Centre for Health Equity
Melbourne School of Population and Global Health

# Work-related Suicide: A Discussion Paper

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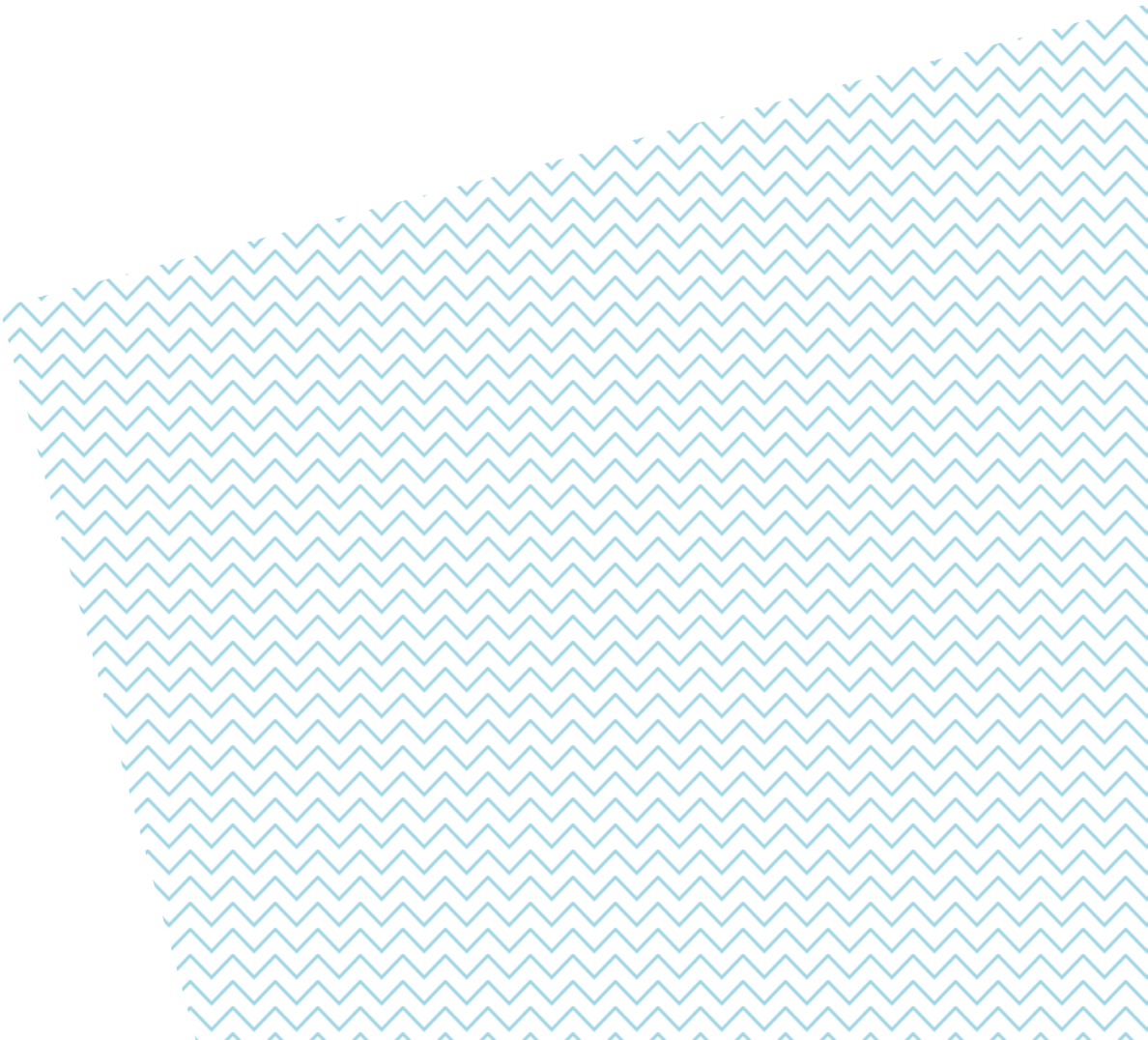

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# EXECUTIVE SUMMARY

There is growing media, policy, and research interest in the relationship between work and suicide. Perspectives differ on the state of the evidence regarding aetiology and intervention, as well as the appropriate policy and practice responses. In this Discussion Paper, we take an occupational health & safety (OH&S) perspective on work-related suicide, focusing on working conditions as potentially modifiable risk and protective factors for suicide in the working population. We outline two complementary approaches to identifying and enumerating work-related suicides: where work-relatedness is established 1) on an individual case-based approach and 2) using a population-based epidemiologic approach.

The document addresses four questions, as set out below.

***What is the definition of work-related suicide from an OH&S perspective?***

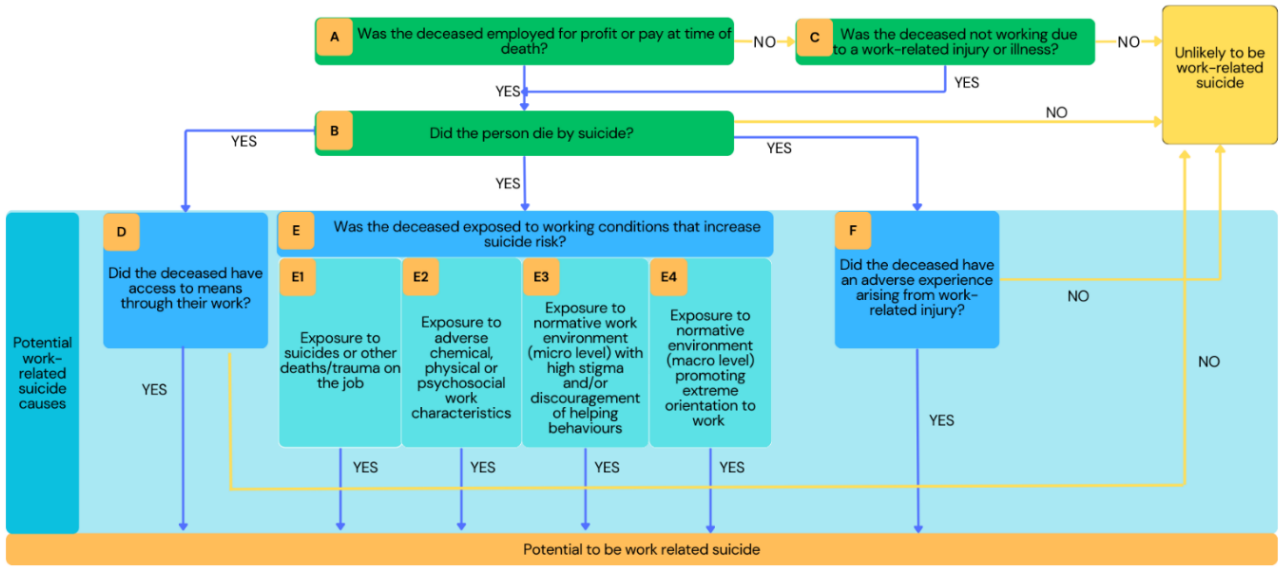
We define work-related suicide as death by suicide that is wholly or partly related to—and caused by—work or working conditions. Further, taking an occupational health and safety (OH&S) perspective, we restrict this to cases of persons who were working for profit or pay at the time of death, and refer to the working conditions of the person who died by suicide.

***What are the potential work-related causes of suicide, and what is the evidence in support of each?***

Some work-related causes of suicide have been previously established, such as having access to means through one's job or workplace. There is mixed evidence that unintentional exposures to hazardous chemicals, such as pesticides and solvents, are related to suicide, but strong and growing evidence linking various psychosocial working conditions, or job stressors, to suicide. Because adverse psychosocial working conditions, or job stressors, are common exposures in the working population, and because this is the most active area of work and suicide research recently, we have treated this subject in the greatest detail. Other potential work-related causes are exposure to suicide or other trauma on the job, exposure to work environments with high

stigma or discouragement of helping behaviours, exposure to broad cultural norms that promote extreme orientation to work, and workplace injuries contributing to subsequent suicide. The evidence for each of these is reviewed and a schema for potential work-related causes of suicide is presented in Figure 1.

Figure 1: Schematic summary of potential work-related causes of suicide




***What is the fraction of suicides in the working population that could be attributable to working conditions?***

Most case-based estimates of work-related suicide (with 'work-related' defined in various ways) are in the range of 10-15%. We are not aware of any epidemiologic estimates that take into account multiple exposures, but attributable fractions of suicide in the working population for specific psychosocial working conditions have been estimated for job strain (5%) workplace sexual harassment (6%) and job insecurity (6%). We conclude that it is likely that a full accounting incorporating a range of chronic job stressors, which are common exposures across the working population, could well exceed the case record-based estimates of 10-15% of suicides in the working population, representing a substantial preventable burden.

***What are the implications for policy & practice?***

There are various principle- and evidence-based workplace intervention strategies available, some of which have been shown to improve suicide prevention literacy, reduce stigma, enhance helping behaviours, and in some instances reduce suicide rates. Prevalent practice in workplace suicide prevention, however, tends to over-emphasise individual-directed intervention and to neglect interventions that reduce exposures to working conditions known to increase suicide risk.

***Conclusions***

We conclude that the current evidence is adequate to justify OH&S and other public health action. In order for workplace suicide prevention to reach its full preventive potential, workplace suicide prevention needs to complement its current focus on individual-directed intervention with greater attention to addressing working conditions that increase suicide risk.

# I. INTRODUCTION & APPROACH

Suicide is a leading cause of death worldwide, and suicide and suicidal behaviour are major contributors to the global burden of disease; further, the impacts extend widely to those bereaved or otherwise affected by suicidal behaviour (1, 2, 3). In absolute terms, most suicide deaths occur among people of working age (2, 4). Yet the role of work in protecting from, or increasing the risk of, suicide is a relatively under-developed area of research. Historically, it has been established that the absence of work when it is desired (unemployment) increases the risk of suicide (5, 6, 7, 8); hence being in work is considered protective relative to being unemployed. However, in developed countries the unemployed usually represent less than 5-10% of the working population. The employed comprise a far greater proportion of the population – typically up to two-thirds of the working age population. What role then, does work play as a modifiable risk or protective factor in the working population? There is growing international attention to this question (9, 10, 11). High profile cases implicating working conditions, such as with Foxconn in China and Telecomm/Orange in France, have raised public awareness, and there is growing policy attention from occupational health and safety (OH&S) regulators and workers compensation authorities (12). In addition, there has been considerable growth in research on work and suicide in the last decade.

Previous research has documented that various occupations and sectors have elevated suicide rates relative to either the lowest risk groups or the average across the working population (13, 14, 15, 16). Access to means to take one's life at or through one's work in such occupations explains some of this excess (e.g., physicians in the healthcare sector, police officers in emergency services) (17, 18). For other groups, it is less clear that access to means could explain elevated rates (e.g., construction workers (19)). Many occupations or sectors at high risk of suicide are also characterised by working conditions that are harmful to mental health, suggesting a role for

adverse working conditions as causal contributors to suicide risk. Until recently, however, relatively few specific occupational exposures have been investigated as risk factors for suicide epidemiologically. This is explored further in section III below.

Defining work-related suicide is, on the face of it, quite simple: death by suicide that is wholly or partly related to—and caused by—work or working conditions. While 'related to', strictly speaking, represents association or correlation, in this context we seek to understand work-related causes of suicide that can, in turn, inform policy and practice responses in an OH&S context. To focus the scope of our arguments in the context of this Discussion Paper, we restrict our examination of work-related suicide to cases of persons who were working for profit or pay at the time of death, irrespective of the specific time or place of death (i.e., not necessarily at workplace or during work hours), and refer to the working conditions of the person who died by suicide (Figure 1). We return to the inherent limitations in this perspective and the need for broader definitions at the end of the Paper.

We seek to integrate two approaches to identifying and counting or quantifying work-related suicides in order to gauge the magnitude of the problem: where work-relatedness is established 1) on an individual case-basis, and 2) using a population-based epidemiologic approach. We argue that these two approaches are complementary, and both are required to understand the scale of the problem and to formulate optimal policy and practice responses (sections II and III). This is followed by an integrated summary of work-related risk factors for suicide that also serves as recommended areas for consideration in suicide investigations (section IV). Finally, we outline the strengths and limitations of this review and its implications for policy & practice in section V.

Some caveats for the arguments that follow: 1) for brevity and defensibility, we focus on deaths by suicide as an objectively determined outcome that is least susceptible to bias in its determination, acknowledging that the role of work in suicidal ideation and suicide attempts also warrant attention; 2) acknowledging that there is a number of recent reviews of work and suicide (9, 20, 21, 22), we will refer to these and repeat content only when essential to our arguments.

# II. INDIVIDUAL CASE-BASED APPROACH TO DETERMINING WORK-RELATEDNESS

Deaths by suicide are routinely documented and investigated by police, healthcare personnel, and coronial authorities, with medical examiners, coroners or police making the final determination of a death as occurring through intentional self-harm (3). As such, individual cases often generate extensive documentation which can be investigated for contributing causes. Work-relatedness can be suggested by many factors including the circumstances of the death, attribution to work by the deceased (e.g., in a suicide note) or by family, friends or co-workers of the deceased, a work location of the death, and accessing means of suicide at or through work. Based on case records, various categories of work-relatedness have been proposed. Highlights of these are outlined below, along with corresponding estimates of the fraction of suicides that are work-related.

Work-related suicide, termed *karo-jisatsu* (as distinct from sudden death from overwork, termed *karoshi*), has long been recognised in Japan, usually in relation to excessive working hours and workloads. A Japanese National Police Report (National Police Agency, Government of Japan, cited in Yamauchi et at, 2017 (23)) stated that there was 24,025 deaths by suicide in Japan in 2015. The reasons for suicide were determined by police in 75% of those deaths, and 12% of those involved "work-related issues." In Japan, Korea, and Taiwan, overwork-related disorders including death by cerebrovascular and cardiovascular diseases (including *karoshi*) and mental disorders attributed to heavy workloads or stressful work events (including *karo-jisatsu*) are compensable occupational diseases under workers' compensation systems. An analysis of submitted and compensated claims in Japan from 1988 through 2014 showed a steep rise in submitted claims for work-related suicide, reaching a peak of roughly 1600 claims, of which less than 500 were compensated (23). How work-relatedness was determined in the Japanese National Police Report

is unclear; however, the number of compensated 'work-related suicides' would seem to represent a small proportion of the estimated total work-related suicides (~500/2883 ~ 17% compensated).

A set of criteria for potentially work-related suicides was recently proposed and tested by the French National Public Health agency for the purposes of developing a working population surveillance strategy (24). Each suicide or death of undetermined cause was considered potentially work-related when at least one of the following circumstances was present:

- The suicide occurred in the workplace;
- A suicide note left by the deceased implicated working conditions;
- The deceased was in work clothes even if not working;
- The testimony of relatives implicated work-related difficulties, or work-related difficulties were identified by investigators.

In a feasibility study, a sample of 1,135 suicide deaths from calendar year 2018 were examined, and 10% met one or more of these criteria (24). Importantly, these criteria were designed as triggers for further investigation, not as evidence *per se* of work as a contributing cause.

In Australia, a 2012 study reviewed 642/3775 (17%) suicides identified as 'broadly work-related' by investigating police or coroners over a 7-year period in the state of Victoria (25). 'Work-relatedness' was further classified as involving reports of work stressors (55%); jumped, laid, or moved in front of a moving train or heavy vehicle (32%); involved a work location (7%); or involved work as a means (e.g., firearm) (6%). Work-related in this context, however, included many who were unemployed, retired or students at the time of death: ~1/3 of 'work stressor' cases, and ~1/2 of those using another person's work as means were unemployed or not in the labour force. Removing those cases leaves 396/3775 or ~10% potentially caused by the deceased's work.

A 2021 analysis of 89,389 suicides from the National Violent Death Reporting System in the US identified 'work factors' in 13.5% of suicides (26); this was based on death certificates and death investigation documentation covering 35 US states from 2013-2017, with work-relatedness defined as an indication of work-relatedness on the death certificate, or a work problem or work crisis being mentioned in the documentation of the death investigation. In a further analysis, these investigators estimated work was a 'major factor' in one fourth of work-related suicides (27).

To summarise, various indicators or categories of work-relatedness have been developed on the basis of individual case records, some of which would suggest work as a contributing cause (e.g., work-related difficulties) and some not necessarily so (e.g., wearing work clothes at the time of death). Some categories are conceptually distinct from our definition of 'work-related,' such as in relation to acute job loss events or experiencing periods of unemployment. While unemployment is a well-established suicide risk factor (5, 7, 8), we classify this as due to the absence of work, rather than work *per se*. In this Discussion Paper, we restrict our focus to cases where a working person dies by suicide, and the potential for work-related causes is restricted to the work and working conditions of the deceased. Hence, we would also exclude the use of the work or workplace *of others* as a means of taking one's own life from our purview (e.g., rail suicides), if the deceased was not working for profit or pay at the time of death.

Case-based approaches have advanced our understanding of work and suicide, as well as insights for developing prevention and control responses both in the workplace (e.g., the 2014 Japanese National Prevention Strategy for Overwork-related Disorders (23)) and in general community settings (e.g., unemployment insurance and job re-training, or 'active labour market', programs). The individual case approach, however, is limited by the lack of standardised data-collection

methods on work-relatedness, knowledge of the work circumstances of the deceased among persons interviewed about them, potential biases of persons close to the deceased, and potential biases of investigators and coroners (e.g., prioritising medical diagnoses while understating psychosocial factors when explaining suicides (28)). For example, an Australian study found that between 1985 and 2007 there were 21 workers' compensation claims for suicide in the state of Victoria, yet review of the coronial records identified work factors or a previous work injury for only 9 of the 21 workers compensation cases, and four of the 21 cases were not able to be identified in the coronial records (29). Accordingly, it seems likely that work-relatedness is under-identified in studies relying on investigations of individual suicide cases, at least historically. In the section that follows, we argue that the individual case perspective needs to be complemented by a population or epidemiologic perspective.

# III. EPIDEMIOLOGIC APPROACH TO DETERMINING WORK-RELATEDNESS

Population-level epidemiologic studies on work and suicide include studies of specific occupational exposures, ranging from hazardous substances to psychosocial working conditions. Epidemiologic studies on suicide by occupation or sector, while valuable for suggesting specific workplace exposures or risk factors, are more useful for identifying target groups for general suicide prevention intervention, and not specific causes.

## Chemical Exposures

Some of the earliest studies on work and suicide were of carbon disulphide exposure in rubber and rayon manufacturing dating back to the early 1900's. These early studies, principally case reports, documented depression, acute mania, suicide attempts and commitments to mental institutions among the exposed (Hamilton 1943, cited in Manucso 1972 (30)). Decades later, a US retrospective cohort study of rayon workers exposed from 1938-1948, with follow-up until 1968, found up to 4-fold elevated suicide mortality rates compared to the US working age population (30).

Unintentional occupational exposures to pesticides, solvents and other neurobehaviorally active agents have been associated with excesses of suicide in some studies (31, 32, 33). Some of these exposures have plausible links to suicide through their association with increased risks of depression and anxiety symptoms, such as for certain pesticides and organic solvent exposures (13, 34). The association is further supported by elevated suicide rates in occupations with these exposures, such as farmers and other agricultural workers (independent of using pesticides as a means of suicide) (35) and automotive workers with potential solvent exposures (34). However, a systematic review of occupational pesticide exposure, depression and suicide found mixed evidence of associations, with the studies limited by poor exposure data, limited control for confounding and a dearth of prospective studies (36). Hence this evidence is inconclusive and further research is needed in this area.

In summary, we conclude that the above-mentioned chemical exposures warrant investigation as potential contributing causes to work-related suicides until further study discounts previous findings of concern (Figure 1, Box E2). These chemical exposures, however, are relatively uncommon in the working population; thus, even if they are causally related to suicide, they are unlikely to account for a large number or proportion of work-related suicides. High levels of carbon disulphide exposure, for example, would be very rare in industrialised countries, though it may still be of concern in developing countries.

## Physical exposures

Some research suggests that psychosocial working conditions (e.g., job demands) interact with acoustics and noise exposure in their association with job-related stress (37). It has been hypothesised that noise may interfere with tasks or activities, which elicit negative changes in emotions, psychological effects, and behavioural changes (37). A Korean national population survey (N = 10,020), for example, found that occupational noise annoyance, as a proxy for noise exposure, was significantly related to depressive symptoms and suicidal ideation after controlling for individual and socio-demographic characteristics (38), although we note that this study was limited by self-report measures and a cross-sectional design. There has been little study in this area to date, but occupational noise exposure is common in the working population. Though the evidence is inconclusive at present, the role of noise exposure, particularly in relation to psychosocial working conditions, warrants further research.

Occupational heat stress is garnering growing attention in light of rising global temperatures, particularly for outdoor workers (39). We are not aware of research specifically linking excessive heat and suicide in a work context, but it is plausible that thermal stress could interact with other

occupational stressors to increase suicide risk. This is an area that warrants monitoring into the future.

## Psychosocial working conditions

There has been substantial growth in the number of epidemiologic studies on psychosocial working conditions as risk factors for suicide over the last decade, as well as continuing improvements in methodological quality over this period (11, 40). Because adverse psychosocial working conditions, or job stressors, are common exposures in the working population, and because this is the most active area of etiologic research on work and suicide in the last 10 years, we have treated this topic in some detail.

A first systematic review of the area was published in 2018 (41), presenting a synthesis of 22 independent studies assessing the relationship between psychosocial working conditions and suicide ideation, attempts, and deaths. Results suggested that exposure to job stressors was associated with elevated risks of suicide ideation, attempt, and death; job insecurity was associated with the highest odds of suicide ideation, whereas low job control was more of a risk for suicide attempt and death (41). The review, however, also acknowledged that studies were available on only a limited number of the most commonly measured job stressors (such as job demand and control, social support at work, and job insecurity). In addition, most studies were cross-sectional in design, and most studies of ideation and attempts were limited by dependent misclassification (self-reported exposure and outcomes measures). All studies were also potentially affected by confounding through health selection: workers who are more vulnerable to suicidal thoughts or behaviours may also be more likely to be employed in jobs with worse working conditions, or more likely to report poor psychosocial working conditions. Overall, results suggested the potential for publication bias, and noted high heterogeneity; further, there was

little control for socio-economic status, some evidence of gender differences, and some summary odd ratios were small and marginally significant, particularly for the small number of studies including suicide deaths (n = 6).

Since the publication of the 2018 review, a number of studies have been published addressing the previously identified shortcomings in the evidence base. We updated the literature search from this review (see Appendix) (41), and identified 6 new studies that included suicide mortality outcomes. A nationally-representative prospective cohort study of 1.5 million French workers using time-varying job exposure matrix (JEM)-based exposure measures, and controlling for calendar year and a range of occupational exposures serving as proxies for occupational status, showed modestly and significantly elevated risks of suicide among men (20-24% increased risk) for low social support, high job strain, isostrain, and passive jobs (with active jobs as reference) and protective associations for job demands; a similar pattern was observed for women, although with elevated risks for high job demands, but analyses were limited by lower numbers of suicide deaths(42).

A prospective cohort study of 85,205 Swedish men and women, representative of the working population, used individual-level self-report exposure data with a mean follow-up time of 13 years. This study reported that workplace sexual harassment was associated with an excess risk of suicide attempt (HR 1.59 [1.21, 2.08]) and suicide death (Hazard Ratio 2.82 [1.49, 5.34]) (43). These results were robust to adjustment for a range of potential confounders including baseline mental and physical health, previous suicide attempts, job demands and job control (43). Another study of the same Swedish cohort using individual-level self-report measures of job insecurity with an average follow-up period of 19 years found elevated risks of death by suicide (HR = 1.51 [1.03, 2.20]) but not suicide attempts (HR 1.03 [0.86, 1.24]); results were robust to marginal structural

Cox regression analyses and inverse probability of treatment weighting to control for confounding (44).

A separate prospective Swedish cohort of 1.5 million late-adolescent males enlisting for military service from 1968—2002 were followed up to 2014 (ages 30-64) (45). Using time-varying JEM-based exposure measures, associations with suicidal behaviour (attempts and deaths combined) were found for passive jobs (HR 1.33 [1.25, 1.43]) and high strain (HR 1.12 [1.03, 1.22]) with low strain as the reference, and active jobs were protective (HR 0.64 [0.60, 0.70]). Men with a history of self-harm at induction were excluded, and a range of confounders were controlled for including conscription year, parental education, IQ, stress resilience, and mental illness (45).

In another Swedish study, roughly 3 million workers between the ages of 30 and 60 at baseline in 2005 were followed until 2016 for register-based suicide attempts and deaths (combined as one outcome) (46). Exposure was estimated using a JEM based on 2005 job title, and analyses included adjustment for health, economic, family and labour market factors both prior to baseline and during follow-up. Lower levels of job control (presented in quintiles) were associated with significantly elevated HRs for both men and women in fully adjusted analyses (as high as 1.49 in men and 1.43 in women); however higher demand was protective or included the null for both men and women. For men, high job strain (low strain = reference) (HR 1.13 [1.03-1.31]) and passive jobs (HR 1.17 [1.15-1.30]) showed elevated HR for men, but not for women (46).

Finally, a Danish prospective study of 98,330 worker (713,798 person-years of follow-up) used individual questionnaire-based assessments of workplace bullying linked to register-based suicide attempts and deaths (combined as one outcome); this study found a hazard ratio of 1.65 [1.06, 2.58] for the association between workplace bullying and suicidal behaviour (47). Results were

robust to adjustment for a range of potential confounders including sex, age, marital status, socio-economic status, history of psychiatric morbidity (3%), and history of prescribed psychotropic drug use (21%). When analysing suicide deaths alone, the HR estimate included 1 (HR 2.08 [0.82, 5.27], being limited by the relatively small number of suicide deaths (<40) (47).

In summary, these recent studies of psychosocial working conditions add substantial weight to the putative associations between job stressors and suicide. These studies have addressed most of the shortcomings noted in the 2018 review (41), and all 6 of the new studies including suicide deaths showed positive associations with the job stressors studied, with the exception of job demands—which as in some cases protective. These studies used death and hospital register-based outcomes, prospective designs, both individual and JEM-based exposure measures, and included adjustments or sensitivity analyses addressing a range of potential confounders.

The extent to which psychosocial working conditions might contribute to suicide has been estimated in some of these epidemiologic studies. Population attributable fractions have been published in the French study, with an estimated 5.3% of suicide deaths among men and 9.1% among women attributable to job strain (42). In Sweden, an estimated 6% of suicide deaths among the working population was estimated to be attributable to sexual harassment at work (43). From the data published in the Swedish job insecurity study (13% prevalence reported), the PAF for suicide deaths can be calculated to be 6% (44). Importantly, however, many job stressor exposures co-occur (48, 49), so even assuming the associations underpinning these estimates are causal, the PAFs could be less than additive. We are not aware of any estimates that take co-exposures into account, nor the extent to which the exposure to chronic job stressors is represented in the case record-based determinations of work-relatedness outlined in the previous section. Because case-based investigations would likely emphasise acute stressors or recent

events, it is likely that a full accounting of work-related suicide that incorporates a range of chronic job stressors- common exposures across the working population-could lead to estimates that well exceed the case record-based estimates of 10-15% of suicides in the working population. This represents a substantial and preventable work-relate suicide mortality burden.

# IV. PROPOSED SCHEMA OF POTENTIAL WORK-RELATED CAUSES OF SUICIDE

Figure 1 presents a schematic summary of potential work-related causes of suicide, as well as a framework for investigating work-related suicides amongst persons working for profit or pay at the time of their death. This is based on the literature above, as well as additional literature reviewed in the context of the schema.

### Box A-C: Establishing that the deceased was employed, and died by suicide

For a death to be classified as a work-related suicide, it must be first established that the deceased was employed for profit or pay at the time of death (Box A). If the deceased was not working at the time of death due to a work-related injury or illness (Box C), it is possible that their death was work-related. For not working due to a work-related injury or illness at time of death and those assessed as being employed, the schema then asks whether they died by suicide (Box B). If the deceased was unemployed or not in the workforce at the time of death, it is unlikely that their death is work-related. Boxes D-F (expanded below) can then be used to assess whether the suicide was partly or wholly attributable to a work-related cause. It is important to emphasise that the specific time and place of a suicide (i.e., whether or not at work or during working hours) are not criteria for assessing work-relatedness in this schema.

### Box D: Access to means

Access to means of suicide through one's work or workplace is a well-established risk factor for suicide (9, 17, 18). Examples include police, military, and other protective services personnel with access to firearms (50), agricultural workers with access to pesticides, veterinarians with access to euthanising drugs (51), healthcare professionals with access to medicinal drugs (52), and more. An Australian national study showed that workers with access to means are more likely to use these means to end their lives than those without access to means (18).

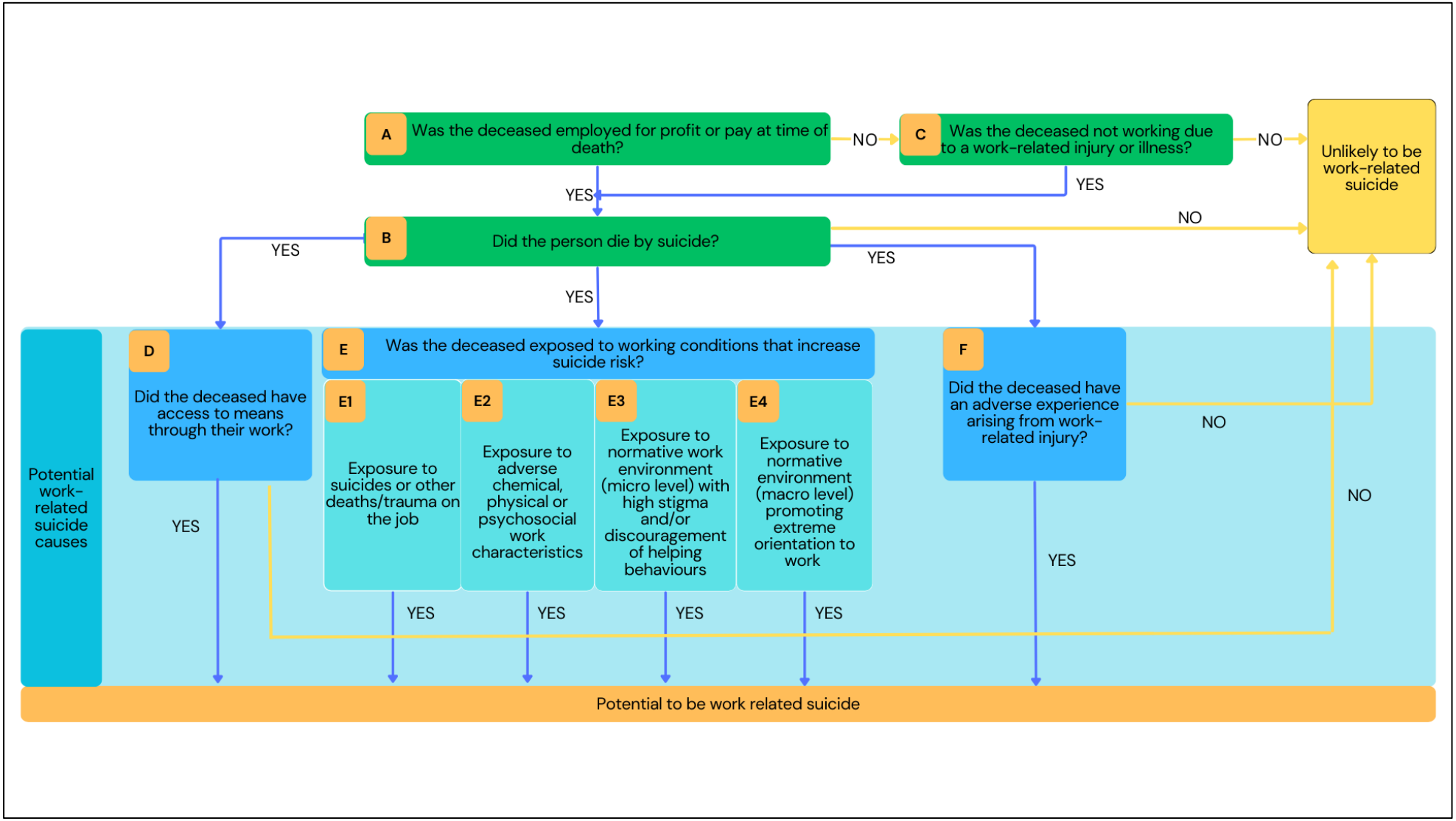
## Box E1: Exposure to suicide or other deaths and trauma on the job

Occupational exposure to trauma entails witnessing bodily injury or death, including suicide, in the course of one's work. Such exposures commonly occur among paramedics, police, firefighters, members of the military, train drivers (driving when a member of the public uses the train as a means to take their own life), social workers, mental healthcare providers, and others. A scoping review of 25 studies found that between 32 and 95% of first responders and mental health professionals had been exposed to suicide on the job (53). Exposure to trauma is strongly associated with post-traumatic stress disorder, and PTSD is in turn a risk factor for suicidal ideation and behaviours (20). Exposure to trauma may also directly affect suicidality, independent of PTSD (54).

A US survey of 1048 first responders, crisis workers, and mental health professionals found that increasing exposure to suicide on the job was associated with increasing levels of depression, anxiety, and PTSD (55). In an Australian national cross-sectional survey of police and emergency services workers (N = 14,868) the career period prevalence of exposure to traumatic events at work was 51%, and was the most frequently named job stressor (56); further, exposure to stressful events was associated with a 4.5-fold increase in odds of post-traumatic stress symptoms (a proxy measure meeting the core diagnostic criteria for PTSD , OR 4.50 [3.65, 5.55]) after adjustment for exposure to non-work stressful events and socio-demographics (56). These results yield a population attributable fraction (PAF) of 65% of post-traumatic stress symptoms being attributable to workplace trauma exposure (56). A further analysis of the same data showed post-traumatic stress symptoms were associated both with suicidal ideation and planning a suicide attempt (57).

Joiner's interpersonal theory of suicide suggests yet another link between exposure to trauma on the job and suicide. Joiner proposes three key mechanisms to explain suicidality: thwarted belongingness, perceived burdensomeness, and acquired capability (58). Acquired capability refers to the capability to make a potentially lethal suicide attempt; this capability can be acquired gradually through repeated exposure to pain, fear, trauma, and death—including on the job, thus potentially desensitising those exposed and reducing barriers to using potentially lethal force on the self.

**Figure 1: Schematic summary of potential work-related causes of suicide**





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### Box E2: Exposure to adverse, chemical, physical, or psychosocial working conditions

As summarised above, the current state of evidence suggests that unintentional occupational exposures to chemical or physical hazards are not major contributors to suicide risk, but this warrants monitoring into the future. The evidence on psychosocial working conditions was reviewed above and is the most rapidly expanding area of work & suicide research. In our view, there is adequate evidence to presume that low job control, high job strain, job insecurity, sexual harassment at work, bullying and possibly other stressors are work-related causes of suicide until shown to be otherwise. These are common exposures in the working population and are also associated with adverse impacts on mental and physical health (59, 60, 61).

Job-exposure matrices, which have traditionally only been used in epidemiology, could be used to supplement investigations of individual suicide cases to establish typical exposures to psychosocial job stressors and other hazards based on job titles and industrial sectors of the deceased (62, 63, 64).

### Box E3: Exposure to normative work environments with high stigma or discouragement of helping behaviours

Work environments vary substantially in prevailing normative cultures. Further, the norms within a workplace can vary in the extent to which they inhibit or foster help-seeking. Here we distinguish these normative influences that operate within workplaces from both macro level normative influences (Box E4) and psychosocial job stressors (Box E2), noting that these three influences may overlap to some extent. Mental health stigma within a workplace has been found to be related to suicidal ideation (65), and it is speculated that perceived mental health stigma may hinder help-seeking and lead to damaging or maladaptive coping behaviours (65). Masculine norms emphasising self-reliance and repudiating help-seeking are known to be associated with suicidal ideation (66, 67), and it is posited that the enforcement or internalisation of these norms within

male-dominated workplaces such as in the construction industry may contribute to high rates of suicide observed in such settings (68), although this has not been conclusively demonstrated. Views may differ on whether environments with high stigma and discouragement of helping behaviours are working conditions subject to OH&S prevention and control intervention; nevertheless, the evidence suggests that they are important modifiable work-related risk factors for suicide.

### Box E4: Exposure to broad cultural norms (macro level) that promote extreme orientation to work

Societies vary in normative orientation to work, and in this section, we consider what is known about the way broad societal cultural norms related to work are associated with suicide. We note some overlap with Box E2 – many of the psychosocial stressors considered in section E2 are relevant here. What is key is the source of these stressors – in this section it is macro level cultural norms that drive operation of the psychosocial stressors. As a motivating example, we draw on evidence from Japan, noting that such macro level stressors may operate in many contexts. Japan has one of the highest rates of suicide in the world (69). The Japanese term *karo-jisatsu* translates to *suicide by overwork*, and is applied to those who have suicided after a sustained period of overwork, characterised by extreme working hours and a heavy workload with little time off and few/no holidays (70, 71). While there is overlap with psychosocial working conditions (e.g., excessive job demands, Box E-2), their association with suicide in Japan also represents an interaction with powerful social or cultural norms. Typical of *karo-jisatsu* is a sense of guilt, shame and self-blame for an inability to accede to work expectations (72). How a person arrives at such a self-excoriating position is thought to be related to a complex set of interacting factors.

In Japan, a strong emphasis is placed on collectivism, meaning that within the workplace, employees are expected to prioritise and optimise the goals and successes of the organisation

over their own wellbeing (70). Great value is placed on having an accommodating, diligent work attitude according to which no task is too much (70). This comes at the expense of personal time and leisure. In addition to working long paid hours, commitment and work ethic is demonstrated through *sabisu zangyo,* which roughly translates to "service overtime". *Sabisu zangyo* is unpaid, and while voluntary, many workers experience significant pressure and an obligation to work hours well beyond those considered to be regular working hours (70, 73). Furthermore, Japanese society places significant emphasis on "saving face", and avoiding shame, embarrassment and losing the respect of others (74). In the workplace then, many workers will save face by striving to meet expectations, never saying no, and ultimately losing sight of what might be reasonable expectations and what might not be. The way in which these Japanese social norms that are steeped in values of respect, perfectionism, and collectivism (69) are embedded and enacted within work settings are thought to underpin *karo-jisatsu* (71). Intersecting with and compounding work related suicide risk in Japan is stigma regarding mental health conditions (75), which means that those in distress may be reluctant to seek help (see also Box E3).

### Box F: Adverse experiences arising from work-related injury or illness

There is growing evidence that workplace injury is associated with elevated rates of suicide mortality. A linked registry-based study of over 700,000 workers in Korea identified that both male and female injured workers had higher suicide mortality relative to the economically active population (76). In the US, a study drawing on linked compensation data in New Mexico found that work injuries classified as "lost-time injuries", that is, injuries necessitating more than 7 days off work or permanent disability benefits, were associated with almost twice the hazard for suicide mortality for women, and 72% increased suicide mortality hazard for men (relative to those with "medical only" injuries, that is injuries only receiving compensation for medical expenses) (77).

The pathways underpinning these associations are complex. Workplace injuries are associated with

a range of adverse outcomes for injured workers, with the consequences of workplace injury not limited to the injury itself, but extending across multiple domains. Compared to non-occupational injuries, occupational injuries are more strongly associated with depressive symptoms (78), with depression being a known risk factor for suicide. In some cases, workplace injury can cause disability (short term or long term) as well as acute and chronic pain. Pain medication including opioids are commonly prescribed and drug-related mortality is known to be higher among "lost time" injured workers than medical-only injured workers.

Worker's compensation processes may also contribute to distress and suicidality among injured workers. Australian workers' compensation processes have been found to be associated with hospital admission for self-harm (79). Other research in Australia has highlighted the stress of workplace injury compensation systems for injured workers (80), and Canadian work supports this, identifying that the compensation process contributed to the stress to a greater extent than the injury itself (81). While identifying the specific mechanisms by which effects are enacted is difficult, all pathways are relevant to understandings of work-related suicide.

We recommend that in suicide investigations, data should be collected on whether the deceased was on temporary disability for a work-related injury or illness (29). Although the deceased in such cases would not have been actively working while out on temporary disability, such cases could be deemed to be work-related if the preceding injury or illness was work-related and the consequences of that injury or illness (e.g., through injury-associated depression or pain, adversarial insurance processes) were a contributing cause of the suicide.

# V. DISCUSSION

In this document, we have proposed a definition of work-related suicide from an OH&S perspective, assessed the weight of evidence for various potential work-related causes of suicide, and reviewed estimates of the proportion of work-related suicides in the working population. This review has a number of strengths and limitations outlined below.

## Strengths and limitations

We focused on suicide deaths for brevity because it is an objective outcome, and because it is the most serious among suicidal thoughts, attempts and death by suicide. Associations of self-reported working conditions and self-reports of suicidal thoughts and attempts are more subject to bias than studies including objective outcomes. We acknowledge the larger literature investigating associations between working conditions and suicidal thoughts, self-harm, and suicide attempts—which also warrants attention to inform policy and practice.

The distinctions between being in work, being unemployed, retired, or otherwise not in the labour force are blurring, particularly with the rise of precarious and highly insecure employment, with workers in certain groups cycling frequently between paid work and unemployment. Indeed, job insecurity and unemployment can be conceptualised as being on the same continuum (82). Our exclusion of unemployment from the current review was partly based on the fact that unemployment is already established as a risk factor for suicide, hence the need to distinguish the influence of unemployment from working conditions while 'on the job.' This may warrant reconsideration in the future. Working conditions may also contribute to suicide risk after leaving a job. For example (hypothetically), if a worker is bullied, becomes depressed and is harassed to a level that the worker leaves the job and subsequently takes their own life, this would be work-related. This would be analogous to Boxes C & F in Figure 1, but without a recognised occupational illness or injury, nor injury-related insurance cover while out of work. This process

could occur soon after leaving a job, or even years later. The French study detailed above (42) provided evidence of lasting effects of job stressors on suicide risk after leaving employment. Job stressor-exposure risks for death by suicide were either attenuated (elevated risk for low job control and low social support, reduced risks for high job demands) or sustained (for passive jobs and high job strain) among men after leaving the last job compared to 'on the job' deaths (Table S-1 in (42)). In the current Discussion Paper, we chose to prioritise the question of work-related suicides occurring during working life, deferring the more complex question of the influence of working conditions on suicide risk after leaving paid work, whether in retirement or other contexts.

Suicide deaths usually involve multiple casual factors (2, 3, 9), of which work-related factors may be one or more among multiple. Further, non-work risk factors are usually stronger in magnitude of association with suicide than work-related factors (e.g., history of—or current—mental illness, history of previous suicide attempt, socio-economic position). In the most recent large-scale register-based prospective cohort studies, however, associations with job stressors were shown to persist after accounting for history of, or current, mental illness, various non-work-related risk factors and confounding by health selection.

In this review, we have considered working conditions categorically, not whether work was a major, minor, or other contributor to a given suicide death. While this is a particular limitation of the individual case-based estimates of the proportion of suicides that are work-related (for all except one study (27)), the epidemiologically-based population attributable fraction estimates are unaffected by this limitation.

Some previous reviews have highlighted that heterogeneity in results of job stressor and suicide studies may be a concern (21, 41). We acknowledge that heterogeneity can arise through bias and or confounding, but it can also be genuine, arising through differences by sample composition, context, or other factors. Previous research has demonstrated effect measure modification of job stressor to mental health associations by gender (83), socio-economic position (84), and national regulatory/government regime categorised by level of protective labour and social policies (85). Hence, rather than discounting study findings, heterogeneity may be revealing variation that warrants further research that could inform policy and practice responses. Heterogeneity can also arise (without bias) through differences in reference categories and measures of exposure, outcome, or association (35). Another common source of heterogeneity is study design, explained by different designs having different strengths and weaknesses. In the evidence reviewed for job stressors, a variety of designs have yielded qualitatively similar answers, providing further support, by triangulation, for causal inference (86).

Given the focus of this paper is on defining, identifying and enumerating work-related suicide – and in the interest of brevity- we have not gone into great detail on plausibility in relation to suicide theory. Working conditions that increase the risk of depression and other psychiatric disorders have clear plausible links to suicide, as these disorders are strong risk factors for suicide (87). But not all who die by suicide have psychiatric disorders. We have touched on Joiner's interpersonal theory above, noting an alternative pathway that exposure to trauma on the job could increase suicide risk through acquired capability. Working in isolation, poor social support at work, and bullying and incivility at work, for example, could also contribute to work-related suicide through Joiner's notion of thwarted belongingness (58). Further, poor supervisory support or supervisory bullying or incivility could contribute to perceived burdensomeness. In short, there are plausible roles for adverse working conditions in each of Joiner's three constructs in the

interpersonal theory. Access to means is a factor common to most theories or models of suicide, which has clear relevance when this is enabled through one's job. A more detailed discussion of work-related factors and suicide theories and models is provided in the 2022 HSE Expert Committee review (21); the authors of this report outline a number of ways in which work-related factors could play roles in the integrated motivational-volitional model (88), which has some overlap with Joiner's model. Finally, a new theory of work-related suicide was proposed in 2021 that draws on Joiner's interpersonal-psychological theory and psychache theory (20). In short, deferring to these and other previously published reviews (20, 21, 22), there is consistency between various theories and a role for work and working conditions as contributing causes to suicidal behaviour.

A major limitation of the evidence base (not of this review, *per se*) is that most of it is based on populations in high income countries; strikingly, 80% of suicide deaths occur in low- and middle-income countries (LMIC), but less than 15% of the research is based on low and middle income countries (3). This represents a substantial research gap that should be addressed.

## Implications for Policy & Practice

The findings of this review have implications for various areas of policy and practice.

### *Workplace prevention & control*

To the extent that specific working conditions contribute to suicide risk, they should be managed, controlled and where 'feasible' or 'practicable', prevented in work settings. The caveat of where 'feasible' acknowledges that in some circumstances, adverse exposures are unavoidable, such as exposure to trauma among emergency responders. Standard OH&S intervention principles would apply: preferencing work-directed elimination of exposures, followed by reduction of exposures,

and then worker-level measures to moderate the impacts of hazards, and finally illness-directed measures to minimise the adverse impacts of illness (89).

Psychosocial working conditions, demonstrably the most significant work-related risk factors for suicide when considering overlaps with normative work environments and culture (Boxes E2, E3, E4), are already recognised as high priorities for prevention and control because they are established risk factors for a range of adverse outcomes including depression, anxiety, burnout, cardiovascular disease, premature mortality and more (59, 60, 61). The association of these risk factors with suicide only further strengthens the need for exposure prevention and control efforts from an OH&S perspective. Prevalent practice to reduce the impacts of psychosocial working conditions on mental & physical health, however, has often fallen short of best practice, with a disproportionate emphasis on worker- and illness-direct measures, and inadequate emphasis on work-directed prevention and control (90, 91, 92). This urgently requires rebalancing.

The last two decades have witnessed massive growth in workplace mental health programs, including specific workplace suicide prevention programs. A systematic review (93) updated in 2018 (9) identified 13 published examples workplace suicide prevention programs, only 5 of which included some form of evaluation. Evaluated programs provided evidence of improvements in suicide awareness and literacy, attitudes towards suicide (including stigma), and helping behaviours, and one large-scale program in the US Airforce showed an implementation-associated decline in the suicide rate. A separate systematic review of programs for emergency and protective services workers included a meta-analysis of 5 studies, and showed that programs were associated with an approximate halving in the suicide rate over an average follow-up period of 5.25 years (94). There were few programs in which restrictions to access to means have been evaluated. In an evaluation of a Montreal police force program (95), improvements were reported

in supervisor's comfort (or willingness) to remove an officer's service revolver as a suicide prevention measure; further, an estimated 15% of supervisors who intervened in a crisis reported removing the officer's service revolver; such restriction measures, however, must be balanced with stigmatising the affected worker and potentially discouraging workers in distress from coming forward. This multi-component training program has showed sustained reductions in suicide rates compared to non-intervention comparison departments over more than two decades of follow-up (96).

With respect to access to means, pesticides warrant particular mention as a means to take one's own life, for people accessing them through work or otherwise. Intentional self-poisoning with pesticides accounts for approximately 1/5 of global suicides, and pesticides are the most common suicide method used in the most populous country in the world, India (3). Hence efforts to eliminate, reduce the use of, and restrict access to pesticides is of paramount concern for both occupational health and general population health, particularly in low to middle income countries (97). This aligns with OH&S authorities or regulators in some jurisdictions including an extended purview to protecting the public from risks arising from work or workplaces.

In summary, most workplace suicide prevention programs to date have focussed on building awareness and suicide prevention literacy, reducing stigma, and enhancing helping behaviours, and utilising the worksite as a setting for generic suicide prevention, usually without addressing working conditions. These programs can help to prevent suicide independent of cause, and can work in concert with, or in parallel with, work-directed approaches to reduce adverse working conditions (90, 91). The importance of addressing working conditions has been acknowledged in policy and practice advice as early as the 2006 WHO Guidelines for Workplace Suicide (54), but has yet to be realised in practice.

'Postvention' is another element of some workplace suicide programs. This entails interventions following a suicide or other critical incident or traumatic fatality in a work group in order to alleviate the distress of co-workers and others who have been affected by the death, to reduce the risk of further suicides happening in the same group, and to promote the recovery of the affected group. This is can also be a particularly valuable element of a workplace suicide prevention program for workers exposed to suicide and other trauma (see Box E-1). A 2021 rapid review identified five critical incidents response programs workplace settings including railways, factories, policing, and the military (98). The review found a very small evidence base of low causal inference studies for organisational responses to critical incidents and suicide. In addition, the evidence provided no evaluations of the impacts of postvention interventions on adverse outcomes for workers or organisations. Nevertheless, the need for such programs is clear, particular in sectors with anticipated exposure to trauma. Pearce et al (98) provide principles-based recommendations for postvention planning spanning pre-incident, incident, and post-incident aspects.

### *OH&S authority investigation of work-related suicide attempts and deaths*

Where suicide attempts or deaths occur at work, this should trigger immediate investigation by OH&S regulators in similar fashion to any other traumatic injury or critical incident at work. Where suicide attempts or deaths occur outside of the workplace or work context and may be work-related, this too should trigger immediate investigation by OH&S regulators. In the latter instance, suspicion of work-relatedness would most likely be determined by police investigation. The focus of the OH&S regulator would be on potential work-related causes of suicide, as outlined in Figure 1 (e.g., un-managed psychosocial hazards). OH&S regulator investigations would be more immediate than coroners' investigations, and their focus on work-related hazards would

complement both police and coronial investigations. OH&S regulator investigations would also be essential to closing the occupational health surveillance loop, wherein the occurrence of work-related injury or death, should feed back to prevent further adverse events arising from the same hazards. This could occur through jurisdiction-based enforcement actions, educational campaigns, or other intervention strategies (not restricted to the affected workplaces (99)). Where coroners operate, they too usually have a duty to relate findings to indicated prevention and control efforts.

### *Workers' compensation*

Work-related suicide is already acknowledged and work-related suicide is eligible for workers' compensation in some jurisdictions around the world. These include France, Japan, and some jurisdictions in Australia (23, 24, 29, 100). Detailed discussion of the compensability of work-related suicide is beyond the scope of this review, but to the extent that work-related causes contribute to a given suicide, it would seem appropriate that such deaths are covered by workers' compensation.

## Conclusions

Work-related suicide likely represents a substantial preventable burden in the working population, potentially accounting for at least 10-15% of suicide deaths. The evidence linking psychosocial job stressors to suicide has grown stronger over the last 5 years when the first systematic review of the topic was published, suggesting psychosocial job stressors may contribute substantially. There are various principles- and evidence-based intervention strategies available, some of which have been shown to improve suicide prevention literacy, reduce stigma, enhance helping behaviours, and in some instances reduce suicide rates. Prevalent practice in workplace suicide prevention, however, places emphasis on individual-directed interventions. Too little attention is directed to addressing those working conditions that increase suicide risk. A stronger emphasis on improving

working conditions will be required in order for workplace suicide prevention to reach its full preventive potential.

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# APPENDIX A: Psychosocial job stressors and suicide: an updated search

This updates the literature search conducted by Milner et al in 2018 (*Milner A, Witt K, LaMontagne AD, Niedhammer I. Psychosocial job stressors and suicidality: a meta-analysis and systematic review. Occup Environ Med 2018; 75: 245–53*).

We note that while the Milner et al review included a range of suicidal outcomes including ideation, this updated review focused on suicide mortality (this requirement being imposed in search criteria).

**Date search conducted:** 22 May 2023

**Search terms (replicating Milner et al search)**

**Tier 1**

((job stress*) OR (psychosocial job stress*) OR (working condition*) OR (psychosocial ADJ2 work*) OR (psychosocial ADJ2 job*) OR (occupation* ADJ2 stress*) OR (psychosocial ADJ2 stress*) OR (work* ADJ2 stress*))

**Tier 2**

(job control) OR (job demands) OR (job secur*) OR (job insecur*) OR (work insecur*) OR (work secur*) OR (precar* ADJ2 work) OR (precar* ADJ2 employ*) OR (precar* ADJ2 job) OR (decision latitude) OR (skill discretion) OR (decision authority) OR (psychological demands) OR (social support) OR workload OR (effort$reward imbalance*) OR (organ* ADJ2 justice) OR (organ* ADJ2 injustice) OR (work* ADJ2 hour*) OR (work* ADJ2 time) OR (temp* ADJ2 employ*) OR (work ADJ2 leadership) OR (job ADJ2 strain)

**Tier 3**

self$harm OR suicid* OR (attempted suicid*) OR parasuicid* OR intentional$self$harm OR (drug overdos*) OR auto$mutilat* OR self$cutt OR (self$destructive behavio*) OR self$poison* OR self$mutilat* OR self$injur* OR (suicid* thought*) OR (suicide* idea*)

**Databases searched:** Medline (Ovid), PsychInfo (Ovid), EMBASE (Ovid)

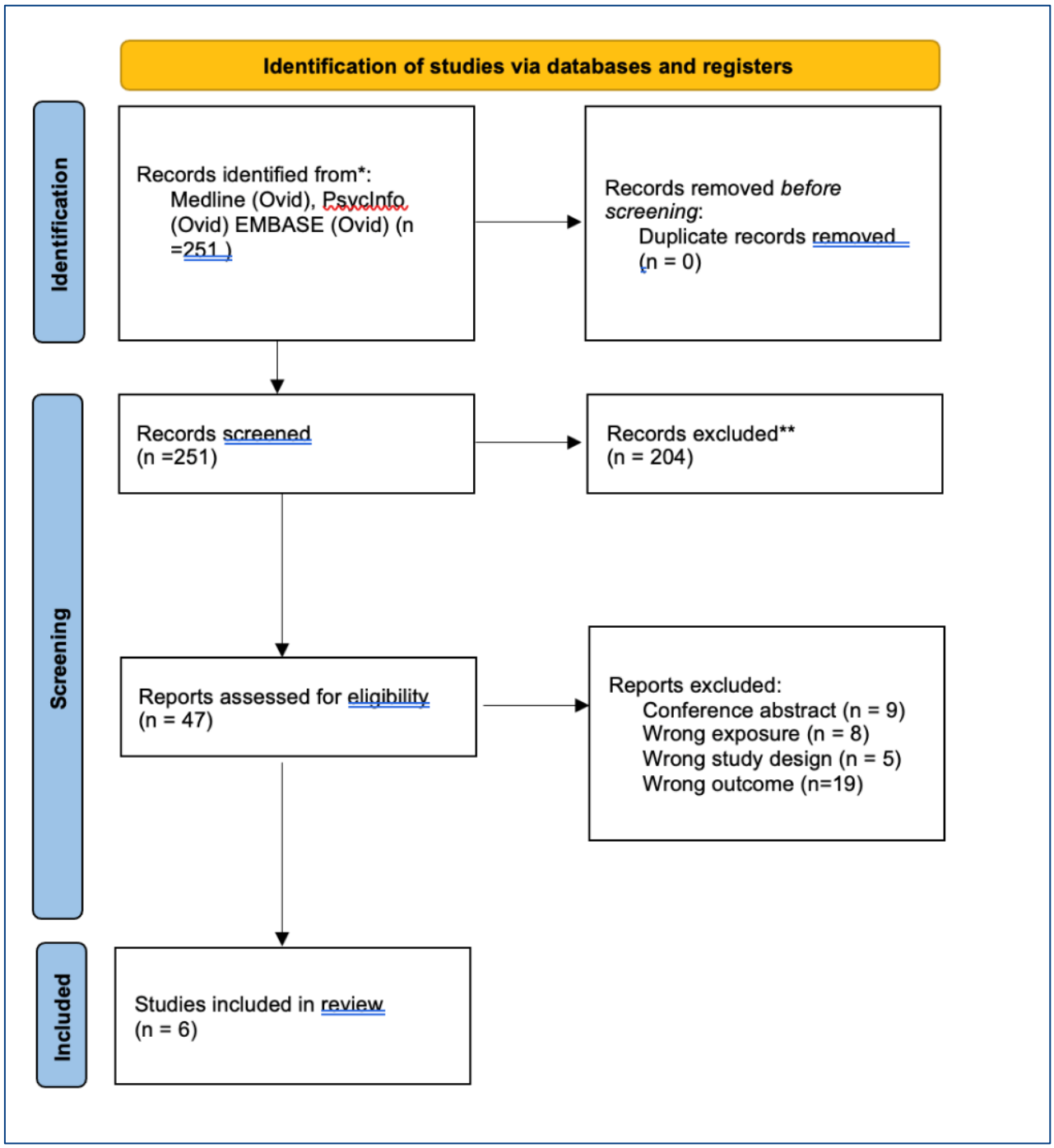
**Search strategy:**

- Search restricted to title/abstract
- Search limited to 2017-present (May 2023)

**Inclusion criteria**

- Must include suicide mortality outcome

**Figure A2: PRISMA flow chart showing studies included in search (Psychosocial job stressors and suicide)**

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