Comparison of work-related ill-health data from different GB sources

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Background
A number of data sources help inform policy decisions regarding the risk of work-related ill-health.

Aims
To compare self-reported and medically reported data from multiple sources and discuss their benefits and limitations in providing estimates of work-related ill-health incidence in Great Britain.

Methods
Sources included The Health & Occupation Reporting network (THOR & THOR-GP (THOR in General Practice)) and the survey of Self-reported Work-related Illness (SWI). Results from SWI and THOR from GPs, rheumatologists, psychiatrists, dermatologists and respiratory physicians (2006–2009) were compared. THOR-GP data also included patient referrals information.

Results
Overall incidence rates were highest when calculated from self-reported data, and lowest from clinical specialists. SWI rates were higher than GP rates for mental ill-health (SWI 790, GP 500 per 100 000 persons employed) and ‘other’ diagnoses (SWI 368, GP 41), whereas incidence rates for musculoskeletal (SWI 670, GP 684) and skin diagnoses (SWI 38, GP 152) were higher from GPs. Very few cases of musculoskeletal and mental ill-health were referred to clinical specialists (<1%). Skin (15%) and respiratory (26%) cases were referred more frequently. Case mix varied by data source.

Conclusions
SWI is more inclusive than THOR-GP; however, reports are unsubstantiated by medical opinion. Clinical specialist reports are subject to biases such as severity and referral patterns. GP data benefit from their inclusion of less severe cases than reports from secondary care and may give a better reflection of the incidence of diseases with a work-related aetiology unrecognized by self-reporting individuals.

Key words
General practice; incidence rate; mental ill-health; musculoskeletal; occupational; referral; respiratory; self-reported ill-health; skin; work related.

Introduction
The collection of data on work-related ill-health is essential to identify the determinants of risks to health that affect different sectors of the workforce. This information helps to direct and evaluate policy decisions aimed at reducing the risk of work-related ill-health and sickness absence. In the United Kingdom (UK) as a whole, sources of data include the surveillance schemes within The Health & Occupation Research network (THOR specialist schemes and THOR-GP (THOR in General Practice)) [1] and for Great Britain (GB; England, Scotland and Wales, excluding Northern Ireland), the survey of self-reported work-related illness (SWI) [2] (Table 1). These schemes collect data at different levels of the ‘work-related ill-health pyramid’ (Figure 1), which is an adaptation of the public health ‘Burden of illness pyramid’ [3].

Each scheme has its strengths and weaknesses and gives reliable estimates for particular aspects of work-related ill-health (e.g. for rates by industry or specific diseases). The SWI is likely to be more inclusive as cases do not require consultation with a medical practitioner; therefore, incidence rates may differ from those where work relatedness is based on medical opinions [5,6]. THOR-GP reports comprise opinions from GPs trained to diploma level in occupational medicine (DOccMed), who are theoretically well placed to judge the work relatedness of a case. Other THOR reports rely on submissions from specialists in their particular field of medicine.
Clinical specialists and GPs participating in THOR and THOR-GP (Table 1) report in two tiers of time sampling, some doctors reporting every month of the year (‘core’ reporters), and others in one randomly selected month per year (‘sample’ reporters) [7]. Participants submit demographic information, diagnosis/symptoms, occupation, industry and suspected causal agent/task/event, for any cases presenting to them, that they believe were caused or aggravated by work. GPs also report information on sickness certification and patient referrals. This information is reported either electronically (via an online webform) or by postal reporting card using well-established methods [8–12]. SWI data collection procedures are fully described elsewhere [4], but in brief, individuals sampled as part of the Labour Force Survey (LFS) are interviewed about any ill-health or injury they believe was related to work in the 12 month period prior to the survey, and published results reflect averages over this period spanning two calendar years [4]. The SWI only includes the episode considered the most serious by the responder. In contrast, within THOR/THOR-GP any number of diagnoses can be included in comorbid cases.
The schemes are nationwide. SWI has a formalized geographically stratified sampling strategy to ensure national coverage [4]. THOR recruits eligible specialists nationally (although regional participation may vary). Most THOR-GPs are recruited from a UK-wide distance learning course and early assessment has shown them to be nationally representative [8,13]. However, not all eligible specialists participate in THOR, and only around 4% of UK GPs undertake DOceMed training and are therefore eligible to participate in THOR-GP [14,15]. Incidence rates are therefore estimated and subject to assumptions and caveats [13,16].

In this study, we aimed to build a comprehensive picture of work-related ill-health in GB by comparing reports from the SWI, THOR-GP and THOR’s clinical specialist schemes (from rheumatologists, psychiatrists, dermatologists and respiratory physicians). Comparing data from these sources (including patient referral information from THOR-GP) will help to provide further detail of the burden across different providers of health care services and the relationship between data reported from primary and secondary care.

Methods

To compare information for full calendar years over the same time period, we analysed data on all cases of work-related ill-health reported from 2006 to 2009 inclusive. So, for the purpose of this comparison, we averaged SWI data from 2006/2007, 2007/2008 and 2008/2009 to cover the same period as THOR data. As SWI does not include data from Northern Ireland, cases from this part of the UK were omitted from THOR and THOR-GP data to limit the comparison to GB rates.

THOR-GP and SWI collect data on all types of work-related ill-health that can be categorized into five diagnostic groups; musculoskeletal, mental illness, skin, respiratory and ‘other’ (audiological, infections, neurological, cardiovascular etc.). THOR-GP includes injury data, but in the SWI, this information is excluded by the interviewer and forms the basis of the Workplace Injuries Survey. So to compare the two schemes, we omitted injury data (approximately 13% of GP cases) from THOR-GP. Cases reported by THOR-GPs are coded as a disease or injury by THOR-GP researchers. For example, a case could be classified as ‘back pain’ (and therefore assigned to a musculoskeletal category) or a ‘back injury’ (and therefore not included in this analysis). To avoid diagnostic misclassification, we adopted a system for defining disease or injury used by the World Health Organisation [17] and methods used to record work-related ill-health and injury in community clinics [18]. These methods stated that ‘an injury is the result of a single traumatic event where the harm or hurt is immediately apparent’ and ‘a disease results from repeated or long-term exposure to an agent or event’.

We calculated incidence rates from THOR-GP and the corresponding THOR specialist scheme using similar methods [13,16] and compared these with THOR-GP referral rates. We calculated annual estimates by multiplying cases from ‘sample’ reporters by 12 and adding these to those submitted by ‘core’ reporters. We then adjusted these numerator data for reporters’ response rates and an estimated participation rate of eligible GB physicians to extrapolate data to estimate a numerator for the national population. We adjusted THOR-GP data for GPs’ part-time practice. In a previous study, we estimated the number of physicians eligible to report to THOR, i.e. practising in GB and seeing patients of working age [16]. We used this to calculate GB incidence rates rather than just cases reported to THOR.

The SWI numerator is adjusted by the sampling fraction to give estimated figures for GB [4]. For all sources of numerator data, LFS information was used as the denominator to calculate incidence rates. With long-latency diseases such as mesothelioma and skin neoplasia, there may be data incompatibility relating to the use of contemporary (2006–2009) LFS denominator data to estimate the working GB population rather than using lagged population data, but at present, it is not clear what the ‘optimum’ lag period should be.

Having calculated incidence rates, we compared referral patterns and case mix by diagnosis from the different groups of reporters. Diagnostic/anatomical sub-division for SWI data was only possible for musculoskeletal disorders. We also compared incidence rates from THOR specialists to referral rates from THOR-GP to hospital consultants by calculating incident rate ratios.

Multicentre Research Ethics Committee approval has been granted to THOR (Reference number MREC 02/8/72).

Results

The overall incidence rate for work-related ill-health was highest when calculated from self-reported data, and lowest from clinical specialists’ reports (Table 2). Comparing SWI incidence rates with THOR-GP rates showed variation by diagnostic category. SWI had higher rates for mental illness, respiratory and in particular ‘other’ diagnoses (nine times higher than GP rates), whereas THOR-GP incidence rates were higher than SWI rates for musculoskeletal and skin diagnoses.

Participation rates differed by medical speciality (chest physicians 73%, dermatologists 69%, rheumatologists 39% and psychiatrists 10%). The incidence rate for mental illness required the most adjustment because of the low participation rate of eligible GB psychiatrists.

Clinical specialists’ rates for the four diagnostic categories were all fairly similar to each other, except for mental ill-health (as reported by psychiatrists), which was proportionately higher.
GPs referred 7% of cases to clinical specialists. Only a very small proportion of musculoskeletal and mental ill-health THOR-GP cases were referred to rheumatologists or psychiatrists, but skin and respiratory cases had higher rates of referral to secondary care (Figure 2). Most of the skin and respiratory cases were contact dermatitis and asthma, and the rates of referral for these diagnoses alone were 15% and 17%, respectively.

We report incidence rates calculated from clinical specialists’ schemes adjusted and unadjusted for the GB cases that are assumed missing due to the non-participation of eligible physicians (Figure 2). The adjusted specialists’ incidence rates were higher than referral rates for all diagnostic categories, apart from skin disease. The incidence rate ratio (adjusted clinical specialists incidence rate/referral rate) for mental ill-health was much higher than for other diagnoses (rate ratios: mental ill-health 20.8, musculoskeletal 4.8, respiratory 1.5 and skin 0.6).

Referrals for skin and respiratory disease were mainly to secondary care specialists, but musculoskeletal and mental ill-health cases were frequently referred to community-based health professionals (Table 3). More musculoskeletal cases were referred to orthopaedic surgeons than to rheumatologists.
Table 4 shows a proportional breakdown of cases and the case mix within each data source. SWI reports comprised a high proportion of back pain (41%), but this decreased with higher levels of the surveillance pyramid (28% in THOR-GP; 9% in rheumatologists’ reports). Case mix also differed between reporting schemes for other diagnostic categories; most cases of mental ill-health were reported by GPs as ‘stress’, whereas psychiatrists reported more cases of anxiety/depression and post-traumatic stress disorder (PTSD). Most skin diagnoses reported by both GPs and dermatologists were contact dermatitis. Twenty-six per cent of cases reported by dermatologists were skin neoplasia, but these cases only constitute 1% of GP reports. Half of the respiratory cases reported to THOR-GP were asthma or asthma-related symptoms. Most cases reported by chest

<table>
<thead>
<tr>
<th>Type of referral</th>
<th>Musculoskeletal, n (%)</th>
<th>Mental ill-health, n (%)</th>
<th>Skin, n (%)</th>
<th>Respiratory, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not referred</td>
<td>1461 (75)</td>
<td>1244 (85)</td>
<td>349 (84)</td>
<td>74 (70)</td>
</tr>
<tr>
<td>THOR clinical speciality (rheumatology, psychiatry,</td>
<td>13 (1)</td>
<td>12 (1)</td>
<td>62 (15)</td>
<td>28 (26)</td>
</tr>
<tr>
<td>dermatology and respiratory physician)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other clinical speciality, e.g. orthopaedics and</td>
<td>109 (6)</td>
<td>12 (1)</td>
<td>0 (0)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>neurologists.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community-based health professionals (e.g.</td>
<td>296 (15)</td>
<td>151 (10)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>physiotherapy and counselling services)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupational health services</td>
<td>22 (1)</td>
<td>25 (2)</td>
<td>3 (1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Other</td>
<td>46 (2)</td>
<td>15 (1)</td>
<td>0 (0)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Total</td>
<td>1947 (100)</td>
<td>1459 (100)</td>
<td>414 (100)</td>
<td>106 (100)</td>
</tr>
</tbody>
</table>

Table 4. Musculoskeletal, mental ill-health, skin and respiratory diagnoses reported to SWI, THOR-GP and THOR (2006–2009)

<table>
<thead>
<tr>
<th></th>
<th>Self-reports (SWI)</th>
<th>General practitioners (THOR-GP)</th>
<th>Clinical specialists (THOR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated number</td>
<td>Number of cases</td>
<td>Number of cases</td>
</tr>
<tr>
<td></td>
<td>of GB cases n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Musculoskeletal anatomical site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper limb or neck</td>
<td>90 000 (45)</td>
<td>1450 (60)</td>
<td>4988 (80)</td>
</tr>
<tr>
<td>Back</td>
<td>81 000 (41)</td>
<td>676 (28)</td>
<td>543 (9)</td>
</tr>
<tr>
<td>Lower limb</td>
<td>29 000 (15)</td>
<td>229 (9)</td>
<td>567 (9)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>75 (3)</td>
<td>164 (3)</td>
</tr>
<tr>
<td>Total musculoskeletal diagnoses</td>
<td>200 000 (100)</td>
<td>2430 (100)</td>
<td>6526 (100)</td>
</tr>
<tr>
<td>Mental ill-health diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety/depression</td>
<td></td>
<td>714 (42)</td>
<td>4077 (63)</td>
</tr>
<tr>
<td>Stress</td>
<td></td>
<td>964 (57)</td>
<td>416 (6)</td>
</tr>
<tr>
<td>Post traumatic stress disorder</td>
<td></td>
<td>11 (&lt;1)</td>
<td>649 (10)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>11 (&lt;1)</td>
<td>1338 (21)</td>
</tr>
<tr>
<td>Total mental ill-health diagnoses</td>
<td>236 000 (100)</td>
<td>1700 (100)</td>
<td>6480 (100)</td>
</tr>
<tr>
<td>Skin diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact dermatitis</td>
<td></td>
<td>422 (82)</td>
<td>5911 (66)</td>
</tr>
<tr>
<td>Infection</td>
<td></td>
<td>57 (11)</td>
<td>34 (0.4)</td>
</tr>
<tr>
<td>Neoplasia</td>
<td></td>
<td>4 (1)</td>
<td>2280 (26)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>32 (6)</td>
<td>694 (8)</td>
</tr>
<tr>
<td>Total skin diagnoses</td>
<td>11 000 (100)</td>
<td>515 (100)</td>
<td>8919 (100)</td>
</tr>
<tr>
<td>Respiratory diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma/asthma symptoms</td>
<td></td>
<td>65 (50)</td>
<td>1200 (12)</td>
</tr>
<tr>
<td>Long-latency disease</td>
<td></td>
<td>18 (14)</td>
<td>7000 (69)</td>
</tr>
<tr>
<td>Rhinitis</td>
<td></td>
<td>13 (10)</td>
<td>90 (1)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>35 (27)</td>
<td>1892 (19)</td>
</tr>
<tr>
<td>Total respiratory diagnoses</td>
<td>16 000 (100)</td>
<td>131 (100)</td>
<td>10 182 (100)</td>
</tr>
</tbody>
</table>

*Numbers of cases not published, therefore GB estimates used.

bTotal diagnoses are greater than number of cases in Table 1 as some cases are comorbid.
Discussion

Incidence rates for work-related ill-health decreased with increasing medical specialization, but this was not uniform across all diagnostic categories. Incidence rates for mental ill-health, respiratory and ‘other’ diagnoses were highest from self-reported data, but GP rates were highest for musculoskeletal and skin diagnoses. Dermatological and respiratory cases were referred to clinical specialists proportionally more often than musculoskeletal and psychological cases. Case mix varied from the three levels of the work-related ill-health pyramid.

THOR reporting by clinical specialists and GPs is easily compared, as data collection is similar [8–12], but SWI data are collected differently [4]. SWI data may be subject to recall bias, as individuals are asked to report episodes from the previous 12 months. Also, approximately a third of the LFS interviews are collected by proxy (i.e. partner, sibling etc), which may affect the accuracy of the data [4]. THOR-GPs generally submit cases electronically when they see patients, but postal reports submitted by specialists at the end of a monthly reporting period may be more subject to recall bias.

Estimates from smaller numbers of reports (skin and respiratory cases) may be less reliable than musculoskeletal and mental ill-health cases that are reported more frequently to both THOR-GP and SWI [2,8].

The reporting schemes collect data from different sub-groups of the population, so it is unsurprising that incidence rates vary. SWI incidence rates are higher and likely to capture more and less severe cases. Most cases reported by clinical specialists are likely to be more severe and to have been referred by GPs. However, SWI rates for musculoskeletal and skin problems are lower than GP rates. Previous research suggests that workers over-attribute arm pain to a work-related cause [19]. Our results show higher rates for GP-diagnosed musculoskeletal disorders despite GPs probably seeing patients who believe their symptom severity warrants medical attention and therefore capturing fewer cases. SWI responders may be less aware of the potential for work-related allergies and exposures and work-related aggravation of pre-existing conditions, such as dermatitis/eczema or asthma/asthma-related symptoms. GPs with occupational health training should be more aware of work-related risk factors, and clinicians participating in THOR/THOR-GP are more likely to be interested in work-related health.

SWI only includes the episodes considered most severe, and individuals may have differing opinions about work attribution from a GP with training in occupational medicine. Additionally, patients may consider episodes more serious if they resulted in a period of absence from work. Previous THOR-GP studies on work-related sickness absence have shown that 79% of mental ill-health cases were issued with a sick note compared with 42% of musculoskeletal diagnoses and 15% of skin cases[8].

The SWI rate for ‘other’ self-reported work-related ill-health is nine times greater than the GP rate. Individuals may assign a work-related cause to ill-health (such as cardiovascular problems), whereas GPs attribute these to other non-work-related factors (such as diet, exercise and family history); therefore, such cases are rarely reported to THOR-GP.

The variation in GP rates of referral by diagnostic category have been discussed elsewhere [20]. In accordance with clinical guidance, musculoskeletal and mental ill-health cases were rarely referred to hospital specialists compared with skin and respiratory diagnoses where referral is recommended for patch or challenge testing in specialist clinics [21–24]. If cases referred by GPs made up incident cases in secondary care, the incidence rates should be similar (and therefore an incident rate ratio of 1). Indeed, the incidence rate ratio was lowest for these (skin and respiratory) diagnostic categories with more objective measures of impairment. For skin disease, the referral rate was higher than the specialist referral rate. Cases making up specialist incidence rates are unlikely to originate from THOR-GPs (approximately 1% of GB GPs) but rather from GPs without occupational medicine training. Guidance [22] advises that a diagnosis of occupational contact dermatitis (82% of THOR-GP skin cases) should be confirmed objectively (by patch test) and not just based on a compatible occupational history. Perhaps occupational health ‘trained’ GPs are more aware of this guidance and therefore more likely to refer patients for testing.

The high incidence rate ratio for mental ill-health may be due to our method (under investigation) for adjusting for GB unreported cases. It is difficult to estimate the number of psychiatrists eligible to participate in SOSMI compared with other clinical specialities [12,16]. Some psychiatry sub-specialities are ineligible for SOSMI participation (e.g. child and old-age psychiatry), and these are difficult to quantify.

Only 9% of rheumatologists’ cases were back pain. This is unsurprising with the increased use of back pain services and triage processes in recent years [25,26]. Very few work-related musculoskeletal disorders reported to THOR-GP were referred to rheumatologists, more were referred to orthopaedic surgeons. Inflammatory diseases such as arthritis are more likely to be referred to rheumatologists and may be more difficult to attribute to work.

Psychiatrists reported a very different case mix from GPs. Studies [27,28] within THOR have shown that reporting patterns between reporter groups resulted from a different clinical case mix rather than different diagnostic labelling, reflecting chronicity/illness severity, with...
cases of ‘stress’ treated within primary care in accordance with NICE guidance [24]. Cases considered more severe, such as PTSD were more likely to be referred to secondary care, with guidance recommending ‘treatment should be provided on an individual outpatient basis’ [29].

The diagnostic differences between skin and respiratory cases reported from primary and secondary care are related to severity. Very few cases of long-latency disease such as skin neoplasia and mesothelioma are reported by GPs, but these make up a large proportion of the cases reported by dermatologists and respiratory physicians.

This study highlights that the highest rates of work-related ill-health (and sickness absence) [8,30] in the community and in GP clinics result from musculoskeletal disorders and mental ill-health, but that very few cases are referred to secondary care. Moreover, in cases such as work-related contact dermatitis and asthma, where testing in specialist clinics is recommended, a large proportion of cases reported by GPs with DOccMed training were not referred. The referral rate for other GPs is unknown. It may not be possible to establish what is the ‘true’ incidence of work-related ill-health in GB using these data sources, as they measure different levels of disease severity with different tools, i.e. level of medical speciality and associated accuracy in the assessment of work relatedness and diagnosis. However, this paper highlights the strengths and weaknesses of the schemes, and how comparison of data reported from SWI, THOR-GP and THOR clinical specialists helps build a more comprehensive picture of work-related ill-health, and the relationship between self-perceived ill-health and ill-health recognized in primary and secondary care.

Key points

- Incidence rates of work-related ill-health are highest based on self-reported data, which benefits from its greater inclusivity. However, these reports are unsubstantiated by medical opinion, unlike reports from GPs and clinical specialists (reporting to THOR specialist schemes and THOR-GP).
- Despite the higher incidence rates of work-related musculoskeletal and psychological ill-health, these conditions were rarely referred to secondary care. By contrast, skin and respiratory cases were referred more often although not as frequently as recommended in clinical guidance.
- Reports from three levels of the work-related ill-health reporting pyramid showed different case mixes. Reports from a clinical specialist are likely to be biased by severity and referral pattern.

Funding

Health & Safety Executive (4307/R56.069, 4496/R60.002 to R.A. and co-investigators).

Acknowledgements

The authors would like to thank all the physicians who participate in THOR and THOR-GP.

Conflicts of interest

None declared.

References