

SHORT REPORT

Incidence rates of occupational diseases in the Dutch construction sector, 2010–2014

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ABSTRACT

Objective To estimate incidence and trends in incidence of occupational diseases (ODs) in the Dutch construction sector.

Methods In a dynamic prospective cohort over a 5-year period (2010–2014), ODs assessed by occupational physicians (OPs) participating in a voluntary construction workers health surveillance (WHS) were reported to the Netherlands Centre for Occupational Diseases (NCOD). ODs were defined as a disease with a specific clinical diagnosis (International Classification of Diseases) that was predominantly caused by work-related factors as assessed by an OP. Annual incidences were determined for the total number of ODs and six frequently occurring OD groups. Trends in incidence were estimated using a multilevel negative binomial regression model.

Results In 2014 the incidence of all OD was 12 964 per 100 000 workers and there was no significant change in incidence between 2010 and 2014 (3%; 95% CI –2% to +9%). Hearing loss (8125 per 100 000 workers) and musculoskeletal disorders (2081 per 100 000 workers) were the most frequently occurring ODs. Noise-induced hearing loss (+7%; 95% CI 1% to 13%) and contact dermatitis (+19%; 95% CI 6% to 33%) showed increasing trends. There was no statistically significant change in the incidence of low back pain, arthrosis, repetitive strain injuries, distress/burnout and chronic obstructive pulmonary disease/asthma.

Conclusions In total, 13% of workers participating in WHS in the Dutch construction industry during 2014 had an OD diagnosed and reported by an OP. Over a 5-year period the annual incidence of reported ODs showed a statistically non-significant increase. Incidences in noise-induced hearing loss and contact dermatitis showed statistically significant increasing trends, 7% and 19%, respectively.

INTRODUCTION

The construction industry is characterised by arduous agents and demanding work.^{1 2} Owing to the varied, unpredictable and time-pressured nature of the work, reducing the health risks remains a problem.³ In addition, as in most branches of industry, the mean age of construction workers is increasing due to the decreasing recruitment of young people into the sector.¹ This results in higher cumulative exposures and thereby increasing the risk of occupational diseases (ODs).

Epidemiological data of ODs for the construction industry, however, are scarce due to lack of

What this paper adds

- ▶ Annual incidences of occupational diseases are reported for the Dutch construction industry, high incidences were reported for noise-induced hearing loss and musculoskeletal diseases.
- ▶ Significantly increasing trends in noise-induced hearing loss and work-related contact dermatitis were observed.
- ▶ Changes in incidence rate ratios over time could be helpful for prioritising and evaluating sector-specific interventions to prevent occupational diseases.

knowledge of work-related aetiology or lack of urgency to perform these studies. Descriptive research based on OD registers^{4 5} offers possibilities to get insight in incidences. Furthermore, notification of ODs can provide insight in to work-related aetiology. The start of preventive research is the examination of incidences of these severe health problems.⁵ When reported, ODs are a relevant outcome measure for this step because these are clinically established diseases mainly caused by work.⁵ Measuring the incidence and trends in ODs may increase the potential to develop, implement and evaluate individual and sectorial interventions to reduce OD-related risk factors.

In the Netherlands, construction workers are offered voluntary periodic workers' health surveillance (WHS) at no cost. This WHS consists of a written questionnaire and a physical examination. The standardised questionnaire asks about working conditions and work demands (eg, physical exertion and working in awkward postures) and health symptoms and conditions. Both the assessment and reporting of ODs are necessary to designate a clinical diagnosis as primarily caused by work-related factors.

The objective for this study is to determine (1) the incidence of reported ODs in 2014 and (2) trends in OD incidence rate ratios over a 5-year period (2010–2014) in the Dutch construction industry.

METHODS**Study design and procedure**

In a dynamic prospective cohort over a 5-year period (2010–2014), all ODs diagnosed by OPs

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participating in construction WHS were reported to the Netherlands Centre for Occupational Diseases (NCOD). The reporting to NCOD was managed by Arbouw, the Safety and Health Institute for the Dutch construction sector. For the Dutch construction industry WHS is the most important route for detecting ODs (in more than 90% of the OD cases). An OD was defined as a disease with a specific clinical diagnosis (International Classification of Diseases 10th Edition, ICD-10 classification) that was predominantly caused by work-related factors.⁶ NCOD provides OPs with reporting guidelines including criteria for clinical and work-related diagnosis. The work-related risk factors are retrieved from varying data based on clinical tests (eg, allergic contact dermatitis, asthma, noise-induced hearing loss, NIHL), exposure observations (eg, musculoskeletal disorders, MSDs) or questionnaires and assessment of medical and work history (eg, burnout). The criteria for work-related risk factors for establishing ODs are evidence-based, that is, these factors are associated with the specific disease in terms of OR's or relative risks of >2, and therefore defined as OD because predominantly caused by work-related factors.

Participating OPs were trained and experienced in occupational health for construction workers and worked at least 50% of their working time on WHS of construction workers. Incidences were determined for all ODs and six most frequently occurring (groups of) ICD-10 diagnosis, namely:

(Noise)-Induced Hearing Loss: H833, H919

Non-specific low back pain: M545

Repetitive strain injuries: I730, M531, M700, M709, M771, M770, G560, G589

Arthritis (excluding spinal): M159, M169, M179, M189, M199

Burnout, distress: Z730, F432

Contact dermatitis: L259

Asthma/chronic obstructive pulmonary disease (COPD): J459, J689, J439, J449

Analysis

Annual incidences were determined by dividing the number of reported ODs per year by the total number of workers visiting a WHS that year. To estimate trends in incidence annual case counts were analysed using a 2 level negative binomial regression model with random effects on the reporting OP; the negative binomial is a generalisation of the Poisson model, particularly useful for over-dispersed data.⁵ Time (year) was treated as a continuous variable and population estimates, as natural logarithms of the annual number of workers visiting a WHS, were included in the regression model as an 'offset'. No report of a specific OD diagnosis was assumed as reporting a zero case for that year so long as the OP had reported at least one OD during that year, otherwise it was assumed that the OP was not reporting for that year. This assumption was checked by an informal sensitivity analysis that compared two approaches for handling missing cases: (1) including OD reports and corresponding OPs, so no zero cases in the regression analyses and (2) imputing zero reports only when OP has demonstrated to be active in WHS in specific year, so assuming true zero reports. The results were reported using the second approach.

All analyses were performed with Stata V9.

RESULTS

In total, 246 occupational physicians reported 18 380 ODs between 2010 and 2014. The annual population of construction

Table 1 Trends in incidence of occupational diseases in Dutch construction industry

Diagnosis ICD-10	Incidence per 100 000 workers in 2014	Trends over time period 2010–2014		
		Occupational diseases N	IRR	95% CI
Total	12 964	18 380	1.03	(0.98 to 1.09)
Hearing				
(Noise)-induced hearing loss	8125	11 315	1.07	(1.01 to 1.13)
MSD				
Non-specific low back pain	750	1305	0.94	(0.86 to 1.02)
Arthrosis	688	1018	0.96	(0.87 to 1.05)
Repetitive strain injuries	643	1321	1.00	(0.92 to 1.07)
Mental				
Distress/burnout	338	488	1.07	(0.98 to 1.16)
Dermal				
Contact dermatitis	214	209	1.19	(1.06 to 1.33)
Respiratory				
Asthma/COPD	128	103	0.93	(0.68 to 1.18)

ICD-10, International Classification of Diseases

IRR, Incidence Rate Ratio.

COPD, chronic obstructive pulmonary disease; ICD, International Classification of Diseases.

workers visiting WHS decreased from 34 229 in 2010 towards 24 259 in 2014.

Table 1 shows the total annual incidence for ODs of 12 964 per 100 000 workers in the Dutch construction industry in 2014, two-thirds of the diagnoses were NIHL. The highest OD incidences were reported for NIHL (8125 per 100 000 workers) and musculoskeletal disorders, primarily low back pains (750 per 100 000 workers), arthrosis (688 per 100 000 workers) and repetitive strain injuries (643 per 100 000 workers). Incidences for distress/burnout, contact dermatitis, asthma/COPD were respectively 338, 214 and 128 per 100 000 workers.

Over a 5-year period, increasing trends in incidence were found for NIHL (+7%; 95%:1% to 13%) and contact dermatitis (CD) (19%; 95% CI 6% to 33%). Annual incidences in work-related repetitive strain complaints, back complaints, arthrosis, distress/burnout and asthma/COPD showed no change.

DISCUSSION

International comparison of OD incidence data is difficult because of under-reporting of physician assessed ODs,^{7 8} different definitions or diagnostic guidelines and criteria for notification and recognition,⁸ and different social and regulatory contexts.⁵ The trends in NIHL and CD in the Dutch construction sector are—in general—opposite compared with data from all European sectors of industry.⁵

Selection bias may have been introduced due to the voluntary nature of surveillance; only 40 to 50% of workers actually attend WHS according to Arbouw, the financier of WHS. This might artefactually increase the frequency of ODs reported during WHS if workers are more likely to attend WHS when they experience health problems. For OD case finding in a population at risk, an active and systematic WHS consisting of a sensitive questionnaire followed by a medical examination may be the best choice compared with widely available questionnaire-based data of workers' self-report about the work relatedness of complaints.⁹

Another methodological limitation is the uncertainty about how to treat the missing data in these regression analyses.¹⁰ In this data set, the two ways of handling the missing data made relatively small differences to trend estimates. No changes in direction or significance of trends were found, however, the approach reported in the results tended to predict a smaller change in incidence (ie, moving the trend towards no change). The main problem is whether a missing should be handled as true zero or missing OD reports, that is, the accuracy of zero reports. Our choice, imputing zero reports only when OP has demonstrated to be active in WHS in specific year, so assuming true zero reports, was the closest match to the presumed situation where an OP not seeing any cases of OD is unlikely to be reporting in that year.

The data presented here, regarding the preponderance of ODs in the Dutch construction industry, is particularly relevant given the aging of this worker population. Increasing trends in incidences in NIHL could be due to longer exposures in the aging workforce and relative high exposure levels outside the workplace. Also increasing requirements for aural communication and safety demands, for example, warnings or telephone or discomfort could reduce compliance in wearing of protective hearing devices (PHD). It is known that the effectiveness of PHD exponentially decrease with the duration of not wearing these devices.¹¹ However, reducing risk factors is the most effective approach to prevent NIHL. For example, during pile driving with diesel hammer applications, the noise emission in an operator area varies from 95 to over 105 dB(A) associated with a serious risk NIHL. In an engineering project,¹² a best practice solution was developed and tested on worksites, consisting of an enclosure of the lower part of the hammer. The integrated design of the enclosure enabled a normal use of the machine.

The increase in the incidence of CD is more difficult to explain because no distinction in OD reporting is made between irritant-induced or allergic-induced CD. It can be hypothesised that increasing use of allergenic materials for example, epoxy products is associated with increased risk of allergic CD, but this is unlikely because 89% of CD in Dutch construction workers was diagnosed as irritant CD.¹³ Increasing irritant-induced CD might happen from workers not leaving the industry when having CD which might reflect staying in the job because of economic reasons. Also increased awareness due to research projects on the worksites regarding CD could be associated with increasing reporting of CD as OD.¹³

MSDs and COPD/asthma showed no statistically significant change in incidence while for both ODs many preventive measures has been implemented.^{14 15} Lack of study power or insufficient reduction in intensity, frequency and duration of relevant risk factors can be hypothesised.¹⁶ Distress/burnout showed a non-statistically significant increasing trend, possibly reflecting changes in workers' population and associated risk factors (from less work site towards more coordinative personnel).

In summary, 13% of workers in the Dutch construction industry had an OD diagnosed and reported by an OP in 2014. Over a 5-year period the annual incidence of reported ODs showed a statistically non-significant increase. Incidences in NIHL and CD showed statistically significant increasing trends, 7% and 19%, respectively.

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

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Competing interests None declared.

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REFERENCES

- 1 Verbeek JH. Should construction workers work harder to improve their health? *Scand J Work Environ Health* 2013;39:427–9.
- 2 Boschman JS, van der Molen HF, Sluiter JK, et al. Occupational demands and health effects for bricklayers and construction supervisors: a systematic review. *Am J Ind Med* 2011;54:55–77.
- 3 Tappin D, Ashby L, Tedstedt-George C, et al. Musculoskeletal disorders in residential construction: what builders do to prevent them. *Conference: 19th Triennial Congress of the International Ergonomics Association (IEA)*; Melbourne, Australia, 2015. http://ergonomics.uq.edu.au/iea/proceedings/Index_files/papers/292.pdf
- 4 Carder M, Bensefa-Colas L, Mattioli S, et al. A review of occupational disease surveillance systems in Modernet countries. *Occup Med* 2015;65:615–25.
- 5 Stocks SJ, McNamee R, van der Molen HF, et al. Trends in incidence of occupational asthma, contact dermatitis, noise-induced hearing loss, carpal tunnel syndrome and upper limb musculoskeletal disorders in European countries from 2000 to 2012. *Occup Environ Med* 2015;72:294–303.
- 6 van der Molen HF, Kuijjer PPFM, Smits PBA, et al. Annual incidence of occupational diseases in economic sectors in The Netherlands. *Occup Environ Med* 2012;69:519–21.
- 7 Raynal A. Occupational medicine is in demise. *BMJ* 2015;351:h5905.
- 8 Curti S, Sauni R, Spreeuwers D, et al. Interventions to increase the reporting of occupational diseases by physicians (Review). *Cochrane Database Syst Rev* 2015, 3: CD010305.
- 9 Lenderink AF, Zoer I, van der Molen HF, et al. Review on the validity of self-report to assess work-related diseases. *Int Arch Occup Environ Health* 2012;85:229–51.
- 10 Khan A, Ullah S, Nitz J. Statistical modelling of falls count data with excess zeros. *Inj Prev* 2011;17:266–70.
- 11 Arenas JP, Suter AH. Comparison of occupational noise legislation in the Americas: an overview and analysis. *Noise Health* 2014;16:306–19.
- 12 Van Noort AM, Janssens MHA, Paarhuis B. Silent Diesel Pile Hammer. TNO report HAG-RPT-010144, Delft. 2001.
- 13 Timmerman JG, Heederik D, Spee T, et al. Contact dermatitis in the construction industry: the role of filaggrin loss-of-function mutations. *Br J Dermatol* 2015. Published Online First.
- 14 Visser S. *Ergonomic measures in construction work: enhancing evidence-based implementation* [Thesis]. University of Amsterdam, 2015. ISBN: 978 94 6259 5057.
- 15 Suarathana E, Moons KG, Heederik D, et al. A simple diagnostic model for ruling out pneumoconiosis among construction workers. *Occup Environ Med* 2007;64:595–601.
- 16 van der Molen HF, Frings-Dresen MH, Sluiter JK. The longitudinal relationship between the use of ergonomic measures and the incidence of low back complaints. *Am J Ind Med* 2010;53:635–40.



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