The Financial Burden of Workplace Aggression:

A Systematic Review of Cost-of-Illness Studies

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Abstract

Understanding the economic impact of psychological and social forms of workplace aggression to society could yield important insights into the magnitude of this occupational phenomenon. The objective of this systematic review was to collate, summarize, review and critique, and synthesize the cost of psychosocial workplace aggression at the individual- and societal-level. A peer-reviewed research protocol detailing the search strategy, study selection procedures and data extraction process was developed *a priori*. Both the academic and grey literatures were examined. To allow for basic comparison, all costs were converted and adjusted to reflect 2014 US dollars. Twelve studies, from five national contexts, met the inclusion criteria and were reviewed: Australia (n=2), Italy (n=1), Spain (n=1), the United Kingdom (n=3) and the United States (n=5). The annual cost of psychosocial workplace aggression varied substantially, ranging between $114.64 million and $35.9 billion. Heterogeneity across studies was found, with noted variations in stated study aims, utilized prevalence statistics and included costs. The review concludes that existing evidence attests to the substantial cost of psychosocial workplace aggression to both the individual and society, albeit such derived estimates are likely gross underestimates. The findings highlight the importance of interpreting such figures within their conceptual and methodological contexts.

Keywords: psychosocial aggression, workplace, societal costs; cost-of-illness studies; systematic review

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The body of literature investigating psychological and social forms of workplace aggression (further referred to here as psychosocial workplace aggression) has grown rapidly over the last two decades (e.g. Hershcovis, 2011; Samnani & Singh, 2012). This bourgeoning literature has provided meta-analytic evidence identifying its respective antecedents and consequences for workers' health and organizational performance (e.g., Bowling & Beehr, 2006; Hershcovis & Barling, 2010; Hershcovis et al., 2007; Nielsen & Einarsen, 2012; Nielsen, Indregard, & Øverland, 2016). The last two decades has seen progressively more discussion surrounding psychosocial workplace aggression at policy (e.g., EU-OSHA, 2010) and practice levels (e.g., NHS Health Scotland, 2010), with a growing number of empirically robust studies observing evidence of its associated human and organizational impact (Nielsen, Indregard, & Øverland, 2016; Samnani & Singh, 2012). So far, less attention has been paid to the financial burden that it places on society despite the importance of this knowledge, and indications that the costs are likely to be sizable in terms of individual, organizational and national economies (Hoel et al., 2001).

For many in the field of Occupational Health Psychology (OHP), and beyond, such cost estimates have proved important (and often highly cited) sources of evidentiary information. Such information is commonly used to exemplify and communicate the scale and magnitude of a given health problem or disease; and, in turn, to argue the business case for preventative action (Koopmanschap, 1998). However, detailed and reliable evaluations of such cost estimates seldom receive attention in the broader OHP literature and some frequently cited cost figures have been produced without any clear specification or transparency in the methodology employed (Hassard, Teoh, Visockaite, Dewe, & Cox, 2017). It is imperative for OHP, at least, to develop a stronger empirical understanding of how existing cost estimates are derived and, in future, how more valid and reliable ones might be established. The aim of the current review is to systematically collate, summarize, review and critique the available cost-of-illness studies on psychosocial workplace aggression and, on this evidence, synthesize a reliable estimation of its cost to individuals and society.

Psychosocial Workplace Aggression: Conceptual Remit

Workplace aggression is a general term that covers a wide variety of interpersonal and harmful behaviors (Schat & Kelloway, 2005). The term workplace violence, by contrast, describes a more specific type of aggression consisting of behaviors that are physical in nature, and that may cause both physical and psychological harm (Schat & Kelloway, 2005). While both constructs can be labelled as aggression, their observed nature and content as well as their antecedents and outcomes appear quite different (Rogers & Kelloway, 1997; Roche, Diers, Duffiend & Catling-Paull, 2010; Lanctôt & Guay, 2014). The current review is restricted in its scope to cost-of-illness (COI) studies examining forms of psychosocial workplace aggression. Like many previously published systematic reviews and meta-analysis (Hershcovis & Barling, 2010; Hershcovis et al., 2007; Nielsen, Glasø & Einarsen, 2017) it excludes physical aggression and workplace violence.

The literature on psychosocial workplace aggression bears witness to a proliferation of conceptually overlapping constructs (Hershcovis et al., 2007; Hershcovis, 2011; Nielsen & Einarsen, 2012; Tepper & Henle, 2010), including: bullying, mobbing, harassment, interpersonal conflict, discrimination, incivility, abusive supervision, and social undermining (See Table 1 for a conceptual summary). While unique in many of their defining characteristics, such constructs are broadly characterised by exposure to a discreet or recurrent set of negative interpersonal behaviors from an individual or group of individuals; where such verbal or non-verbal acts are perceived as threatening and experienced as harmful by the victims, potential bystanders and organizations themselves (Hershcovis, 2011; Nielsen & Einarsen, 2012; Tepper & Henle, 2010). However, such constructs diverge in terms of: (i) the nature of the perceived intent and intensity of such negative behaviors, (ii) their frequency (e.g., one off occurrence or on a weekly/daily basis) and patterns of occurrence (e.g. systematic or sporadic); (iii) the level of invisibility felt by the target(s); and (iv) the nature of the perpetrator-victim relationship (Hershcovis, 2011; Neuman & Baron, 2005). Distinguishing between such constructs is made more difficult by the fact that similar measures are often used to quantify exposure to such negative interpersonal behaviors and acts. Consequently, attempts to establish divergent validity can be impaired due to limited and restricted measurement variance (Hershcovis, 2011; Hershcovis et al., 2007; Hershcovis & Barling, 2010).

[Insert Table 1]

Some have argued that the abundance of overlapping constructs has resulted in a fragmented knowledge-base (Neuman & Baron, 2005; Nielsen & Einarsen, 2012; Schat & Kelloway, 2002). Psychosocial workplace aggression has been suggested as a useful conceptual tool for research seeking to investigate negative interpersonal behaviors at work, their antecedents and impact (Hershcovis, 2011). Consequently, this term was chosen by the authors to define the conceptual remit of this review.

A Theoretical Perspective on the Individual, Organizational Relevant and Societal Costs of Psychosocial Workplace Aggression

A theoretical framework proposed by Nielsen and Einarsen (2012) outlines the pathways and mechanisms that link the negative affect experienced by victims of psychosocial aggression in the workplace. At the individual level, Nielsen and Einarsen suggest that negative effects of concern, include: psychological ill health and poor physical wellbeing, and attitudinal and behavioral outcomes (e.g., poor job satisfaction and substance abuse respectively). Support for these pathways is evidenced by both meta-analytic reviews and longitudinal studies (e.g., Nielsen & Einarsen , 2012; Verkuil, Atasayi, Molendiijk, 2015). The current review adopts Nielsen and Einarsen's (2012) individually focused framework, but extends it to include organizationally relevant and societal outcomes (Figure 1). Existing evidence demonstrates an association between exposure to negative interpersonal acts in the workplace and organizationally relevant outcomes, for example, in terms of sickness absence (Nielsen & Einarsen, 2012; Nielsen, Indregard, & Øverland, 2016), intention to leave (Nielsen & Einarsen, 2012) and presenteeism (Conway, Clausen, Hansen, & Hogh, 2016; Janssens et al., 2016). There is a logical relationship between aggregated costs to individuals and organizations, and costs to society. The extension of Nielsen and Einarsen's framework can, therefore, argue for the validity of describing of sources of costs in COI studies as societal: direct (e.g., health and medical costs), indirect (productivity-related losses) or intangible (decreased quality of life)**.** This categorization of costs is discussed below.

[insert Figure 1]

Basic Concepts of Cost-of-Illness Studies

Understanding the financial cost to society is an important avenue by which to assess the magnitude and significance of an occupational or public health problem (Jo, 2014). COI studies aim to

estimate the total economic impact of a disease incurred by all relevant stakeholders within a given society (Drummond, Sculpher, Torrance, O'Brien, & Stoddart, 2005) with such estimates (ideally) accounting for the direct, indirect and intangible costs (Dagenais, Caro, & Haldeman, 2008). The objective of COI studies is primarily to itemize, value and sum the costs of a particular problem (Koopmanschap. 1998). The following sections aim to provide a short summary of the key characteristics of COI studies. For a more comprehensive discussion see Larg and Moss (2011).

Types of costs. The economic burden of a given disease or health problem is estimated by accounting for the costs typically associated with resource consumption, productivity losses, and other '"intangible" burdens within a specified group (Larg & Moss, 2011). Typically, COI studies stratify costs into three categories: direct, indirect and intangible costs (Dagenais et al., 2008; Jo, 2014; Luppa, Heinrich, Angermeyer, König, & Riedel-Heller, 2007; Molinier et al., 2008; see Figure 1). *Direct costs* are incurred by the healthcare system, family, society and the individual; and typically consist of healthcare and non-healthcare costs (Jo, 2014). The former refers to medical care expenditure related to diagnosis, treatment and rehabilitation; while the latter relates to the consumption of non-health care resources (such as, transportation, household expenditures, relocation, property losses, and litigation; Dagenais et al., 2008; Jo, 2014; Luppa et al., 2007). Typically, direct medical costs are the easiest to estimate, and, consequently, the most commonly accounted for in many COI studies. This is likely to be due to the fact that records are kept of such transactions. In contrast, evidence of direct non-medical costs are less well documented, or less readily available, making the estimation of aggregated figures challenging (Dagenais et al., 2008; Luppa et al., 2007).

Within COI studies *indirect costs* refers to productivity losses due to mortality or morbidity borne by the individual, family, society or the employer (Gold, Siegel, Russell, & Weinstein, 1996). Most COI studies tend to focus on productivity losses incurred within the occupational context for example: sickness absence, turnover, and presenteeism (Béjean & Sultan-Taïeb, 2005; McTernan et al., & LaMontagne, 2013). Considerably fewer studies have accounted for non-work related productivity losses, such as: housework, voluntary work, and other unpaid productivity work (Molinier et al., 2008; Larg & Moss, 2011). *Intangible costs*, by contrast, reflect the financial value prescribed to the pain and suffering, and the reduced quality of life experienced by the afflicted individual or group

of individuals (Luppa et al., 2007). Due to the difficulty in quantifying such experiences, intangible costs are seldom included in COI studies. However, their empirical importance in allowing valid and reliable cost estimates is acknowledged within both the economic and public health fields (Larg & Moss, 2011).

Methodological approach. COI studies can be broadly grouped around three different approaches: top-down, bottom-up, and deductive (Drummond et al., 2005; Larg & Moss, 2011). In general, the deductive approach is less commonly used than top-down or bottom-up approaches (Giga, Hoel, & Lewis, 2008; Hoel et al., 2001). The *top-down (population aggregated-based) approach* measures the proportion of a problem that is due to exposure to the relevant risk factor(s) (Larg & Moss, 2011). Attributable costs are calculated by using aggregated data along with population-attributable fraction calculations (Morgenstern, Kleinbaum, & Kupper, 1980). The empirical rigor of top-down approaches relies heavily on the quality of the secondary data sources used. There is often difficulty in distinguishing group differences in the consumption and utilization of health and other economic resources (Larg & Moss, 2011). Despite this, such an approach is typically quicker and easier to conduct than the bottom-up approach as the former often relies solely on secondary data (Mogyorosy & Smith, 2005).

The bottom-up (person-based) approach estimates costs by calculating the estimated cost per case and extrapolates it to the national or societal level (Larg & Moss, 2011). In this instance, medical expenditure and/or loss of productivity are costed per person or per case, and then multiplied by the number of cases or persons affected (Giga et al., 2008; Larg & Moss, 2011). The strength of this approach lies in the potential of identifying all relevant cost components for each specific case or person (Wordsworth, Ludbrook, Caskey, & Macleod, 2005). However, the lack of appropriate data sources can make thorough calculations time consuming or even, in some case, unfeasible (Mogyorosy & Smith, 2005).

Finally, the *deductive approach* examines the proportion of costs associated with the given problem, as obtained from the research literature, and applies this fraction to a total estimate of illness (Giga et al., 2008). For example, if workplace aggression was thought to constitute 10% of the total cost of work-related ill-health (estimated to be a hypothetical $100 billion), the estimated costs of workplace aggression would, therefore, be $10 billion. The advantage of the deductive approach lies

in its simplicity. However, it assumes the breakdown and the average cost of workplace aggression are identical to the average cost of work-related ill-health (European Commission, 2002).

Aim of the Current Study

The aim of the current study is to address this identified gap in knowledge by conducting a systematic review of the literature. The central objective is to collate, review and synthesize evidence-based economic estimations of the burden of psychosocial workplace aggression at the level of the individual and society. More specifically, the systematic review aims to: (i) describe the identified studies; (ii) classify and categorize the identified cost-of-illness studies according to their main objectives and their methodological approach; (iii) compare the results of the studies; and (iv) consider the implications of such findings for the field of OHP.

Method

A scoping review of the literature was conducted prior to the commencement of the study. The results informed the development of the research protocol, which was agreed upon by the entire research team. The systematic review was informed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman & The PRISMA Group, 2009) guidelines.

Search Strategy

Five databases were searched: Ingentaconnect, EBSCO (Academic Search Premier, Business Source Premier, PsychArticles, PsychInfo), JSTOR, Science Direct and Web of Knowledge (Medline, Web of Science). The inclusion period encompassed the start of the database until April 19th, 2017. Search terms and their free text variants were identified in relation to the three facets of the set research question: cost (financial cost, economic cost, monetary cost, cost-of-illness, economic evaluation, illness costs, medical costs, health costs), work-related (work, job, occupation), and aggression (bullying, mobbing, harassment, interpersonal conflict, discrimination, incivility, abusive supervision, social undermining). To examine the grey literature and complement the database search Google and Google Scholar (the first ten pages each), websites of NGOs (e.g., WHO), governmental departments (e.g., Department of Health), and non-departmental public bodies (e.g., UK Health and Safety Executive) were searched.

Included articles were required to meet five inclusion criteria. The article must: (i) refer to aggression or one of its related terms (bullying, mobbing, harassment, interpersonal conflict, discrimination, incivility, abusive supervision, social undermining); (ii) be a cost-of-illness study; (iii) be work-related or set within an occupational context; (iv) costed at the individual, societal or national level (e.g., costs borne by an individual, national health insurance/ service, economy, or government); and (v) published in English. No restrictions were placed on the approach or methodologies used to obtain the financial figure quoted.

Data Extraction and Quality Assessment

To standardize the extraction and synthesis process a data extraction form was developed and, subsequently, piloted. Data was extracted across five domains: study background, methodological design, population, costs and sub-costs, and a study quality assessment checklist. The checklist is based upon the ten-item health economic quality checklist (Drummond et al., 2005) that was adapted by Hassard et al. (2017) in a recent review of COI studies examining the domain of work-related stress. The adapted checklist was used for the current study.

Each study was evaluated against ten criteria outlined in the quality assessment checklist (Hassard et al., 2017; see Appendix I). These criteria critically examined the following methodological and conceptual domains: (i) specification of the utilized definition of psychosocial workplace aggression and theoretical grounding of the study; (ii) descriptive clarity of epidemiological sources used; (iii) detail in the disaggregation of total costs into appropriate sub-costs; (iv) transparency in the utilized activity data (i.e., the data linking epidemiological statistics [prevalence or incidence statistics] with an appropriate health or work outcome); (v) outlining and critically evaluating the nature all cost values used; (vi) identification of unit costs and consideration of their given value; (vii) provision of methodological detail of study parameters; (viii) the use of discounting (where appropriate); (viiii) the use of sensitivity analysis; and (x) presenting the results of the study consistently in relation to the utilized methodology.

Discounting refers to the adjustment of costs to reflect future costs having less of a value than present day costs (Mauskopf, 1998). This analytical procedure should be conducted where costs extend over a one year period. Discounting makes current costs and benefits worth more than those occurring in the future (Torgerson & Raftery, 1999). The economic models derived by COI studies are

complex; and, consequently, contain many uncertainties and unknowns. Sensitivity analysis permits testing the robustness of the results by varying in range key variables (e.g. prevalence, unit costs, etc.; Costa et al., 2012).

In order to comparatively evaluate the studies, and attempt to rank them accordingly, a scoring system was utilized. The ranking system used by Hassard and colleagues (2017) was adopted by the current review. The checklist included ten quality assessment criteria. A score was given in relation to each specified criteria (*0* = criterion not met; *1* = partially met; *2* = fully met). The score for each criterion were summed to provide a composite score for each study. A method of weighting was not used in relation to the ten criteria as such an approach has not been used or validated in previous COI reviews. Studies were categorized based by their yielded composite score: good (aggregated scores between 16 and 20), average (8 to 15), or poor quality (1 to 7). Each included study was independently rated by two reviewers, and differences discussed until consensus was obtained. No studies were excluded based on quality as it allowed for an examination of the diverse range of studies examining psychosocial workplace aggression; and their respective empirical and methodological quality.

Review Process

The search strategy obtained 512 studies after 88 duplicates were removed. These were reviewed using a two-stage review process (see Figure 2): (i) title and abstract, and (ii) full-text. All 512 identified abstracts were reviewed. For an article to be included in the second stage (full-text) of the review, the reviewed abstract had to: (i) refer to aggression or one of its related terms (e.g., bullying, mobbing, harassment), and (ii) be a cost-of-illness study. This process resulted in 425 studies being excluded, leaving 87 full-text articles to review in the subsequent stage of the review. All five of the specified inclusion criteria were applied to the full-text review of short-listed articles. Stages one and two were conducted by one reviewer ($Reviewer_1$). To assess the reliability and validity of the utilized selection process, a random selection of 20% of identified abstracts (n=102) in stage one and full-text articles (n=17) in stage two were independently reviewed blind by two reviewers ($Reviewer_2$ & $Reviewer_3$). The degree of inter-rater agreement was assessed by calculating Cohen's kappa statistic (McHugh, 2012). Adequate inter-rater agreement was observed at both stages of the review (stage one, k=.74 & .78; stage two, k =.82 & .85).

[insert Figure 2]

Results

General Characteristics

After applying the exclusion criteria, twelve articles were retained and reviewed (Table 2). These were drawn from five different national contexts: Australia (McTernan, Dollard & LaMontagne, 2013[2]; Sheehan, McCarthy, Barker, & Henderson, 2001[3]), Italy (Fattori et al., 2015[10]), Spain (Carnero & Martinez, 2005[5]), the United Kingdom (Giga et al., 2008[1,7-8]), and the United States (Asfaw, Chang & Ray, 2014[4]; Brockman, 2013[9]; Hutton & Gates, 2008[11]; Lewis & Malaecha, 2011[12]; Tepper , Duffy, Henle, & Lambert, 2008[6]). The article by Giga et al. (2008) provided three separate cost estimates, each using a different methodology. Therefore, for the purpose of this review, each was treated as a separate study. Consequently, twelve studies were included and reviewed. Six studies examined workplace bullying[1-3,7,8,10], two workplace incivility[11-12], and one study each examined workplace mistreatment[4], mobbing[5], abusive supervisors[6], and interpersonal conflict[9].

The studies included were categorized based on their focus (individual-level: estimated cost per case; societal-level: estimated cost to society); and, in turn, on their methodological approach (top-down, bottom-up, and deductive approach). Of those studies focused on the cost estimates at the societal-level, three studies used a top-down [1-3], three a bottom-up[4-6], and two a deductive approach[7-8] (see Table 2). At the individual level, four studies[9-12] estimated the cost per case of psychosocial workplace aggression. These approaches and respective foci structured the result section below.

[insert Table 2 and 3]

Standardization of Cost Figures

To allow for comparisons between different currencies and years, the presented cost in each study was inflated using country specific consumer price indexes (specified to December 31st, 2014), and then converted to US dollars using purchase power parities (World Bank, 2015a). Consequently, costs within this review reflect annual costs using 2014 US dollars. Total national-level costs were

divided by size of the national labor force (World Bank, 2015b) to obtain average cost of workplace aggression per worker per year. The estimated costs stated by each study are presented in Table 2.

Study Quality Assessment Criteria

Table 4 describes the ten COI quality assessment criteria and maps each study against it. Overall, no study fully or even partially met all the quality criteria. Nine were considered average and three of poor quality. The lack of complex methodologies is evident as none of the studies carried out appropriate sensitivity analysis, which would have considered uncertainty and variation within key parameters (e.g., prevalence rates, unit costs). The absence of examining costs over a one year period meant that that discounting criterion did not apply to eleven studies[1-6,8-12]. Seven studies (58%) failed to adequately present and discuss their cost figures obtained. All twelve studies partially met the criterion describing the sources of the unit costs, with partial scores here reflecting the lack of sufficient detail provided within the described methodology. Three quarters (75%) of studies partially met criteria on transparent methods and unit costs being appropriately valued.

Cost to Society: Top-down Approach (n=3).

Study aims and characteristics. Three studies used a top-down approach. Two were from Australia[2-3] and one from the United Kingdom[1]. All three focused on the conceptual domain of workplace bullying, and rated as of average quality. The brief aims and description of each study are presented in Table 2. The first study[3] aimed to develop a model that estimated the different costs of workplace bullying in Australia. The remaining two articles focused on specific workplace bullying-related outcomes, namely the estimated cost of: absenteeism, turnover and productivity to UK organizations[1]; and production loss due to bullying-related depression[2].

Prevalence. McTernan et al. (2013)[2] used a prevalence statistic (5.9%) of workplace bullying derived from an Australian statewide working conditions survey. In this survey, participants were provided with a definition of bullying, and asked whether they were exposed to such interpersonal behaviors within the previous six months. Utilized prevalence rates for the other two studies derived from: a literature review (Giga et al., 2008b; prevalence: 10-20%)[1] to estimate the occurrence of workplace bullying in the United Kingdom, and data from three separate national contexts (Sweden, the UK and the USA) to estimate the rate within Australia (Sheehan et al., 2001)[3]. Sheehan et al.

(2001) justified this methodological choice through the absence of recent local figures. Neither study[1, 3] provided any indication on how bullying was defined or measured by the utilized secondary sources of data. When the current authors reviewed the secondary data used by Sheehan et al. (2001)[3] and Giga et al. (2008b)[1], these in fact related to the theoretical constructs of mistreatment (Keashley & Jegatic, 1999) and mobbing (Leymann, 1996) rather than workplace bullying per se.

Calculation method and cost components. The main focus of all three studies was on indirect costs due to production loss. None of these studies included direct medical or intangible costs within their economic models (Table 5). Presenteeism and sickness absence costs were included in all three studies, with turnover costs covered by two studies[1,3]. To obtain the indirect costs for sickness absenteeism and presenteeism, the average worker's salary was respectively multiplied with the period of absence and the proportion of reduced productivity. Beyond these cost types, Sheehan et al. (2001)[3] was the only study to consider the direct non-healthcare related costs (compensation, legal costs, redundancy and early retirement payouts) and non-productivity indirect costs (cost of setting up policies and procedures, the provision of workplace support). These were drawn from the best available Australian sources, including the National Institute of Labour Studies and the Australian Bureau of Statistics.

[insert Table 5]

Findings. Converted to 2014 US dollar rates (see Table 2 for overview), the estimated total cost of workplace bullying in Australia[3] per year was between $5.7 and $35.1 billion[3]. The cost per working-aged adult nationally estimated to range from: $460.06 to $2,830.55. The cost estimate of workplace bullying-related depression annually in Australia was estimated at $310.1 million[2]; with the cost per worker equating to $24.95[2]. In the United Kingdom[1], the total cost of workplace bullying was estimated to be $23.4 billion annually, approximately $709.09 per working adult. Across these three studies, presenteeism proportionally constituted the largest cost component (between 70% and 80%), followed by sickness absence (10% to 18%) and turnover (5% to 12%)[1,3].

Cost to Society: Bottom-up Approach (n=3).

Study aims and characteristics. A bottom-up approach was used by three studies[4-6]; these examined the cost of workplace mistreatment in the United States[4], mobbing in Spain[5], and abusive

supervision in the United States[6]. Study aims varied across the three studies (Table 2), with each focusing on estimating the cost of: (i) workplace mistreatment-related sickness absence[4]; (ii) mobbing-related ill-health; and (iii) abusive supervision to employers in the United States[6]. Two studies were rated as of average quality[4,5] and the last poor[6] (see Table 4).

Prevalence. The frequency of abusive supervision in the US[6] was estimated using the lower end of a previously published prevalence range (10% - 16%; Namie & Namie, 2000). No details were provided about how exactly this estimate was obtained by the primary source, albeit others have suggested this data conceptually relates to workplace bullying rather than abusive supervision (e.g., Martinko, Harvey, Brees, & Mackey, 2013). The occurrence of exposure to mobbing behaviors[5] at work was established using data derived from the Fifth Spanish Working Conditions Survey (Table 3; 5.02%). The frequency of exposure to mistreatment at work[4] was estimated using the 2010 National Health Interview Survey. Approximately 7.8% of survey respondents reported being "bullied, threatened or harassed" in the previous year (Table 3). Frequency or repeated exposure was not assessed.

Calculation technique and cost components. The three studies focused on different costs, as reflected by their study aims. The one study[5] that examined mobbing-related costs was the only article to consider health costs. Data on medication and health service use, and their associated costs, were obtained from the Fifth Spanish Working Conditions Survey and governmental data on health spending. The difference of medical costs between mobbing versus non-mobbing victims informed the estimated cost per case. This figure was than extrapolated to the national level.

Tepper et al. (2006)[6] multiplied the proportion of workers experiencing abusive supervision (10%) with the number of workers nationally (140.5 million) and the estimated cost per mistreated worker to obtain a cost of abusive supervision to employers in the US. Labor data was drawn from the Bureau of Labor Statistics. The cost per mistreated worker derived from the estimated cost per case of workplace bullying in Australia (Sheehan et al., 2001). Asfaw et al. (2011)[4] obtained their financial estimate of the cost of workplace mistreatment-related sickness absence by firstly multiplying the number of mistreated workers with the number of extra days absent, followed by the mean daily salary for the United States. Aside from the prevalence statistic, the remaining data was drawn from federal government statistics.

Findings. Considering the diverse aims of the bottom-up approach studies, it is not surprising that the costs obtained were equally as diverse. The cost of abusive supervision equated to an annual national cost of $31.7 billion or $197.03 per worker in the United States[6]. In comparison, the average healthcare cost per mobbing victim was $179 in Spain[5]. Extrapolating this to the national level equated to $114.6 million per year, or 0.12% of public health expenditure. Finally, Asfaw et al. (2011)[4] estimated the cost of mistreatment-related absence as $4.4 billion annually, an average of $27.36 per American worker.

Deductive Approach

Study aims and characteristics. The deductive approach was used by two studies[7-8] , both examined the cost of workplace bullying. Both examined the United Kingdom context and were classed as poor quality. The aims of these studies were very broad (see Table 1). The first aimed to calculate the financial cost of workplace bullying[7], and the second the total cost for bullying to the United Kingdom's Gross Domestic Product[8] (GDP).

Calculation technique and findings. In the first study[7], workplace bullying was estimated to account for 15% of the estimated costs associated with work-related stress. This 15% is the mid-range estimate of the previously published figures (10-20%) by Beswick, Gore and Palferman (2006). Beswick and colleagues do not, however, specify how this figure was obtained. This approach yielded an estimated annual cost of $1.16 billion for workplace bullying, the equivalent of $35.20 per working adult nationally. The second study applied 1.5%, drawn from the estimate that bullying costs society 1.4% to 2% of GDP (Gordon & Risley, 1999), to the United Kingdom's GDP in 2007. When converted to 2014 US dollars, this represented a total estimated cost of $32.2 billion annually, or $975.42 per worker. The absence of a clear breakdown of what the cost of work-related stress and GDP contains means, therefore, it is not possible to evaluate what these yielded figures actually consist of.

The Cost of Psychosocial Workplace Aggression to the Individual: Cost per Case

Study aims and characteristics. The final group of studies (n=4) examined the cost per case of psychosocial workplace aggression, but did not extrapolate this to the national level. Thus, estimated costs remain at the individual level. The four studies examined interpersonal conflict[9], workplace bullying[10], and workplace incivility[11,12], and were all rated as average quality. Three studies

originated from the United States[9,11-12] and one from Italy[10]. The aims of all four studies were to estimate the cost of psychosocial workplace aggression-related productivity (Table 2).

Prevalence. With the exception of the study on interpersonal conflict[9], the remaining three studies used questionnaires to obtain prevalence rates for psychosocial workplace aggression[10-12]. Rather than examining the prevalence of interpersonal conflict, Brockman (2013)[9] employed critical-incident techniques in interviews with 74 construction workers. In total, 41 cases of interpersonal conflicts were identified through these interviews. The Italian study[10] on workplace bullying used a series of national surveys of patients with common medical disorders (e.g., depression, inflammatory bowel disease, autoimmune arthritis). Participants rated the frequency in which they experienced bullying using the Negative Acts Questionnaire (Einarsen & Skogstad, 1996). Two studies[11-12] costed workplace incivility among nurses using variants of the Nursing Incivility Scale (Guidroz et al, 2007). This assesses the frequency of 43 uncivil behaviors from five sources: coworkers, supervisors, the general environment, physicians, and patients, their families and visitors. Lewis and Malecha (2011)[12] reported a prevalence rates over the previous year as 84.8% for workplace incivility. However, no such statistic is provided for the study by Hutton and Gates (2008)[11].

Calculation technique and cost components. Congruent to their aims, all four[9-12] studies focused on estimating reduced productivity due to the examined dimension of psychosocial workplace aggression. One study[10] also considered the cost of related sickness absence. To cost each case of interpersonal conflict, each incident elicited from the critical-incident interviews was broken down to identify parties involved and the estimated time lost dealing with resolving the conflict. The time lost per person was costed at the median hourly wage for a person in that role, and aggregated with other parties involved to obtain an overall cost per case. Estimated salary costs derived from the US Bureau of Labor Statistics.

The remaining three studies used a questionnaire to estimate reduced productivity. For workplace bullying[10], the Work Productivity Activity Impairment questionnaire (Reilly, Zbrozek, Dukes, 1993) measured sickness absence and presenteeism, and used economic metrics to establish a percentage of productivity loss. This was then applied to the Italian per capita GDP for 2010. The two incivility studies[11-12] used the Work Limitations Questionnaire (Lerner, Amick, Rogers, Malspeis, & Bungay, 2001) to measure the degree incivility interfered with participants' performance across four

domains: time management, physical demands, cognitive/interpersonal, and output demands. This produced a score representing the overall percentage productivity loss, which was applied to the average salary for a worker in that job role. However, this score for registered nurses varied substantially between both studies; with one observing a decrease of 2.9%[11], while the other a decrease of 19%[12]. A decrease of 4.8%[11] was observed in nursing assistants.

Findings. In Fattori and colleagues' (2015)[11] study, after controlling for demographics and disease status, the adjusted overall productivity cost of workplace bullying ranged from 13.9% to 17.4% depending on disease type, equating to between $4494.51 and $5627.28 per case. Substantial variation was observed between the two studies examining workplace incivility[11-12]; with the application of reduced productivity figures to the average annual salary equating to $1,388.84[11] for nursing assistants, and $1,662.85[11] and $12,633.13[12] for registered nurses. It is not clear why there is such a large discrepancy for production loss between both studies, although this explains why the variation of cost is equally high. Finally, the discrepancy between mean and median costs per case of workplace conflict also indicates substantial range in costs per case. Across the incidents the average cost in lost time was $11,427.86, although the median cost substantially lower ($313.15). The average cost is exacerbated by one very high maximum time lost (6,000 hours), with the median number of hours lost considerably lower: 5.25 hours. For all four studies no direct (e.g., healthcare, litigation) or intangible costs were examined.

Discussion

The review found evidence that exposure to psychosocial workplace aggression is associated with a financial cost for the individual and society-at-large. However, reviewed cost estimates are difficult to compare due different currencies, methodologies, timeframes, and the selection of different cost components examined by each study (e.g., healthcare cost, productivity and performance losses, sick leave, and replacement costs). A key aim of the study was to conduct a global review of the available economic evidence of the cost of psychosocial workplace aggression to society and the individual. In order to gain a macro-level view of the extant literature an exclusion criterion was not placed on study quality. This is line with previous published reviews of COI studies (e.g., Hassard et al., 2017). The review observed three quarters of reviewed studies were rated as average in methodological quality, with the remaining rated as poor. While this pool of literature, by and large,

demonstrates satisfactory level of methodological quality; it does, however, identify a number of areas where scientific rigor and methodological practices could and should be improved.

One of the key contributions of this review - beyond outlining the available economic evidence in this conceptual domain - is the identification of important gaps in knowledge and methodological practices in this field. Seeking to understand such deficiencies in the literature provides those in the OHP community a framework to apply a critical interpretive lens on such economic figures, but also helps to develop an agenda for future research in this field. In particular, the review identified three important areas of consideration and development: (a) defining psychosocial workplace aggression, (b) its measurement, and (c) the costs components included in economic models. All of which should be considered when reflecting on the nature, magnitude and range of the identified cost.

Psychosocial Workplace Aggression as a Construct

The lack of suitable data, on both prevalence and cost figures, means some researchers have relied heavily on data measuring other, albeit related, constructs related to psychosocial workplace aggression; with many arguably used as proxy variables. For example, the prevalence rates used to inform the economic estimate of workplace bullying in Australia (Sheehan et al., 2001) in fact referred to workplace mistreatment and mobbing. Similarly, while Asfaw et al.'s (2014) study was on workplace mistreatment study, it drew on workplace bullying data. This is also evident with Tepper et al. (2006), which focused on abusive supervision but used costs and prevalence rates that related to workplace bullying (Martinko et al., 2013; Namie & Namie, 2000). Therefore, whether intentional or not, the different conceptual dimensions or facets of psychosocial workplace aggression appear to be substantively intertwined and confounded. Both in the OHP literature, but also as evidenced by the current review within allied research fields (such as, public health and health economics). The implications of this are twofold. First, when reporting on or using these figures it is important to be aware of the primary data sources used by many COI studies to inform their economic estimates. This is particularly true, if the purpose is to emphasize the cost associated with a specific form of workplace aggression. In its current state, drawing on data from external forms of psychosocial workplace aggression may unintentionally serve to reinforce the conceptual ambiguity within this field (Hershcovis, 2011). Second, there needs to more distinctive and coherent data collection on the cost and prevalence of the different forms of psychosocial workplace aggression. This will allow future

estimations to draw on data that is more theoretically relevant to the given conceptual dimension of workplace aggression being examined.

Defining and Measuring Psychosocial Workplace Aggression

Considerable variation within the literature was observed in relation to the prevalence statistics of psychosocial workplace aggression (Keashly & Jagatic, 2010), with rates ranging from 3.5% (Sheehan et al., 2001) to 16.5% (Giga et al., 2008). One of the basic requirements of a COI study is being able to measure the magnitude of the disease being costed (Drummond et al., 2005; Larg & Moss, 2011), which in this case refers to the prevalence or incidence of psychosocial workplace aggression (or associated construct). Higher prevalence is associated with increased cost as a larger section of the population is affected. This is evident in Sheehan et al.'s (2001) study, where lower costs ($5.71- 12.80 billion) were obtained when a conservative prevalence of 3.5% was used compared to a higher prevalence of 15% ($16.58 billion- 35.19 billion). Consequently, the nature and reliability of utilized prevalence statistics is of central importance when critical evaluating derived financial estimates.

The notable diversity of prevalence statistics is likely explained by the varied measurement methods used within surveys. Previous workplace bullying research has shown that the type and nature of the questions used to quantify the occurrence of workplace bullying can have a direct impact on its respective measurement (Einarsen, Hoel, Zapf, Cooper, 2011; Nielsen, Matthiesen, Einarsen, 2010). For example, lower prevalence rates are typically observed when surveys ask participants to self-identify as a victim of bullying, compared to when they measure participants' experience or exposure to specific acts of bullying. In part, this is attributable to the taboo nature of this topic, limited awareness among workers of what bullying is (or is not), and overall cultural consciousness of this occupational phenomena (Einarsen et al., 2011). This is evident in this review, where prevalence rates from the research literature typically were higher than those from national-level surveys that utilized one or two items requiring participants to self-identify as targets of workplace aggression. Consequently, a more in-depth discussion within the research community on the measurement of psychosocial workplace aggression (and its associated constructs) is necessary, and recognizing its potential implications towards COI studies is an important future direction.

Cost Drivers: Are We Getting the Full Economic Picture?

Results from this systematic review demonstrated that that the main form of costs examined across reviewed COI studies were production-related, with only one study considering medical costs (Carnero & Martinez, 2005) and none looking at intangible and hidden costs. This is surprising, particularly in relation to medical costs which are a common feature of COI studies (Boonen et al., 2005). At an empirical level, their omission is in direct contrast to the growing pool of research that demonstrates a strong association between the exposure to negative interpersonal acts and a myriad of health ailments (Kivimäki et al., 2003; Samnani & Singh, 2012; Nielsen & Erickson, 2012). Therefore, the indirect costs associated with medical treatment and healthcare is likely to be present and considerable; and, therefore, should be considered within economic estimations. A systematic review of COI studies examining the cost of work-related stress to society observed the proportional cost of medical and healthcare costs to range between 10-30% of the total cost (Hassard et al., 2017), highlighting their importance and weight within derived economic estimations of occupational health issues.

The omission of direct medical and healthcare cost, along with intangible costs, within derived economic estimations bears two important empirical implications. Firstly, the exclusion of such costs has likely resulted in estimates that are, at best, conservative; or, at worst, gross under-estimates of the scale and cost of the problem. Secondly, the observed finding may highlight that, unlike other work-related illnesses or occupational health issues (e.g., lower back pain, Dagenais, Caro & Haldeman, 2008; and depression, Luppa et al., 2007; work-related stress, Hassard et al., 2017), psychosocial workplace aggression may be perceived more as a productivity or human resources-related issue rather than as a health or medical concern. Despite the growing evidence of the associated health implications of exposure to aggression in the workplace, these are considerable gaps in knowledge; with important empirical and conceptual implications that should be considered.

Limitations of the Systematic Review

The findings of this review are limited by a number of methodological limitations. Firstly, the specified inclusion and exclusion criteria may have resulted in the exclusion of potentially relevant studies due to its published language or specified topic domain. Secondly, caution needs to be exercised when interpreting the cost figures that have been converted into 2014 US dollars. This method allows for basic comparison, but does not consider factors such as: study quality, definitions,

and cost components. Moreover, the absence of the most recent statistics means costs could only be adjusted to 2014. Thirdly, the quality assessment checklist only assesses the quality of the included COI study, and not the studies from which original data originates from. While it does include criteria on the suitability of prevalence rates and on the definition and measurement of psychosocial workplace aggression, these are not sensitive enough to comprehensive and exhaustive review of the secondary sources of data utilized by the COI study. This is a reflection of the wider discipline of health economics where the use of proxy variables is not uncommon (Drummond et al., 2005), and reinforces the importance of critically evaluating how the costs of psychosocial workplace aggression are estimated. Finally, the review did not account for publication bias. However, as costing workplace aggression does not rely on significant results. This topic, therefore, is less likely to be vulnerable to publication bias in the same regards as other systematic reviews. Moreover, the grey literature search functioned to obtain studies published as reports. Despite this, the included studies themselves are vulnerable to publication bias when attempting to cost the magnitude of workplace aggressions effect. This issue is evident in the quality assessment of included studies where not one study fully met the criteria for sensitivity analysis, which required recognition of possible variations of key parameters in the analysis. Sensitivity analysis helps provides a range in which the trust cost likely is situated in. It also serves to elucidate the challenges in COI estimations. While it is not practical to account for every variable, some acknowledgment of variation in key contributing factors in the analyses is important.

Concluding Comments

The review concludes that a body of evidence exists that attests to the substantial cost of psychosocial workplace aggression to both society and the individual, albeit such derived estimates are likely gross underestimates. However, such figures (or range of estimates) should not be taken at face value; but should be critically examined and understood within their national, methodological and conceptual contexts. While the precision of the derived estimate may be questioned and critiqued, they do provide an “educated guesstimate” of the financial burden associated with psychosocial workplace aggression. Such information may act as an important discursive catalyst regarding the value and importance of preventative action at both policy and practice levels. Therefore, while we may query the exact ‘dollar and cents’ of such estimates their practical value in supporting and

engaging key stakeholders should not be undervalued. However, for those in the field of OHP it is imperative that we have a clear methodological understanding of the nature of such figures, including the methodologies used to derive such estimates. We hope that this review is an important preliminary step in supporting this critical review process. Looking forward, the authors would argue that strengthening this empirical field is not simply a function of revising utilized figures or numbers; but, rather, requires the further integration of this arguably empirically fragmented literature in conceptual and measurement terms. Developing a strong empirical foundation that seeks to understand the pathways, mechanisms and outcomes of psychosocial workplace aggression will provide further clarity and precision to derived estimated figures.

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Table 1. Summary of constructs associated with workplace aggression (adapted from Herschovis, 2011)

Construct and Definition	Defining Characteristics	Example of Standardised Measurement	Summary of sampled domains by instruments items
Social Undermining Behaviours intended to hamper, over time, the ability to establish and maintain positive interpersonal relationships, work-related success and favourable reputation (Duffy et al., 2002)	• Intentional negative behaviours • Impact on social relationships, and work-related goals and reputation.	*Social Undermining Measure* (Duffy et al., 2006) A 26 item scale that measures the frequency of participants' experience of negative interpersonal behaviours by their supervisor and co-workers.	• Having feelings hurt • Being dismissed or undermined. • Ignored or socially isolated • Being insulted, belittled, and gossiped about. • Being talk down to • Someone competing with you for status or recognition • Made to feel incompetent • Not giving help when needed. • Not defend by others when spoken poorly off.
Workplace Incivility Low intensity deviant acts (e.g., rude and discourteous behaviours) enacted towards another organizational member with ambiguous intent to harm (Andersson & Pearson, 1999).	• Low intensity negative interpersonal behaviours: • Such deviant acts can be verbal or non-verbal. • The intent of act abstruse and ambiguous.	*The Workplace Incivility Scale (Cortina et a., 2001)* Measures the frequency of participants' experiences of disrespectful, rude or condescending behaviours from superiors or coworkers in past five years.	• Put down or dismissed • Ignored or isolated socially • Targeted rude or condescending behaviours • Being draw you into a conversation of personal matters • Having your ability or judgment questioned
Abusive Supervision The sustained display of hostile verbal and non-verbal behaviors, which excludes physical contact (Tepper, 2000).	• Top-down, non-physical, behaviour perceived as distressing by subordinates • Acts of aggression are assumed to be experienced differently by targets than those enacted by someone else (e.g., co-worker). • Sustained exposure	*Abusive Supervision Scale* (Tepper , 2000) Respondents are asked to rate the frequency with which their supervisors engaged in negative and aggressive behaviours directed at themselves.	• Put down, dismissed or ridiculed • Being ignored or isolated socially • Invades my privacy • Reminds me of my past mistakes and failures • Doesn't give me credit for work or effort or doubts my judgement or ability • Blames me to save their own embarrassment • Break promises and lies to me. • Expresses anger at me when they are mad for another reason

			• Makes negative comments about me to other
Interpersonal Conflict An organizational stressor involving disagreements between employees, which can range from minor disagreements between coworkers to physical assaults on others (Spector & Jex, 1998).	• Perceived disagreements between co-workers. • Verbal and physical acts. • Conflict may be overt (e.g., being rude) or may be cover (e.g., spreading rumours)	*Interpersonal Conflict at Work Scale* (Spector & Jex, 1998) Aims to measure conflict with other people at work.	• Arguments with co-workers • Co-workers acting in a nasty or rude manner • Being yelled at by co-workers.
Bullying and harassment Situations where a person repeatedly and over a period of time is exposed to negative acts and aggressive behaviours (i.e. constant abuse, offensive remarks or teasing, ridicule or social exclusion) at work that are primarily of a psychological nature (Einarsen, 2000).	• Frequently and persistent recurring exposure • Relationship between perpetrator and target is defined by a power imbalance. • Verbal or non-verbal acts • Top-down, bottom up, or co-worker –co-worker.	*Negative Act Questionnaire -Revised* (Einarsen et al., 2009) Measures exposure to bullying within the last 6 months. Single item self-reported exposure to bullying is also commonly used within many surveys.	• Threats of violence or abuse • Experiencing intimidating behaviours • Put down, dismissed, ridiculed or humiliated • Having rumours spread about you • Having opinions ignored and isolated/ excluded socially • Reminded of or criticised for past mistakes, errors or failures • Given tasks with unreasonable deadlines, having an unmanageable workload, and excessive monitoring of your work. • Information regarding work purposefully withheld. • Pressure to quite job • Target of spontaneous anger • Target of allegations

Table 2: Overview of Studies and Total Costs

	Study Aims	Aggression Terminology	Aggression Prevalence (%)	Cost (Year)	2014 USD	Cost per Working Person[a]	Quali
Top-down approach							
[1]Giga et al. (2008b) **United Kingdom**	Estimate the total cost for absenteeism, turnover and productivity costs of bullying for organisations in the UK in 2007	Bullying	16.5	£13.75 billion (2007)	$23.38 billion	$709.09	Averag
[2]McTernan et al. (2013) **Australia**	Estimate the contribution of job strain and bullying to depression-related productivity loss	Bullying-related depression	5.9	AU$413 million (2009)	$310 million	$24.95	Averag
[3]Sheehan et al. (2001) **Australia**	Provides a model for the initial assessment of the impacts and costs of workplace bullying, and present an indicative costing derived from this approach	Bullying	3.5 -15	Low prevalence AU$5.9 - 13.2 billion (2000) High prevalence AU$17.1 - 36.3 billion (2000)	$5.71- 12.80 billion $16.58 billion- 35.19 billion	$460.06- 1029.29 $1333.40- $2830.55	Averag
Bottom-up approach							
[4]Asfaw et al. (2014) **USA**	Examine the association between workplace mistreatment and occurrence, duration, and costs of sickness absenteeism	Workplace Mistreatment	7.8	$4.1 billion (2010)	$4.4 billion	$27.36	Averag
[5]Carnero & Martinez (2005) **Spain**	Study the economic consequences of mobbing behaviours at the workplace in terms of health	Mobbing	5.02	€64 million (2003)	$114.64 million	$4.92	Averag
[6]Tepper et al. (2006) **USA**	Estimate of costs to U.S. employers for abusive supervision	Abusive supervision	10	$23.8 billion (2001)	$31.7 billion	$197.03	Poor
Deductive approach							
[7]Giga et al. (2008a) **United Kingdom**	Use a deductive method to calculate the financial cost of bullying	Bullying	10	£682.5 million (2007)	$1.16 billion	$35.20	Poor
[8]Giga et al. (2008c) **United Kingdom**	Estimate the total cost for bullying to the UK GDP	Bullying	1.4-2	£17.65 billion (2007)	$32.16 billion	$375.42	Poor
Per case approach							

[9]Brockman (2013) **USA**	Measure the monetary cost of interpersonal conflict on a construction site	Interpersonal Conflict		$10,948 (2011)	$11,427.86	Averag
[10]Fattori et al. (2015) **Italy**	Assess work productivity losses and health disutility associated with bullying among subjects with chronic medical conditions	Bullying	16.3	$4182– 5236 (2010)	$4494.51- 5627.28	Averag
[11]Hutton & Gates (2008) **USA**	Estimate the costs to health care organizations due to decreased productivity related to incivility at work	Incivility		Nursing asst.: $1,235; Registered nurse: $1,484 (2008)	$1,383.84- 1662.85	Averag
[12]Lewis & Malaecha (2011) **USA**	Investigate the impact of workplace incivility (WPI) on staff nurses related to cost and productivity	Incivility	84.80%	$11,581 (2009)	$12,633.13	Averag

[a]The average cost of bullying per working person was obtained by dividing the estimated total cost of bullying by the size of the labour force in that country (OECD, 2014).

Table 3: Workplace aggression definitions and prevalence sources across studies

Study	Aggression Term	Sample Size	Survey	Survey Characteristics	Year Data Collected	Mean Age	Female %	Prevalence %
Top-down approaches								
[1]Giga et al. (2008b) **United Kingdom**	Bullying	5,288	Cooper, Hoel & Faragher (2001)	Survey of 70 UK organisations	-	40.2 (SD 9.84)	47.6	10.5-16.5
[2]McTernan et al. (2013) **Australia**	Bullying-related depression	2,790	Australian Workplace Barometer	Survey of working conditions in two states (Western Australian & New South Wales)	2009-10	46 (SD Males 12.6) (SD Females 12)	49.82	5.9
[3]Sheehan et al. (2001) **Australia**	Bullying	2,400	Survey by Leymann (1996)	Employees representative of the Swedish working population	-	Range 15- 74	-	3.5
		5,288	Hoel & Cooper (2000)	Survey of 70 UK organisations	-	40.2 (SD 9.84)	47.6	10.5-16.5
		-	Keashley (2000)	Survey of employees in Minneapolis, USA	-	-	-	21.5
Bottom-up approach								
[4]Asfaw et al. (2014) **USA**	Workplace Mistreatment	13,807	National Health Interview Survey	Represent the 122.5 million US working adult population	2010	41.9 (SD 13.5)	46.84	7.8
[5]Carnero & Martinez (2005) **Spain**	Mobbing	5,236	Fifth Spanish Working Conditions Survey	Information on working conditions including psychological factors	2003	-	-	5.02
[6]Tepper et al. (2006) **USA**	Abusive supervision	-	Report by Namie & Namie (2000)	Bullying survey	-	-	-	10-16
Deductive approach								
[7]Giga et al. (2008a) **United Kingdom**	Bullying	-	Literature Review by Beswick et al. (2006)	International prevalence rates	-	-	-	10-20
[8]Giga et al. (2008c) **United Kingdom**	Bullying	-	Estimated proportion of bullying cost to economy	-	-	-	-	1.4-2

Per case approach								
[9]Brockman (2013) **USA**	Interpersonal Conflict	74	Interviews within study	Construction workers from four firms	2011	-	5.4	-
[10]Fattori et al. (2015) **Italy**	Bullying	1717	ILiberamente and MOSAICO Surveys	Survey of patients with common medical conditions	2013	46.8 (13.1)	61.7	16.3
[11]Hutton & Gates (2008) **USA**	Incivility	184	Survey conducted within study	Nurses in the Midwest, USA	-	38	91%	-
[12]Lewis & Malaecha (2011) **USA**	Incivility	659	Survey conducted within study	Nurses in Texas, USA	2009	46.38	92%	84.8

Table 4: Quality assessment of included studies

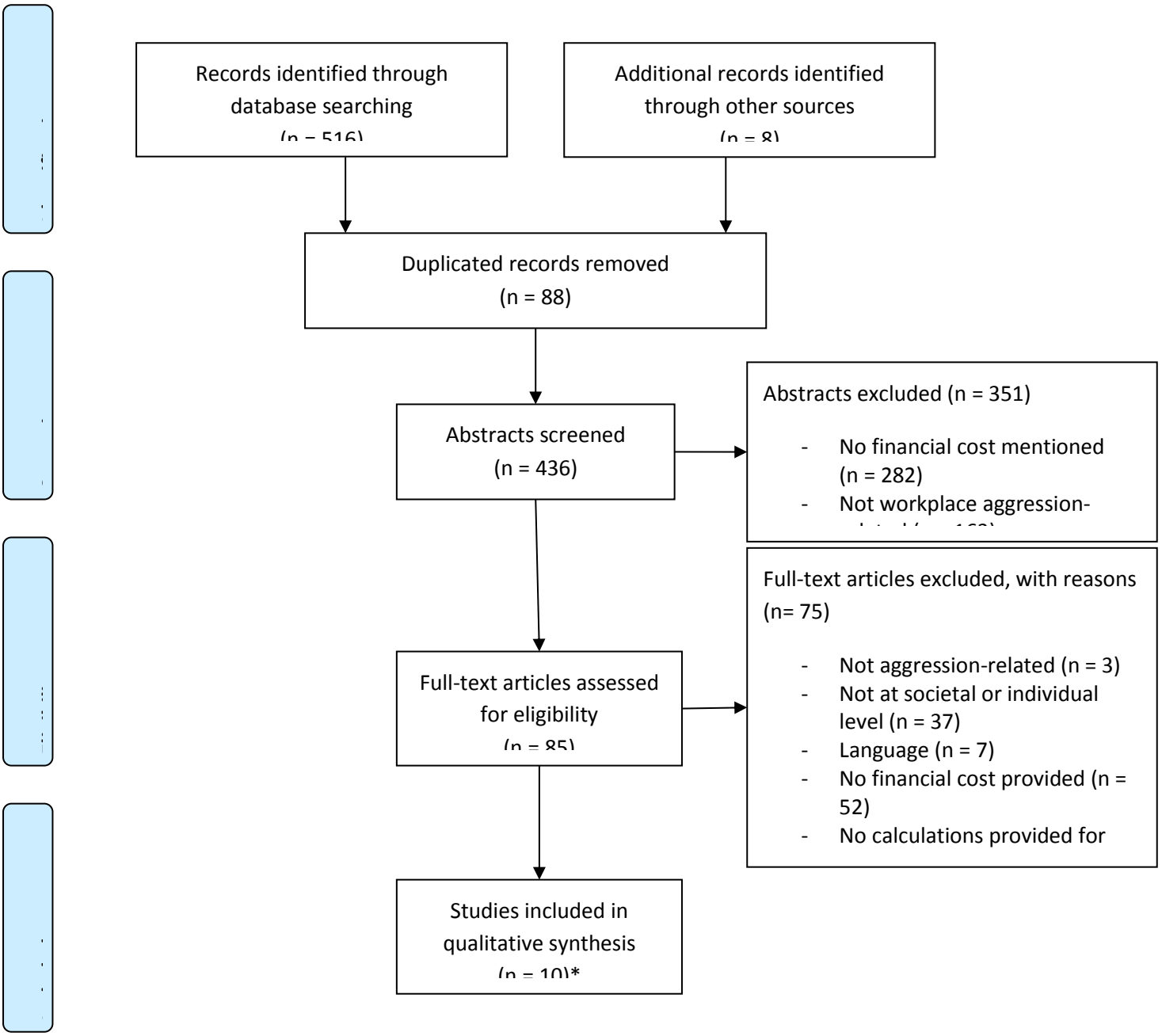
	Articles											
Quality Assessment Criteria	1	2	3	4	5	6	7	8	9	10	11	12
Approach	TD	TD	TD	BU	BU	BU	DD	DD	PC	PC	PC	PC
1. Was a clear definition of the illness given?	N	P	P	P	Y	N	N	N	Y	Y	Y	Y
2. Were prevalence sources carefully described?	N	Y	N	Y	P	N	N	N	Y	Y	Y	Y
3. Were costs sufficiently disaggregated?	Y	N	Y	Y	N	N	N	N	Y	Y	Y	Y
4. Were activity data appropriately assessed?	P	Y	P	P	Y	Y	P	N	N	Y	Y	Y
5. Were the sources of all cost values analytically described?	P	Y	Y	Y	Y	P	P	P	Y	Y	P	P
6. Were unit costs appropriately valued?	Y	P	N	P	Y	N	N	Y	Y	Y	Y	Y
7. Were the methods adopted carefully explained?	Y	Y	N	Y	N	Y	Y	Y	P	N	Y	Y
8. Were costs discounted?	NA	NA	NA	NA	NA	NA	Y	NA	NA	NA	NA	NA
9. Were the major assumptions tested in a sensitivity analysis?	N	P	P	N	N	N	N	N	N	N	N	N
10. Was the presentation of study results consistent with the methodology of study?	N	Y	Y	Y	P	N	N	N	Y	N	N	N
Total Score	10	15	11	15	12	7	6	7	15	14	15	15
Study Quality	Average	Average	Average	Average	Average	Poor	Poor	Poor	Average	Average	Average	Average

Note. (Y) denotes criterion fully met and is worth 2 marks; (P) represents partially met and is worth 1 mark; (N) represents met not met and is worth 0 marks; NA means criterion not applicable; TD: Top-down; BU: Bottom-up; DD: Deductive.

Table 5: Types of sub-costs included in cost estimation

	Direct Costs		Indirect Costs		Intangible Costs
	Healthcare	Non-healthcare	Productivity-related	Non-productivity	
Top-down approaches					
[1]Giga et al. (2008b)			Presenteeism; Sickness absence; Turnover		
[2]McTernan et al. (2013)			Presenteeism; Sickness absence		
[3]Sheehan et al. (2001)		Compensation; Legal; Redundancy & Early retirement	Management/ Supervisor involvement; Presenteeism; Sickness absence; Turnover	Procedures & policies; Workplace support (e.g., EAP, HR)	
Bottom-up approaches					
[4]Asfaw et al. (2014)			Sickness absence		
[5]Carnero & Martinez (2005)	Doctor visits; Medication		Time to visit doctor		
[6]Tepper et al. (2006)		Compensation; Legal; Redundancy & Early retirement	Management/ Supervisor involvement; Presenteeism; Sickness absence; Turnover	Procedures & policies; Workplace support (e.g., EAP, HR)	
Deductive approaches					
[7]Giga et al. (2008a)					
[8]Giga et al. (2008c)					
Per case approaches					
[9]Brockman (2013)			Reduced productivity		
[10]Fattori et al. (2015)			Reduced productivity		
[11]Hutton & Gates (2008)			Reduced productivity		
[12]Lewis & Malaecha (2011)			Reduced productivity		

Figure 1. The review process based on PRISMA flow diagram.



*Note: Giga et al.'s (2008) study provided three separate cost estimates, each using a different methodology. Therefore, for the purpose of this review, each was treated as a separate study. Consequently, twelve studies