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SHORT REPORT

How to improve the assessment of the impact of occupational diseases at a national level? The Netherlands as an example

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ABSTRACT

Objective To explore the impact of occupational diseases (ODs) through estimations of population attributable fractions (PAFs) in a national context.

Methods PAFs were calculated for eight prevalent ODs using existing data on the prevalence of exposure to risk factors at work and the strength of their association with diseases based on systematic reviews. Six systematic reviews with meta-analyses and two overview papers were selected. All addressed the relationship between occupational exposure to work-related risk factors for these eight prevalent ODs. Prevalence figures for exposure to work-related risk factors were retrieved from the Dutch National Working Conditions Survey (NWCS) based on self-reports by approximately 40 000 workers. The specific risk factors retrieved from the reviews were matched with the available and dichotomised self-reported exposure items from the NWCS by two authors.

Results The eight frequently reported ODs among the Dutch working population revealed PAFs varying between 3% and 25%. Lateral epicondylitis and distress/burnout had the highest attributable fractions, with percentages of 25% and 18%, respectively. For knee osteoarthritis (13%), shoulder soft tissue disorders (10%) and non-specific low back pain (10%) approximately 1 in 10 cases were attributable to work. PAFs for irritant contact dermatitis, noise-induced hearing loss and chronic obstructive pulmonary disease were 15%, 6% and 3%, respectively.

Conclusion Data from systematic reviews and self-reported data on exposure provide opportunities to estimate the impact of ODs. For the Netherlands, they revealed substantial and varying attributions of work for prevalent diseases.

Key messages

What is already known about this subject?

- Registries for occupational diseases (ODs) depend on the behaviour of occupational physicians and case definitions for ODs. Alternative approaches could enhance insight into the impact of ODs in a national context.

What are the new findings?

- Simple estimates of population attributable fractions (PAF) were retrieved from existing data on work-related exposure and the strength of the association between diseases and work-related risk factors. These PAFs enhance epidemiological knowledge about the impact of ODs in a national context.

How might this impact on policy or clinical practice in the foreseeable future?

- Knowledge of PAFs of prevalent ODs might stimulate the use of work-related exposure reduction as a short term and easily obtainable proxy for the prevention of ODs.

INTRODUCTION

Data on occupational diseases (ODs) are essential for government bodies, employers, trade unions, social security institutions, occupational health and safety professionals and other stakeholders to fulfil their ambition and obligation to prevent and control work-related diseases.[1] In the Netherlands, as in other countries, ODs are under-reported because their registration depends on the behaviour of occupational physicians and on the case definitions for ODs. The reporting of ODs by occupational physicians is hindered by its perceived lack of usefulness, lack of urgency, the complexity of assessment and concern about liability issues.[2] Worldwide, a lack of clear and standardised case and exposure definitions,[3] as well as the absence of standardised eligibility criteria for OD recognition between countries,[4 5] may also hamper the gathering of reliable data on ODs.

To stimulate recognition, ensure consistency in the case definitions of ODs and contribute to the prevention of work-related diseases in occupationally exposed groups, international criteria documents have been developed by the WHO, the International Labour Organisation and the European Union.[6 7] In addition, national OD registration or diagnostic guidelines have been developed and disseminated.[8] To increase the quality and compliance in the reporting of ODs, the development and use of these guidelines could indeed be promising with respect to retrieving more reliable estimates of OD within and between countries.

An additional approach to retrieving more reliable OD estimates within and between countries involves estimates of population attributable fractions (PAFs), based on high-quality systematic reviews regarding work-related risk factors for clinically assessed diseases, preferably with meta-analyses, and estimates of the prevalence of exposure to work-related risk factors in the workplace. In reply

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to a government request to obtain more reliable estimates of the burden of ODs, this approach was explored in a national context in the Netherlands.

METHODS

Based on systematic reviews, PAFs were estimated for eight prevalent ODs using existing data on the prevalence of exposure to risk factors at work and the strength of their association with the disease. PAFs were calculated according existing formulas[9]: (proportion of workers exposed to risk factor) × (attributable proportion in the exposed)=P_e (RR_e-1) / [1+P_e (RR_e-1)]. The PAF indicates the proportion of disease that would not occur in a working population if the exposure to a risk factor at work was eliminated. The attributable risk in the working population depends on the prevalence of exposure to the risk factor and the strength of its association with the disease.

Six systematic reviews with meta-analyses were identified that addressed the relationship between occupational exposure to work-related risk factors for six prevalent ODs: lateral epicondylitis,[10] knee osteoarthritis,[11] specific soft tissue disorders of the shoulder,[12] non-specific low back pain,[13] distress/burnout[14] and chronic obstructive pulmonary disease (COPD).[15] The systematic reviews selected revealed epidemiological evidence of a prospective association between exposure to work-related physical risk factors and the four musculoskeletal disorders (summary ORs: 1.3–2.6), chemicals and COPD (summary OR: 1.4), and psychosocial factors and mental disorders (summary ORs: 1.3–2.0).

For lateral epicondylitis, hand force, repetitive movement, hand-arm vibration and elbow load (combined physical exposure) were identified as risk factors at work. For knee osteoarthritis, kneeling or squatting, lifting and climbing were identified as risk factors. For specific soft tissue disorders of the shoulder, arm-elevation, hand force, hand-arm vibration and shoulder load (combined physical exposure) were identified as risk factors. For non-specific low back pain, manual material handling, bending and twisting of the trunk and whole body vibration were identified as risk factors. For distress/burnout, job demands, emotional demands, low decision authority, effort–reward imbalance, low co-worker support, low supervisor support, low procedural justice and low relational justice were identified as risk factors. Exposure to vapours, gases, dust or fumes was identified as a risk factor for COPD. In addition, overview papers were used for hearing loss[16] and irritant contact dermatitis,[17] with exposure to noise and wet work identified as occupational risk factors, respectively. The overview papers reported associations between exposure to wet work and irritant contact dermatitis (OR=2.1) and exposure to noise and noise-induced hearing loss (OR=1.9).

Prevalence figures for exposure to work-related risk factors were retrieved from the National Working Conditions Survey (NWCS),[18] executed in 2017 using a representative sample of the Dutch working population. Data on exposure were based on self-report by workers (n=39 986–41 859), usually on a one-item question with a three-point or four-point answer scale such as: 'Do you exert force during work?' ('yes, regularly', 'yes, sometimes', 'no') or 'Is your skin exposed to wet work?' ('never', 'sometimes', 'often', 'always'). As a best estimate, the specific risk factors retrieved from the systematic reviews were matched with the available and self-reported exposure items from the NWCS[18] by two authors.

Subsequently, risk factors were categorised and exposure dichotomised as follows: physical risk factors in terms of force (combined physical exposure wrist and elbow: lateral epicondylitis; hand force: specific soft tissue shoulder disorder; lifting: knee osteoarthritis; manual material handling: non-specific low back pain), posture (combined physical exposure wrist and elbow: lateral epicondylitis; arm elevation: specific soft tissue shoulder disorder; kneeling or squatting: knee osteoarthritis; bending and twisting: non-specific low back pain) and noise ('yes, regularly'). Psychosocial risk factors in terms of job demands, decision authority, emotional demands ('often' or 'always'); social support from manager and social support from colleagues (mean ≤2.5 on a two-item scale with four answer categories); chemical risk factors such as inhaling substances ('often' or 'always'); and dermal exposure to wet work ('often' or 'always'). The prevalence of work-related risk factors varied between 4% and 46% (see table 1).

Table 1 Estimated population attributable fractions of diseases due to exposure to work-related risk factors in the Netherlands

International Classification of Diseases-10	Prevalence	Risk ratio		PAF
	Risk factors (%)	OR	95% CI	%
Musculoskeletal				
Lateral epicondylitis				
Force	21.0	2.6	1.9 to 3.5	25
Posture	10.8	2.6	1.9 to 3.5	15
Knee osteoarthritis				
Force	21.0	1.7	1.4 to 2.0	13
Posture	10.8	1.7	1.4 to 2.1	7
Shoulder soft tissue disorders				
Force	21.0	1.5	1.3 to 1.9	10
Posture	10.8	1.9	1.5 to 2.5	9
Non-specific low back pain				
Force	21.0	1.5	1.3 to 1.7	10
Posture	10.8	1.7	1.4 to 2.0	7
Mental				
Distress/Burnout				
Work quantity	46.2	1.5	1.4 to 1.6	18
Emotional demanding	12.9	1.6	1.4 to 1.9	7
Low decision authority	12.7	1.3	1.2 to 1.5	4
Low support manager	15.5	1.3	1.2 to 1.4	4
Low support colleague	4.2	1.3	1.2 to 1.4	1
Dermal				
Irritant contact dermatitis				
Wet work	15.8	2.1	1.4 to 3.0	15
Auditive				
Hearing loss				
Noise	7.5	1.9	-	6
Respiratory				
COPD				
Inhaling substances	8.1	1.4	1.2 to 1.7	3

COPD, chronic obstructive pulmonary disease.

RESULTS

The eight frequently reported ODs among the Dutch working population revealed PAFs varying between 3% and 25% (table 1). Lateral epicondylitis and distress/burnout showed the highest attributable fractions, with percentages of 25% and 18%, respectively. For irritant contact dermatitis (15%), knee osteoarthritis (13%), shoulder soft tissue disorders (10%) and non-specific low back pain (10%), approximately 1 in 7–10 cases were attributable to work. Of the diseases selected, the lowest PAFs were for noise-induced hearing loss (6%) and COPD (3%).

DISCUSSION

The results show that a fairly simple approach may increase insight into the impact of ODs independently of national social security regulations if PAFs can accurately be calculated. If so, these PAFs could also be calculated for various of industry sectors and jobs when valid and reliable estimates of risk factors are available, thereby providing data to employers, workers and policy-makers about the industrial sectors and jobs at risk. This might increase the sense of urgency for the prevention of ODs.

Limitations of this explorative study encompass the self-reported wide exposure categories in the survey[18] and the lack of knowledge about minimum exposure categories for different ODs. Furthermore, often knowledge was lacking about health effects due to combined exposures, for example, force and posture. Or, as for lateral epicondylitis, the effect of combined physical exposure on health is known, but the prevalence of self-reported combined exposures was unknown, therefore the PAF could vary up to 25%.

Consequently, the accuracy of the calculated PAFs is hampered by the used data of exposure categories, the quality of estimated associations between work-related risk factors and their corresponding diseases, and exposure that is often not measured in similar ways in the survey as in the systematic reviews. Also, PAFs can be too optimistic in estimating the potential for prevention.[9] Therefore, intervention studies are needed to assess effectiveness in daily work.

However, the potential effect of preventive actions on work-related exposure in terms of the occurrence of ODs and their medical and productivity costs can still be explored. For example, in the Netherlands, the annual incidence of knee osteoarthritis among men and women in the working age bracket of 45–64 years, as assessed by family physicians in 2012, was 9 and 17 per 1000 patient years. Based on the data in table 1, at least 7% of these cases seem preventable. Given that the Dutch working population in this age category is equivalent to approximately 2.0 million men and 1.6 million women, this would imply a preventable number of approximately 3200 cases annually, as a conservative estimate. The costs per month for each Dutch worker with knee osteoarthritis is €871: medical costs €148 (17%) and productivity loss €723 (83%).[19] Based on these data, the annual preventable costs can be estimated to be €5.7 million for care and €27.8 million in productivity loss.

Finally, the presented approach may encourage more close international collaboration[20] regarding exposure assessments on standardised cut-off points for evidence-based risk factors; for example, in relation to daily exposure to hand-arm elevation $\geq 60^0 \geq 1$ hr/day in the case of work-related shoulder soft tissue disorders, or daily exposure to 86 dB(A) over 10 years, for noise-induced hearing loss. The use of consensus-based international exposure criteria as outcome measures in intervention studies might also stimulate prevention of ODs, rather than waiting for the actual occurrence of ODs.

Correction notice This article has been amended since it first published. It has been made open access.

Contributors HFvdM: conceived and designed this short report, interpreted the data, and drafted this short report. All authors were involved in the conception of this study, made critical revisions and approved the final manuscript.

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