



The development of a conceptual model and self-reported measure of occupational health and safety vulnerability



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ARTICLE INFO

Article history:

Received 18 February 2015

Received in revised form 27 April 2015

Accepted 8 June 2015

Available online 19 June 2015

Keywords:

Work injury

Vulnerability

Prevention

ABSTRACT

Injuries at work have a substantial economic and societal burden. Often groups of labour market participants, such as young workers, recent immigrants or temporary workers are labelled as being “vulnerable” to work injury. However, defining groups in this way does little to enable a better understanding of the broader factors that place workers at increased risk of injury. In this paper we describe the development of a new measure of occupational health and safety (OH&S) vulnerability. The purpose of this measure was to allow the identification of workers at increased risk of injury, and to enable the monitoring and surveillance of OH&S vulnerability in the labour market. The development included a systematic literature search, and conducting focus groups with a variety of stakeholder groups, to generate a pool of potential items, followed by a series of steps to reduce these items to a more manageable pool. The final measure is 29-item instrument that captures information on four related, but distinct dimensions, thought to be associated with increased risk of injury. These dimensions are: hazard exposure; occupational health and safety policies and procedures; OH&S awareness; and empowerment to participate in injury prevention. In a large sample of employees in Ontario and British Columbia the final measure displayed minimal missing responses, reasonably good distributions across response categories, and strong factorial validity. This new measure of OH&S vulnerability can identify workers who are at risk of injury and provide information on the dimensions of work that may increase this risk. This measurement could be undertaken at one point in time to compare vulnerability across groups, or be undertaken at multiple time points to examine changes in dimensions of OH&S vulnerability, for example, in response to a primary prevention intervention.

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1. Introduction

The burden of work injury and illness¹ is not equally distributed across labour market participants. Studies from Canada and elsewhere have observed a higher burden of work injury among workers with lower levels of education (Breslin et al., 2008; Cubbin and Smith, 2002; Oh and Shin, 2003), younger workers (Breslin and

Smith, 2005; Runyan and Zakocs, 2000), workers starting their employment (Breslin and Smith, 2006; Butani, 1988), recent immigrants (Smith and Mustard, 2009) and those in temporary employment relationships (Quinlan, 1999). As a result of above average injury rates, younger workers, new workers, temporary workers and recent immigrants are often labelled as “vulnerable workers” (Law Commission of Ontario, 2012; The National Institute of Occupational Safety & Health, 2011). However, using this approach to categorise workers as “vulnerable” does little to identify the specific factors that place identified sub-groups at higher risk of experiencing a work-related injury. This approach to categorising workers can also lead to risk of injury being seen as something inherent to an individual or a particular population

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¹ From here on we use the term “injury” and “injuries” to refer to both injury/injuries and illness/illnesses.

group (Weil, 2009). Studies that have compared measures of the working conditions and/or work relationships among “vulnerable” groups and non-vulnerable groups often find that these characteristics explain much of the increased risk of injury among the former (Breslin and Smith, 2010; Premji and Smith, 2013; Saunders, 2006). Further, while the hazards that a worker is exposed to are linked to their risk of work injury, there is a general acceptance that the factors that lead to increased risk of injury are broader than simply unsafe conditions in the workplace and unsafe actions taken by workers (Andersson and Menckel, 1995; Keyserling and Smith, 2007; Laflamme, 1990).

The objective of this paper is to describe the development of a new measure of occupational health and safety (OH&S) vulnerability. We had three goals in developing this measure:

1. To facilitate a better understanding of the contextual factors that create increased risk of work injury. This includes broadening the focus from identifying the types of workers who are more likely to sustain injuries, to understanding and measuring the work these workers do, and the characteristics of the workplace or industries in which they are employed. The lens of the analysis, however, is on the worker rather than the workplace, in recognition that vulnerability may vary markedly among workers in the same workplace, for reasons we explore below.
2. To allow surveillance to move from lagging indicators such as the rate of injury that occur to more leading indicators such as the level of work conditions and the work context that places workers at increased risk of injury. This data collection would in turn allow for more proactive primary prevention activities.
3. To facilitate the surveillance of OH&S vulnerability by providing insights into the relationship between sociodemographic and contextual factors and vulnerability. This surveillance could be at one point in time, or over time (e.g. in response to population level interventions), noting that a measure of OH&S vulnerability is likely more sensitive to changes in working conditions compared to a lagging indicator such as work injury rates or workers' compensation claim rates.

1.1. A conceptual framework of OH&S vulnerability

Our assumption in developing a conceptual framework of OH&S vulnerability was that the dimensions that lead to workplace injury (increased OH&S vulnerability) are broader than simply unsafe conditions in the workplace and unsafe actions taken by workers (Andersson and Menckel, 1995; Keyserling and Smith, 2007; Laflamme, 1990). As such, we conceptualised four related, but distinct dimensions, as the key features of our concept of OH&S vulnerability.

1. **Level of hazard potential faced by the worker:** A hazard is generally defined as a source of potential damage to a worker. The key objective of this dimension is to measure how often a worker is exposed to hazards such as the use of dangerous equipment or materials, work in dangerous locations, or undertaking work activities where there is a potential for injury.
2. **Workplace/organisation-level protections and policies:** This dimension deals with workplace-level procedures in place to protect workers. It acknowledges that understanding OH&S risk needs to take into account both the potential for, and protection from, exposures occurring within the workplace (Habeck et al., 1998; Hunt et al., 1993; LaMontagne et al., 2003, 2009). Examples include the systematic delivery of training on OH&S and worker rights; the labelling of hazardous materials within the workplace; the provision of safety equipment (e.g. safety guards for machines or personal protective equipment); and

procedures to identify and replace defective equipment and collect and act on information about near miss incidents. This dimension would also include specific policies or supports that address power differentials within the workplace such as the presence and effectiveness of OH&S or representative within the workplace; or the active collection of OH&S concerns from employees.

3. **Worker awareness of occupational hazards:** Based on theoretical models in health behaviour research, awareness is a key component of motivation to engage in health enhancing behaviours (or avoid unhealthy behaviours) (Ajzen, 1991, 2002; Prochaska and DiClemente, 1982). As such, when workers are made aware of the hazards in their workplace, this will – in part – likely serve as a motivator to use personal safety protections (e.g. if workers are not provided with information on why or when safety protections should be used, it is unlikely they will use them, even if they are regularly made available). Further, increased knowledge of legislated rights and responsibilities related to OH&S among workers and supervisors has been suggested as an important factor driving management and workers collaborations to improve OH&S and reduce injuries (Expert Advisory Panel on Occupational Health and Safety, 2010). Examples of this dimension include if workers feel they are aware of the hazards involved in their job as well as those within their workplace.
4. **Worker empowerment to participate in injury prevention:** This dimension deals with an individual's capacity to protect themselves from hazards at work. Examples include if workers feel able to correctly use provided protective equipment (equipment fit, instructions for use etc.); if they feel empowered to refuse unsafe work; or if they feel they can ask questions of their employer about perceived hazards in the workplace.

Although we expect these four dimensions would be related to each other, we feel they are conceptually distinct and important to measure separately. For example, two workers may be exposed to the same level of hazard potential, but if one is employed in a workplace with active policies and procedures to control these hazards they would be less vulnerable to workplace injury. Moreover, even within the same workplace, where a common set of workplace policies applies, individual workers might have different levels of vulnerability because of different levels of awareness or rights or hazards, or different degrees of labour market power. For example, a low-skill worker in a non-permanent job may feel much less able to speak up than a high-skill worker in a permanent job. Accordingly, we define OH&S vulnerability as exposure to workplace hazards, in combination with inadequate workplace policies and procedures and/or low OH&S awareness and/or a workplace culture that discourages workers' participation in injury prevention. While we acknowledge that measures are currently available that capture elements on each of these dimensions (e.g. available measures of safety climate often capture information on workplace policies and procedures), the uniqueness of our measure is that it seeks to measure these dimensions separately, and then combine these dimensions to better understand OH&S vulnerability.

2. Methods

The first step in developing a new measure is to identify a set of potential items (Guyatt et al., 1986; Kirshner and Guyatt, 1985; Streiner and Norman, 2008). We developed a pool of potential items that are related to our conceptual framework of OH&S vulnerability through two steps: (1) a systematic search for existing measures in the peer-reviewed, non-peer-reviewed, and

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