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Review article

WHO/ILO work-related burden of disease and injury: Protocol for systematic reviews of occupational exposure to dusts and/or fibres and of the effect of occupational exposure to dusts and/or fibres on pneumoconiosis[☆]



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ARTICLE INFO

Keywords:

Asbestos
Asbestosis
Coal dust
Occupational health
Silica
Silicosis

ABSTRACT

Background: The World Health Organization (WHO) and the International Labour Organization (ILO) are developing a joint methodology for estimating the national and global work-related burden of disease and injury (WHO/ILO joint methodology), with contributions from a large network of experts. In this paper, we present the protocol for two systematic reviews of parameters for estimating the number of deaths and disability-adjusted life years attributable to pneumoconiosis from occupational exposure to dusts and/or fibres, to inform the development of the WHO/ILO joint methodology.

Objectives: We aim to systematically review studies on occupational exposure to dusts and/or fibres (Systematic Review 1) and systematically review and meta-analyse estimates of the effect of occupational exposure to dusts and/or fibres on pneumoconiosis (Systematic Review 2), applying the *Navigation Guide* systematic review methodology as an organizing framework.

Data sources: Separately for Systematic Reviews 1 and 2, we will search electronic academic databases for potentially relevant records from published and unpublished studies, including Medline, EMBASE, Web of Science and CISDOC. We will also search electronic grey literature databases, Internet search engines and organizational

[☆] Systematic review registration number: CRD42018084131.

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websites; hand-search reference list of previous systematic reviews and included study records; and consult additional experts.

Study eligibility and criteria: We will include working-age (≥ 15 years) study participants in the formal and informal economy in any WHO and/or ILO Member State but exclude children (< 15 years) and unpaid domestic workers. Eligible risk factors will be dusts and/or fibres from: (i) asbestos; (ii) silica; and/or (iii) coal (defined as pure coal dust and/or dust from coal mining). Included outcomes will be (i) asbestosis; (ii) silicosis; (iii) coal worker pneumoconiosis; and (iv) unspecified pneumoconiosis. For Systematic Review 1, we will include quantitative prevalence studies of occupational exposure to dusts and/or fibres (i.e. no versus any exposure) stratified by country, sex, age and industrial sector or occupation. For Systematic Review 2, we will include randomized controlled trials, cohort studies, case-control studies and other non-randomized intervention studies with an estimate of any occupational exposure to dusts and/or fibres on the prevalence of, incidence of or mortality due to pneumoconiosis, compared with the theoretical minimum risk exposure level of no exposure.

Study appraisal and synthesis methods: At least two review authors will independently screen titles and abstracts against the eligibility criteria at a first stage and full texts of potentially eligible records at a second stage, followed by extraction of data from qualifying studies. At least two review authors will assess risk of bias and the quality of evidence, using the most suited tools currently available. For Systematic Review 2, if feasible, we will combine relative risks using meta-analysis. We will report results using the guidelines for accurate and transparent health estimates reporting (GATHER) for Systematic Review 1 and the preferred reporting items for systematic reviews and meta-analyses guidelines (PRISMA) for Systematic Review 2.

PROSPERO registration number: CRD42018084131.

1. Background

The World Health Organization (WHO) and the International Labour Organization (ILO) are developing a joint methodology for estimating the work-related burden of disease and injury (WHO/ILO joint methodology) (Ryder, 2017). The organizations plan to estimate the numbers of deaths and disability-adjusted life years (DALYs) that are attributable to selected occupational risk factors. The WHO/ILO joint methodology will be based on already existing WHO and ILO methodologies for estimating the burden of disease for selected occupational risk factors (Pruss-Ustun et al., 2017; International Labour Organization, 2014). It will expand existing methodologies with estimation of the burden of several prioritized additional pairs of occupational risk factors and health outcomes. For this purpose, population-attributable fractions (Murray et al., 2004) – the proportional reduction in burden from the health outcome achieved by a reduction of exposure to the theoretical minimum risk exposure level – will be calculated for each additional risk factor–outcome pair, and these fractions will be applied to the total disease burden envelopes for the health outcome from the WHO *Global Health Estimates (World Health Organization, 2017)*.

The WHO/ILO joint methodology may include a methodology for estimating the burden of pneumoconiosis from occupational exposure to dusts and/or fibres, if feasible, as one additional prioritized risk factor–outcome pair. To optimize parameters used in estimation models, a systematic review is required of studies on the prevalence of occupational exposure to dusts and/or fibres ('Systematic Review 1'), as well as a second systematic review and meta-analysis of studies with estimates of the effect of occupational exposure to dusts and/or fibres on pneumoconiosis ('Systematic Review 2'). In the current paper, we present the protocol for these two systematic reviews, in parallel to systematic review protocols on other additional risk factor–outcome pairs (Hulshof et al., 2018; Tenkate et al., 2018; John et al., 2018; Teixeira et al., 2018; Li et al., 2018; Descatha et al., 2018; Rugulies et al., 2018; Pachito et al., 2018). To our knowledge, this is the first protocol of its kind. The WHO/ILO joint estimation methodology and the burden of disease estimates are separate from these systematic reviews, and they will be described and reported elsewhere.

We refer separately to Systematic Reviews 1 and 2 because the two systematic reviews address different objectives and therefore require different methodologies. The two systematic reviews will, however, be harmonized and conducted in tandem. This will ensure that – in the later development of the methodology for estimating the burden of disease from this risk factor–outcome pair – the parameters on the risk

factor prevalence are optimally matched with the parameters from studies on the effect of the risk factor on the designated outcome. The findings from Systematic Reviews 1 and 2 will be reported in two distinct journal articles.

1.1. Rationale

Exposures to asbestos, silica and coal dust (defined as pure coal dust and/or dust from coal mining) are known occupational risk factors for pneumoconiosis. In the Institute for Health Metrics and Evaluation *Global Burden of Disease Study 2016*, asbestosis (as an outcome separate to coal worker pneumoconiosis and other pneumoconiosis) and silicosis are 100% attributed to occupational exposure to asbestos and silica respectively (G. B. D. Risk Factors Collaborators, 2017). In the same study, the entire burden of coal worker pneumoconiosis and of other pneumoconiosis is 100% attributed to the risk factor occupational particulate matter, gases and fumes (G. B. D. Risk Factors Collaborators, 2017). However, the population-attributable fractions may actually be smaller than 1.00, considering that some burden of pneumoconiosis may be caused by residential exposure to one or more sources of asbestos (Tarres et al., 2013), silica and coal dust (Akaoka et al., 2017) among residents near mines; non-occupational exposure to silica from the natural environment (e.g. in deserts or from sand storms) (De Berardis et al., 2007) and from second-hand exposures (e.g. family members of exposed workers coming into contact with contaminated clothes etc.).

To consider the feasibility of estimating the burden of pneumoconiosis from occupational exposure by inhalation of dusts and/or fibres, and to ensure that potential estimates of burden of disease are reported in adherence with the guidelines for accurate and transparent health estimates reporting (GATHER) (The GATHER Working Group, 2016; Stevens et al., 2016), WHO and ILO require a systematic review of studies on the prevalence of occupational exposure to dusts and/or fibres (Systematic Review 1), as well as a second systematic review and meta-analysis of studies with estimates of the relative effect of occupational exposure to dusts and/or fibres on the prevalence of, incidence of and mortality from pneumoconiosis, compared with the theoretical minimum risk exposure level (Systematic Review 2). The theoretical minimum risk exposure level is the exposure level that would result in the lowest possible population risk, even if it is not feasible to attain this exposure level in practice (Murray et al., 2004). These data and effect estimates should be tailored to serve as parameters for estimating the burden of pneumoconiosis from occupational exposure to asbestos, silica and/or coal dust in the WHO/ILO joint methodology.

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