most of these do not have such a specific interest in occupational diagnoses.

Probabilities of a non response and, for returned cards, of a “zero” return were modelled as a function of calendar time using 2-level logistic models. Annual change in disease incidence (all work-related respiratory disease and specific diagnoses) was estimated using a 2-level (hierarchical) Poisson regression model controlling for reporter characteristics (e.g. ‘core’ or ‘sample’ reporting), season, and whether or not a first report. The impact of membership time on reporting was also investigated. The STATA software command xtnbreg was used to fit longitudinal, negative binomial (i.e. over-dispersed) Poisson models with random effects.
Case reports include information on age, gender, geographical location (first half of postcode) job title, industry, and suspected agent (up to six agents can be recorded) for each case. The occupational information within the case reports is coded using the Standard Occupational Classification (SOC) for the job title, and the Standard Industrial Classification (SIC) for data on industry [9],[7],[1]. The postcode information allows grouping of information according to the geographical classification in the Labour Force Survey [8]. All coding is undertaken independently by two researchers, and any discrepancies are reconciled by a third person.

Case details were analysed for all respiratory disease, reports of NMPD, and diagnoses of pneumoconiosis, using SPSS v15.0.

4. Results

Annual change in incidence of all work-related respiratory disease reported by specialist chest physicians (1999-2006) was -1.7% (95% CI: -3.1%, -0.2%). Specific diagnoses reported by chest physicians showed that the annual change in incidence for pneumoconiosis was -0.8 (95% CI: -4.8, +3.3), and for NMPD was +2.2 (95% CI: -1.0%, +3.2%), over the same time period (Figures 1 and 2).

Figure 1. Percentage change in incidence of pneumoconiosis in SWORD (1999-2006)
Between 1999 and 2006, 3697 cases of non-malignant pleural disease (NMPD) were reported to SWORD. Nearly all (97.7%) were males, and the mean age was 66.3 years (most cases [55.6%] being in the 60-75 year age range). The most frequently reported employment sectors were construction (37.0%); ‘manufacture of other transport equipment’ (20.3%) i.e. ship building; and ‘electricity, gas, steam and hot water supply’ (8.2%) i.e. employment in power stations. Nearly all cases (98.8%) cited asbestos as a causal agent.

There were fewer reports of pneumoconiosis than NMPD over this 7 year time period, with 637 cases reported to SWORD. Again, the vast majority (99.1%) were males, and the age demography was similar to that seen for NMPD reporting; a mean age of 69.1 years and most cases [54.9%] being in the 60-75 year age range. Construction (27.0% cases) and ‘manufacture of other transport equipment’ (17.4%) were the two most frequently reported employment sectors, but ‘mining of coal and lignite; extraction of peat’ (which was solely coal mining as reported to SWORD) featured as the third most frequently reported industrial sector, contributing 12.6% cases. Asbestos was reported as a causal agent in three quarters (75.2%) of the cases, coal dust in 10.2%, and silica in 8.9%.
5. Conclusions
We cannot conclude with confidence whether the incidence of pneumoconiosis is changing using these data, but there is a suggestion of increasing incidence for NMPD. We also found variations in trends between ‘core’ and ‘sample’ reporter groups for the two diagnoses.

For pneumoconiosis, it is likely that potential cases of work-related lung disease are referred to (and therefore reported by) tertiary respiratory centres who make up the ‘core’ reporting group within SWORD, thereby accounting for the differences in incidence between ‘core’ and ‘sample’ reporting. It is also possible that, if pneumoconiosis incidence is falling (or perceived to be falling), the tertiary centres with specialist interest in occupational disease see proportionately more of the cases than chest physicians without special interest or expertise in this area.

In comparison, the greater increase in trend for ‘sample’ (rather than ‘core’) reporting for NMPD might be explained by changes in medical practice, which may artefactually affect trends. For example the increasing availability and sensitivity of modern imaging techniques (such as computerised tomography) might produce incidental findings including pleural plaques, and result in apparent upward trends, especially for the ‘sample’ reporting group who may have less expertise in, and experience of, work-related lung disease.

When addressing work-related disease incidence, validity is also vulnerable to systematic changes in, or awareness of, the epidemiological evidence of causal links, and in government policy (such as compensation), and we cannot rule out reporting bias for such reasons. Brief guidance on attribution is available to SWORD reporters, but imposition of strict criteria for disease or its attribution is deliberately avoided so as to encourage and maintain participation. Such compromises are typical of surveillance systems – characterised by “practicality, uniformity and rapidity, rather than by accuracy or completeness” [4] - but may also be inevitable in any long-term, voluntary data collection system [5].

In summary, although the monitoring of trends as described here need to be interpreted with caution, they may have a place in planning or evaluating interventions aimed at improving the health of a workforce. For pneumoconiosis and NMPD such interventions may have limited scope in view of historical aspects relating to exposure, but these methodologies may be important for ongoing monitoring of newer agents, such as ‘asbestos substitutes’. Further work to investigate case details (e.g. suspected agents/exposures, industrial sectors and occupations) may also add to our knowledge base of work-related lung diseases.

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