Workforce coverage by GB occupational physicians and disease incidence rates

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Background  In various countries, reports from occupational physicians (OPs) are an important source of work-related illness (WRI) data. In Great Britain (GB), this is undertaken through the Occupational Physicians Reporting Activity (OPRA) surveillance scheme. Because access to an OP is uneven in GB applying the GB workforce as the denominator could lead to bias when calculating incidence rates. To improve the validity and utility of OP-derived data, it is important to improve the quality of the underlying denominator data.

Aims  To estimate the proportion of the GB workforce covered by OPRA participants and subsequently to calculate OP-derived incidence rates.

Methods  OPRA participants were surveyed once in each triennial period (2005–07 and 2008–10) about the workforce they covered. Numbers of GB employees within each major industrial division covered by the OPRA reporters’ occupational health (OH) services were calculated and compared with Labour Force Survey data. Incidence rates were calculated for all industry and for selected sectors.

Results  OPRA reporters’ OH services covered ~13% of the GB workforce in 2005–07 and 9% in 2008–10. This increased to 34% if adjusted to represent all GB OPs. Annual average incidence rates (2005–07 and 2008–10) were 301 and 336 (total WRI), 150 and 199 (mental ill-health), 103 and 99 (musculoskeletal), 23 and 24 (skin), and 11 and 9 (respiratory), per 100,000 employed.

Conclusions  Estimating the workforce covered by OP reporters can strengthen the quality of the information source, enabling comparisons between OP data and information from other sources, as shown by OPRA in GB.

Key words  Incidence; occupational physicians; surveillance.

Introduction

The annual cost of workplace injuries and work-related illness (WRI) to Great Britain (GB; i.e. England, Scotland and Wales) is high at an estimated £13.4 billion [1]. For policy makers to address this burden, reliable data are required on the incidence of WRI, including variation across employment sectors. Most countries within the European Union have national systems established to recognize and compensate WRI and/or independent systems that are not linked to compensation [2]. Within GB, major independent sources of WRI data include the Self-reported Work-related Illness (SWI) survey [3] and The Health and Occupation Research (THOR) network [4]. Data collected by both are extensive. However, reports to THOR are medically diagnosed, as opposed to self-reports to the SWI. Three categories of physicians currently report to THOR: system specialists in dermatology and respiratory medicine, general practitioners (GPs) trained to diploma level in occupational medicine (DOcc Med) and specialist occupational physicians (OPs) (Supplementary Figure 1, available as Supplementary data at Occupational Medicine Online). The collection of data from different groups of physicians within THOR enables the ‘triangulation’ of incidence rates, that is, comparison of rates originating from different sources [5]. However, the validity of this triangulation is dependent on accurate incidence rates, which requires (amongst other things) the denominator (population covered) by each group of physicians to be accurately quantified.
For system specialists and GPs in GB quantifying the denominator is comparatively straightforward; according to principles underpinning the UK (i.e. GB and Northern Ireland) National Health Service, the whole of the GB workforce has access to a GP, who can make referrals to a system specialist. Not all relevant specialists or GPs participate in THOR, so incidence rates could be underestimated if the whole of the GB workforce was applied as the denominator. However, if the participation rates were known, incidence rates could be adjusted accordingly [6,7]. For OPs, however, the situation is less straightforward. Access to an OP amongst the GB workforce is biased toward the public sector and larger employers, with ~12% of the UK’s working population having access to an OP (based on 503 OPs reporting to THOR from 1998–2000) [8]. Therefore, applying the total GB workforce as the denominator could lead to bias when calculating OP incidence rates. However, the quantity and quality of information returned by OPs are good (active engagement with THOR is high for OPs) [9]. Therefore, to improve further the validity and utility of these OP-derived data, it is important to improve the quality of the underlying denominator data.

This study aimed to estimate the proportion of the GB workforce covered by OPs reporting to THOR, to enable calculation of incidence rates of WRI reported by this group of physicians.

Methods

Within THOR, OPs report cases of WRI to the Occupational Physicians Reporting Activity (OPRA) scheme, which has been described previously [10]. Briefly, physicians are asked to report incident cases that they believe have been caused or aggravated by work. Physicians participate either on a continuous monthly basis (core reporting) or for one randomly selected month each year (sample reporting). Reports include diagnosis, age, gender, occupation, industry, suspected agent, reason for referral to an OP and date of symptom onset.

In 2005, a 3-year rolling denominator survey was initiated to investigate the workforce covered by OPRA participants. Each reporter was asked to complete a questionnaire once in 3 years and non-responders were followed up on two further occasions. This process was undertaken for two triennial periods: 2005–07 and 2008–10. The questionnaire listed the main industrial sectors in GB corresponding to the Standard Industrial Classification (SIC) [11] and the OP was asked to estimate the number of employees by sector covered by their occupational health (OH) service. OPs were also asked what proportion of WRI cases were seen (i) personally, (ii) by other OPs within the same OH service and (iii) by other OH professionals (e.g. nurses). Data were entered into a Microsoft Access database, checked by a second independent researcher and then exported to SPSS for analysis.

For each triennium and for each industrial sector, the number of GB employees that the OPRA reporters said their OH services covered was calculated by adding up the totals provided in the individual questionnaires. To estimate the proportion of the total GB workforce this equated to, these totals were compared with the total number of GB employees working in each industrial sector, using Labour Force Survey (LFS) data [12]. The LFS is a quarterly survey of UK households, which obtains representative information on the UK labour market. In GB, ~50,000 households are sampled every quarter (representing ~0.1% of the GB population) [13]. The method employed to calculate incidence rates is shown in Figure 1. Incidence rates were calculated for all employment sectors (separately for each major diagnostic category) and for selected sectors.

Multicentre research ethics committee approval has been granted to THOR (reference number MREC 02/8/72).

Results

A total of 467 OPs in GB were sent the denominator questionnaire during the first triennium and 345 in the second triennium (Table 1). Of these, 330 OPs were surveyed in both. Response rates were higher for the first survey (68%) than the second survey (55%). Of the 509 questionnaires returned overall, 70 did not provide estimates about numbers employed (reasons included the physician having retired, died or moved away or that it was too difficult to provide estimates). In both surveys, OPs most frequently reported covering sectors including manufacturing, health and social care and public administration and defence (Table 2). A comparison with LFS data suggested that 13% (2005–07) and 9% (2008–10) of the GB workforce was covered by OPRA reporters’ OH services.

The proportion of WRI seen personally by OPs completing the questionnaires reduced the total number of employees covered to 1,567,722 (42% of the total covered by OH services) for 2005–07 and 791,214 (33%) for 2008–10 (Table 3). For health and social care, manufacturing, education and electricity, gas and water supply, the proportion of cases reported by OPs who also stated they covered the associated sector in the denominator questionnaire was >50% in both triennia. For other sectors, the equivalent proportions were much lower, notably <1% in the case of agriculture.

The annual average incidence of WRI (all industry) was slightly higher in 2008–10 (336 per 100,000 employed) compared with 2005–07 (301 per 100,000 employed) (Figure 2). Among diagnostic categories, incidence rates were highest for mental ill-health with an increase from 150 per 100,000 employed in 2005–07 to 199 in 2008–10. Incidence rates for musculoskeletal disorders were similar for the two periods (103 per 100,000 employed for 2005–07 and 99 for 2008–10).
Lower incidence rates were observed for skin and respiratory WRI with similar rates for the two periods: skin 23 (2005–07) and 24 (2008–10) per 100 000 employed, and respiratory 11 (2005–07) and 9 (2008–10).

When analysed by industry sector, incidence rates were highest for manufacturing and health and social care, with rates for both sectors lower in 2008–10 compared with 2005–07: manufacturing 741 (2005–07) and 679

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### Figure 1. Methodology employed to calculate incidence rates for occupational physicians reporting to OPRA, for the periods 2005–07 and 2008–10.

OPs were asked to provide the number of employees in each of the main industrial sectors their OH services covered.

OPs were asked what percentage of the total cases seen in their OH service they saw personally.

For each industry, the number of employees covered was adjusted by the percentage seen personally. For example, if an OP said their OH services covered 500 employees in manufacturing but they personally only saw 10% of the cases, then the number of employees in manufacturing personally covered by them was 50. If a physician did not state the proportion they saw personally, it was assumed they saw 100% of the cases.

For each industry, the numbers of employees each OP covered personally were summed to obtain a total denominator estimate for that industry.

The numerator data were cases reported to OPRA over the same time period as each survey (i.e. cases reported during 2005–07 and cases reported during 2008–10). From these, cases were selected for inclusion in the numerator only if the OP who reported them also provided denominator information for the industry in question.

Incidence rates were calculated for total industry by summing all the cases selected in Step 5 and dividing by the sum of all the denominator totals calculated in Step 4 and multiplying the result by 100000. This was carried out for all causes and then separately for skin, respiratory, musculoskeletal and mental ill-health.

Step 5 identified a number of ‘mismatches’ between the numerator and denominator data, that is OPs reporting cases from industries they did not say they covered in the denominator surveys and vice versa. It was decided to only calculate industry-specific incidence rates for those industries where >50% of the cases were reported by OPs who had also returned denominator information for the sector in question.

Incidence rates (all causes) were calculated for each of the industries selected in Step 7 by summing the cases (for the relevant industry) selected in Step 5 and dividing by the sum of the denominator totals (for the selected industry) calculated in Step 4 and then multiplying the result by 100000.
(2008–10) per 100 000 employed and health and social care 473 (2005–07) and 445 (2008–10) per 100 000 employed (Figure 3). Incidence rates for education were lower compared with industry overall, with an increase between the two time periods from 209 (2005–07) to 248 (2008–10) per 100 000 employed. Of the four sectors, incidence rates for electricity, gas, and water supply exhibited the greatest variation between the two time periods increasing from 315 per 100 000 employed in 2005–07 to 548 in 2008–10.

Discussion

This study found that ~13% in 2005–07 and 9% in 2008–10 of the GB workforce were covered by OPRA reporters’ OH services. This compares to 12% from a study undertaken in 2001 (which covered the UK rather than GB) [8]. However, the ‘true’ proportion of the workforce covered by OPs in general is likely to be higher. Not all OPs participate in OPRA, despite recruitment being an ongoing process. According to the UK Faculty of Occupational Medicine, there were ~940 (2005–07) and 970 (2008–10) qualified (i.e. excluding doctors in training) OPs during the study period [14], suggesting OPRA participation rates of 56% and 45%. Adjusting for this, and for those OPRA participants who did not provide denominator estimates, would increase the proportion of the GB workforce covered to ~34% (for both 2005–07 and 2008–10). Others have estimated that 30% of the UK workforce had access to specialized OH care in 2010 [15].

Construction and agriculture, both of which have been shown to have significantly increased risks of
many types of WRI [16, 17], were identified as having low coverage by OPs. McDonald (2001) also observed a lack of OH provision within the agricultural sector (1% of the workforce) [8]. However, in general, any apparent ‘trends’ between the surveys should be interpreted with caution and would involve careful consideration of differences in questionnaire response rates and so on.

Incidence rates based on OPRA data (UK rather than GB) have been estimated previously [18]. The annual average reported incidence rate of WRI (1996–2001) was 342 per 100,000 employed compared with 301 (2005–07) and 336 (2008–10). Diagnoses reported to OPRA (2005–10) were predominantly of musculoskeletal disorders and mental ill-health (>90%). Musculoskeletal disorder incidence rates decreased from 163 per 100,000 employed (1996–2001) to 103 (2005–07) and 93 (2008–10), whereas mental ill-health incidence rates increased from 83 per 100,000 employed (1996–2001) to 150 (2005–07) and 199 (2008–10). Similar changes in OP-reported (relative) incidence have been shown using multilevel models (adjusted for potential confounders), perhaps reflecting a shift over time in how patients present their symptoms from a physical to a psychological perspective [9]. OP-reported skin and respiratory disorder incidence rates (1996–2001) were 60 and 23 per 100,000, respectively [18]. This compares to 23 (2005–07) and 24 (2008–10) for skin and 11 (2005–07) and 9 (2008–10) for respiratory disease. These findings are consistent with multilevel model results, which observed a steeper fall in (relative) incidence of OP-reported skin and respiratory disease in earlier (1996–2004) compared with later (2005–10) years [19]. The overall decline may reflect the success of interventions aiming to reduce the incidence of WRI attributed to specific agents such as latex and chromium [20,21].

Calculating incidence rates enables OPRA data to be triangulated with other sources. For example, WRI incidence rates based on GP-reported THOR data were 4–5 times higher than OP-reported rates at ~1551 (2006–08) and 1429 (2008–10) per 100,000 employed [22,23]. The observed disparity may reflect factors such as consultation preferences. Employees with access to both an OP and a GP are likely to consult their GP, where they routinely self-refer, particularly for problems that are more difficult to attribute to work [24]. Only 14% of cases reported to OPRA (2005–10) were self-referred. Incidence rates based on reports to THOR from dermatologists and chest physicians might be expected to be lower (because they tend to see more severe cases of disease) than those based on OP data. However, although true for skin disorders, respiratory disease incidence rates were higher for chest physicians compared with OPs [6]. This apparent anomaly may reflect low coverage of construction sector workers by OPs. Consequently, OPs tend not to see asbestos-related cases (that comprise 70% of the cases

<table>
<thead>
<tr>
<th>SIC codesa</th>
<th>Description</th>
<th>2005–07</th>
<th>2008–10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of employees covered by OPRA reporters</td>
<td>Annual estimated casesb</td>
<td>Annual estimated cases (%)c</td>
</tr>
<tr>
<td>1, 2, 5</td>
<td>Agriculture, hunting, fishing</td>
<td>5085</td>
<td>13</td>
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<tr>
<td>10–14</td>
<td>Mining and quarrying</td>
<td>5945</td>
<td>93</td>
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<td>15–37</td>
<td>Manufacturing</td>
<td>141 688</td>
<td>1597</td>
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<tr>
<td>40, 41</td>
<td>Electricity, gas and water supply</td>
<td>26 373</td>
<td>163</td>
</tr>
<tr>
<td>45</td>
<td>Construction</td>
<td>22 256</td>
<td>156</td>
</tr>
<tr>
<td>52</td>
<td>Retail trade</td>
<td>91 482</td>
<td>136</td>
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<tr>
<td>60–63</td>
<td>Transportation</td>
<td>117 574</td>
<td>205</td>
</tr>
<tr>
<td>64</td>
<td>Post and telecommunications</td>
<td>51 870</td>
<td>100</td>
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<tr>
<td>65–67</td>
<td>Financial intermediation</td>
<td>38 106</td>
<td>114</td>
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<tr>
<td>75</td>
<td>Public administration and defence</td>
<td>353 187</td>
<td>1473</td>
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<tr>
<td>80</td>
<td>Education</td>
<td>145 152</td>
<td>548</td>
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<tr>
<td>85</td>
<td>Health and social care</td>
<td>451 131</td>
<td>3182</td>
</tr>
<tr>
<td>50, 51, 55, 70–74, 90–99</td>
<td>All other industries</td>
<td>117 873</td>
<td>569</td>
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<tr>
<td>All Total</td>
<td></td>
<td>1 567 722</td>
<td>8349</td>
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</tbody>
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aSIC 2003.
bAnnual estimated cases reported by all OPRA reporters.
cAnnual estimated cases (and proportions) reported by those OPs who returned denominator information for this sector.
reported by chest physicians). The long latency period of some asbestos-related diseases means that cases may not manifest until after retirement, so are less likely to be seen by an OP. The other main GB-wide source of WRI information is the SWI. As expected (given that reports to the SWI are self-referred), incidence rates based on SWI data were higher than those based on OP data at \( \approx 1800 \) (SWI) per 100 000 employed for total WRI (rates remained relatively unchanged during 2005–10) [25].

Incidence rates were also estimated for industries for which >50% of the cases reported to OPRA were from OPs also reporting denominator information for the sector in question (five industries). The substantial number of OPs providing ‘mismatching’ numerator and denominator information perhaps reflects the difficulty for OPs in accurately defining the workforce they cover, with many companies disbanding their OH departments in favour of external OH services, which may cover a wide range of companies. All of the selected industries (except education) had higher incidence rates compared with industry overall. This may reflect increased awareness of WRI by employees within these sectors, or be associated with implementation of guidance from the Health and Safety Executive in sectors, where access to OH services is comparatively good. OPs covering the higher education sector may cover students as well as staff (e.g., student nurses). If included in the denominator estimates for education (of which there was some evidence), incidence rates for this sector would be underestimated (in THOR, equivalent numerator cases are categorized by the industry being trained for, e.g., health and social care for student nurses).

The methodology explored in this article is relevant internationally. Various health surveillance systems in Europe [26] and elsewhere [27] rely on OPs (as well as other specialities) for data collection on WRI. These health surveillance schemes can make an important contribution to observational epidemiology in OH [28]. Therefore, the results presented here, albeit based on OPs practising in GB, provide important information, which can be generalized. They provide a current picture of the extent of OP coverage, including how it may vary between industries. Furthermore, despite the limitations associated with determining denominators for OPs, obtaining these updated estimates of the workforce covered by OP reporters has strengthened OP reporting as an information source. It has enabled incidence rates to be calculated, thus allowing comparisons between OP-reported data and information from other sources, both within and external to THOR.

Figure 2. Incidence rates (per 100 000 employed) of WRI (by major disease category) reported to OPRA, 2005–07 and 2008–10, all industrial sectors.
consistency has been observed within THOR datasets, helping to triangulate the data sources.

**Key points**
- Approximately 13% (2005–07) and 9% (2008–10) of the Great Britain workforce was covered by Occupational Physicians Reporting Activity reporters’ occupational health services.
- Annual average incidence rates for total work-related illness were 301 (2005–07) and 336 (2008–10) per 100,000 employed.
- Estimating the workforce covered by occupational physician reporters (thus enabling incidence rates to be calculated) has strengthened Occupational Physicians Reporting Activity as an information source, facilitating comparisons between occupational physician data and information from other sources.

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We are grateful to the physicians who report to THOR for their continuing support. Physicians who wish to join THOR and participate in reporting can find further details at [http://www.medicine.manchester.ac.uk/ohresearch/thor/](http://www.medicine.manchester.ac.uk/ohresearch/thor/). This paper expresses the views of the authors and not necessarily of the funders.

**Conflict of interest**

None declared.

**References**


