

# HSE Workplace Health Expert Committee (WHEC)

## Evaluating interventions in work-related ill health and disease



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This report, its contents, including any opinions and/or conclusions expressed, are those of the committee members alone and do not necessarily reflect HSE policy.

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## Foreword

The development of policy in HSE needs to be informed by the best available contemporary scientific evidence. In 2015, HSE formed the Workplace Health Expert Committee (WHEC) to provide independent expert advice to them on:

- New and emerging workplace health issues
- New and emerging evidence relating to existing workplace health issues
- The quality and relevance of the evidence base on workplace health issues

Questions about workplace health issues come to WHEC from many sources, which include HSE, trade unions, employers, interested individuals and members of WHEC. WHEC's responses to these questions are published online as reports to HSE, as position papers following investigation, or as a briefer response where the current evidence is insufficient to warrant further investigation. In cases where the evidence-base is limited WHEC will maintain a watching brief and undertake further investigation if new and sufficient evidence emerges.

In its formal considerations, WHEC aims to provide answers to the questions asked based on the available evidence. This will generally include review of the relevant scientific literature, identifying the sources of evidence relied on in coming to its conclusions, and the quality and limitations of these sources of evidence.

The purpose of WHEC reports is to analyse the relevant evidence to provide HSE with an informed opinion on which to base policy. Where there are gaps in the evidence, which mean that this is not possible, WHEC will identify these and, if appropriate, recommend how the gaps might be filled.

## Background

Evaluation of interventions in the workplace, intended to reduce the risk of ill health caused by hazards, both physical and psychological, is needed if what works is to be distinguished from what does not and undesirable, yet unforeseen, consequences are to be recognised. The success of interventions is most easily judged against past experience but for many reasons this can be misleading. A formal evaluation of the outcomes of an intervention from which reliable inferences can be drawn is clearly more desirable. In many circumstances this requires the means of evaluation to be integrated into the design and process of the intervention, which can be a cause of difficulty, particularly if thought to be delaying the implementation of desirable change or the cause of unnecessary cost.

WHEC therefore decided to undertake a review of interventions to provide a view on their value in providing reliable information for occupational health practitioners, by considering the different ways in which such evaluations have been undertaken and reflecting on their strengths and weaknesses. While the underlying principles of carrying out reliable evaluations have been clearly described, the complexity of undertaking these in the modern workplace, particularly for ill health caused by psychological factors which are often operating both at and away from the place of work, can make them difficult to undertake. The first review comprises a broad overview and is followed by a separate review of interventions for psychological ill health; a subsequent discussion of interventions for musculoskeletal illness is planned.

## Part 1 Overview

### Introduction

Interventions in the workplace to prevent or ameliorate accidents, disease and ill health attributable to work are a primary tool for those concerned with occupational health, both professionals and policy makers. Here, we define an 'intervention' as an intentional modification in the circumstances of a working population with the primary and explicit aim of improving their health or reducing their risk. We can have confidence in the evidence that certain exposures are hazardous, whether these exposures are chemical or psychosocial, and hence determine that intervention is necessary/ethical, but at the same time be uncertain what approaches can or will work to reduce risk and hence improve health outcomes. Studies of the effectiveness of interventions to achieve these ends are important to show what works, in what context, to what extent and for whom and, as important, what does not work and why. They can also be useful in understanding the aetiology and models of ill health.

This paper discusses different types of interventions and the methods whereby their effectiveness may be tested. There is a focus on the difficulties of evaluating interventions that comprise several dimensions and on those that may be highly context-specific and of limited generalisability. In this part we provide a broad overview with several instructive examples; part 2 is a focussed discussion on interventions designed to improve psychological health at work.

### Types of intervention

Interventions are often classified as being 'simple' or 'complex'. The former, perhaps better described as 'discrete', are applicable where there is a clearly established, generalisable and monotonic relationship between a modifiable exposure and a distinct adverse health outcome. Typical examples of discrete workplace interventions are those designed to reduce exposures to physical agents for which there is strong evidence that they are causally, strongly and singly associated with specific disease risk in a wide range of settings; an example, discussed further below, concerns the problem of occupational contact dermatitis arising from skin exposure to hexavalent chromium in wet cement.

The European Chromium (VI) Directive prohibited the sale or use of hydrated cement with a concentration of chromium >0.0002%, an intervention relatively simply achieved by the addition of ferrous sulphate to dry cement during its production, promoting the reduction of chromium (VI) to the less sensitising chromium (III).

Most circumstances in which we wish to undertake interventions in contemporary workforces, however, do not have these characteristics. The major causes of contemporary work-related ill-health are illnesses (e.g. musculoskeletal and psychosocial disorders) that are not specific to occupation but have multiple potential causes, many outside the place of work; workplace aetiologies are complex, disputed or have low or unclear relative risks. Thus, most workplace interventions are of the more complex kind, conventionally defined as those with several interacting components targeting several organisational levels and frequently requiring changes in behaviours.

Even where the relationship between a single workplace exposure and an adverse health outcome is clearly established, intercessions to reduce or eliminate harmful exposures generally require several, linked intervention activities; by way of example, reductions in workplace exposures to airborne enzymes in the detergent industry were achieved by a series of simultaneous activities and technological advances (see later). In addition to the practical and methodological difficulties that any successful evaluation must overcome, complex interventions present a number of special problems for evaluators. Many of these relate to the difficulty of standardising the design and delivery of the interventions and their sensitivity to features of the local context, the organisational and logistical difficulties of applying experimental methods to service or policy change, and the length and complexity of the causal chains linking intervention with outcome. Organisations are complex adaptive systems that change and shift dynamically. This means that evaluation not only needs to be multi-level but must also account for a constantly shifting situation and the multiple feedback loops that will be operating to enhance or detract from the benefit of any intervention.

An intervention progresses using working hypotheses which

test questions of aetiology, fidelity to design and the process of implementation. Failure to demonstrate any benefit may reflect inadequate knowledge of aetiology (e.g. the “cause” is not a cause or only a cause in some circumstances) or some failure of implementation. Where a complex intervention has been found to be effective, it can be difficult to know which of its element(s) has contributed to this. Ideally, the intervention programme can be dissected through process evaluation (1) which has gained increasing attention from wider health programmes concerned with demonstrating impact, but is still seldom used in the context of workplace health interventions. The same approach can be used to examine why some complex interventions are demonstrably ineffective or even generate unintended harms. The growing use of process evaluation in workplace health interventions and some of these issues of effectiveness and harm are discussed in more detail and in the context of ‘psychosocial’ interventions in part 2.

### Measuring outcomes

A successful intervention reduces the incidence of work-related disease or ill health. Measuring incidence is impossible when the denominator population is unknown and is problematic in health conditions that have a relapsing nature as do many psychological or musculoskeletal disorders. Not infrequently, reports of the evaluation of an intervention rely solely on accident or disease ‘counts’ rather than ‘rates’; these may mask important changes in the size, structure or composition of the at-risk population producing a potentially biased estimate of the effect of the intervention (Box 1).

#### Box 1. Measuring the impact of the European Chromium Directive

The numbers of cases of contact dermatitis from chromium (VI) reported to non-statutory UK and French surveillance schemes were compared before and after the introduction of the European Chromium Directive in 2005. The authors reported a significant reduction in the incidence rate ratio (IRR) in the period 2006-2010 when compared to 2002-2005 (2).

The denominators for these ‘IRRs’ were unspecified but were (probably) assumed to be constant; thus this report is in fact of a reduction in the number of notified cases which might reflect several trends, including – as the authors note – a temporal decline in dermal chromate sensitisation in the general population.

Some workplace diseases (‘outcomes’) are specific to occupational exposures; that is, their clinical features are such that they are seen only in response to exposures acquired at work. The several pneumoconioses are an example. Interventions that aim to reduce the incidence of such outcomes are generally easier to evaluate than those concerned with conditions that are found also outside the workplace such as many musculoskeletal or psychological conditions. Evaluations that aim to assess the effectiveness of interventions to reduce the incidence of the latter category need carefully to account for non-occupational causes of disease; this preferably requires the use of a control or ‘referent’ group in which there has been no intervention.

As with trials of therapeutic drugs, successful workplace interventions do not necessarily benefit all workers; rather, their benefit is an *average* effect. Sub-group analyses, rarely pre-specified, may help in identifying individual workers, or groups of workers, who have or have not benefitted; this issue is further discussed in part 2.

### Types of evaluation

Archie Cochrane, in 1972, defined three concepts related to the testing of (healthcare) interventions (3):

1. *Efficacy* is the extent to which an intervention does more good than harm under ideal circumstances (“Can it work?”).
2. *Effectiveness* assesses whether an intervention does more good than harm when provided under usual circumstances (“Does it work in practice?”).
3. *Efficiency* measures the effect of an intervention in relation to the resources it consumes (“Is it worth it?”).

In the context of workplace interventions, and in particular those of a complex nature, the first two concepts are often bundled together, largely because 'ideal circumstances' are hard to define or find. Published cost-benefit studies, designed to measure efficiency, are surprisingly rare, although may be a component of an organisation's intervention monitoring protocol, used for decision-making to continue or cease any particular intervention.

Intervention studies are easier to evaluate in short latency conditions, such as occupational asthma, and those readily attributable to a single agent, such as asthma arising directly from exposure to detergent enzymes or latex. Interventions to improve conditions that are the outcome of multiple causes, such as mental and some musculoskeletal illness, the dominant problems of contemporary occupational health, are generally more difficult to evaluate, in large part because it is difficult to control for their several non-workplace aetiologies.

The evaluation of an intervention in long latency conditions such as lung cancer, even when due to a single agent such as asbestos, is not feasible for many years and evaluating the effectiveness of an intervention in these circumstances too early can give misleading results (see Box 2).

### **Box 2. Evaluation of an intervention to reduce the incidence of a long-latency disease**

In his initial study of workers at the Turner and Newell asbestos textile factory in Rochdale, Richard Doll compared the death rates of the 113 men who had worked for at least 20 years in areas scheduled under the 1931 Asbestos Regulations, with the rates of those in the general population between 1935 and 1953 (4). There were 39 deaths in the workforce as compared to 15.4 expected in the general population. The excess deaths were entirely due to lung cancer (11 v 0.8 expected) or other respiratory deaths (22 v 7.6 expected). All of the deaths in the factory workers had occurred in persons with at least nine years employment before the 1931 Asbestos Regulations; improvements in dust control had been implemented from 1933.

To determine whether this risk was eliminated by the improved dust control which followed implementation of the 1931 Regulations would require follow up for at least 30 years of those who started employment after 1933 and had a sufficient duration of exposure (10 or more years). This was borne out by two subsequent studies. In the first (5), a study of overall death and lung cancer rates up to 1966, i.e. after 33 years, there was no excess overall mortality (79 v 81.05 expected) or deaths from lung cancer (10 v 8 expected). It was only in a later study (6) which measured mortality up to 1974, i.e. 41 years from 1933, that an excess of lung cancer deaths was found: of 678 men, 33 had died of lung cancer (including mesothelioma) as compared to 18 expected, and 31 died of respiratory disease as compared to 18 expected.

The improvements in dust control following the 1931 Asbestos Regulations had not been sufficient to eliminate entirely the risks of asbestosis and lung cancer.

A viable, more immediate alternative in such circumstances can be hazard evaluation: has the level of exposure been reduced sufficiently (based on knowledge of exposure-response relationships) to suggest that disease incidence will consequently be reduced? For established carcinogens or asthmagens, the proxy of reduced workplace exposures is probably appropriate. In more complex systems, where several factors interact in increasing the incidence of disease or ill health, the use of proxies as an indicator of later health outcomes can be problematic and can even misdirect intervention efforts. An example is the use of sickness absence levels as a proxy for a health outcome. While stress-related absence is used as a primary population level health indicator, absence in itself is not a straightforward outcome indicator at the individual level; absence levels appear to have been used on the assumption that actions that reduce sickness absence have caused improvement in work-related health. However, as happens in complex interventions, what we have from the simplistic use of absence as a proxy for health outcomes is an unintended harmful consequence – in this case from the evidence of a growth of problems associated with

presenteeism. This is particularly relevant when considering work related stress sickness absence, as exposure to job demands and demand intensification is a key contributor to harm; these issues are discussed in more detail in Part 2.

Another problematic conflation between proxy and outcomes is represented in the statement that ‘work is a health outcome’ as this embeds the assumption that being in work is a proxy for long term health. While a move from unemployment to good quality work appears to lead to a reduction in chronic stress biomarkers (7), continued unemployment is associated with lower biomarker levels than a move to employment in a poor-quality job. This suggests that merely being in work cannot reasonably be used as a proxy for an improved health outcome or as a proxy for a psychosocial factor that will improve health. To do so is to risk causing unintended harm to health (see later), particularly given the high prevalence of ‘bad’ work addressed in part 2.

There is growing interest in biomarkers as proxies for later health outcome (box 3). The field of psychophysiology studies how experiences that lead to psychological distress impact on physiological mechanisms such as inflammation and immunity, cardiovascular reactivity (8), and the functioning of the sympathetic nervous system.

### **Box 3. Biomarkers as (proxy) outcomes**

Drawing on data from a longitudinal UK dataset, Coronado et al (9) reported an association between measures of workplace demand-reward imbalance and several biomarkers. As workplace adversity reduced over a career, so did the levels of inflammatory biomarkers. Exploring work-life conflict as an alternative marker of work-related adversity, a recent prospective study found that reduced working hours for parents, enabled through flexible working arrangements, was associated with a lowering of inflammatory biomarkers (10).

### **Choosing study designs for the evaluation of an intervention**

Well planned evaluation studies are difficult and often costly, and, in many circumstances, interventions are introduced with the results judged solely against past experience. This can easily mislead. Campbell and Stanley (11) identified six

potential sources of error in such circumstances; here we consider these in relation to potential occupational causes of disease.

1. *Changing circumstances.* Working conditions tend to improve over time, making it likely there is less disease now than in the past.
2. *Aging and an aging workforce.* The working population may have reached an age when diseases of long latency, such as cancer and COPD, are becoming manifest leading to an underestimate of the effectiveness of an intervention.
3. *Ascertainment.* Pneumoconiosis, for instance, is better diagnosed since the advent of CT scanning and so apparently more frequent than in the past.
4. *Regression to the mean.* Control measures are used when situations are bad; in general, the worst tends to improve and the best to deteriorate.
5. *Selection.* Workplaces accessible to study tend to be the better organised and more cooperative; their workers may therefore fare better than the average.
6. *Losses.* Labour turnover, which affects both the risk of diseases and their detection, may be higher or lower than average in the plants under study. The early studies of the prevalence of pulmonary fibrosis in asbestos factories were criticised on the grounds that the dead were buried and the sick in hospital, neither group available for study.

These potential sources of bias have led to the development of more rigorous designs for evaluation studies which reduce the risks of biased assessment. Evaluation studies that employ an ‘experimental’ design through a randomised control trial (RCT) potentially provide an estimate of effectiveness that is least biased. This, however, may be at the cost of generalisability, and other non- or quasi-experimental designs can also achieve high levels of internal validity.

### **Experimental designs – the randomised controlled trial (RCT)**

The strengths of the RCT, in which an intervention group and a comparator or control group are compared concurrently, are well known; random allocation to intervention or comparator group, avoiding selection bias and confounding; and where possible ‘blinding’ of both participants and observers to participant allocation. The



outcomes in the two groups are compared with appropriate statistical analysis. The RCT is now widely used in the evaluation of drug safety and efficacy but is not without problems in the context of evaluating interventions in the workplace.

Random allocation of an intervention to individuals in a single workplace may not be feasible and 'blinding' of allocation in the workplace may not be possible with interaction between participants in the two arms of study. In these circumstances, the comparison can be made between groups or 'clusters' such as workplaces allocated at random – the cluster randomised trial. This design can overcome the potential for 'contamination' between participants in a single workplace intervention trial. However, the unit of analysis is the cluster, in this case the workplace, with two sources of variation – between workforces and between individuals in a workforce - increasing the size of standard errors, and widening confidence intervals when compared to a study of the same size using simple randomisation. The effective sample size is reduced, often requiring many clusters to ensure sufficient power.

#### **Box 4. Kitchen ergonomics; a cluster RCT**

A cluster RCT was used to evaluate multiple ergonomic interventions proposed by the trial participants to be potentially beneficial. 119 municipal kitchens with 504 workers in Finland were allocated at random; 59 to the interventions and 60 as comparators. 402 ergonomic changes were implemented during a period of 11 to 14 months. Outcome measures, evaluated at 3, 6, 9 and 12 months (with a very high response rate), included musculo-skeletal pain at seven anatomical sites, sick leave from musculo-skeletal disorders and fatigue at work. No systematic difference was observed between the intervention and comparator kitchens during the single year of interventions and a subsequent year of follow up (12).

This well-conducted, randomised trial of a complex, 'participatory' intervention failed to demonstrate the intended effect. The authors suggest that this may have been because the intervention was 'not intensive enough'; an alternative explanation may be that the underlying causal hypothesis was inadequate. Interestingly the workers in the intervention cluster reported higher rates of stress; the issue of unintended harm is discussed in part 2.

RCTs, often of a cluster type, have been used widely in studying the effectiveness of workplace interventions and more frequently in the evaluation of 'complex' than discrete interventions. In part this reflects the nature of the hazards for which simple interventions are designed to eradicate. The elimination or reduction of exposure to an agent reproducibly shown in high quality studies to be carcinogenic, such as asbestos, or fibrogenic, such as silica, is unequivocally necessary and the allocation of withholding exposure reduction in some workers or workforces is clearly unethical.

Because they effectively control bias, RCT's have high 'internal validity'. They are, however and of necessity, highly controlled and may therefore be difficult to generalise beyond the setting(s) in which they took place. Effect sizes alone do not provide policy makers with information on how an intervention might be replicated in their specific context, or whether trial outcomes will be reproduced. Randomisation may be impracticable or unethical if the intervention is already in widespread use or if key decisions about how it will be implemented have already been taken, as is always the case with regulatory interventions and often so with institutional changes or interventions whose impact on health is secondary to their main purpose.

#### **Non- and quasi-experimental designs**

Non-randomised studies of effectiveness are most useful where the effects of the intervention are large and rapid and where the effects of selection, allocation and other biases are relatively small. Although there is a range of approaches for dealing with such biases the interpretation of small effects from non-randomised studies requires particular care and should draw on supporting evidence where possible – including for example a consistent pattern of effects across studies, or a dose-response relationship in which more intensive variants of the intervention are associated with larger effects.

The simplest, non-experimental design is the before-and-after study comparing the frequency of accident, illness or disease in a workforce before and after an intervention, with the initial frequency as the basis for comparison (box 5). This design is vulnerable to the errors in interpretation listed above and any subsequent findings must be considered with a degree of scepticism.

**Box 5. Occupational asthma in the detergent industry; a before-after comparison**

An early study to investigate the effect of a complex intervention in occupational asthma was the evaluation of the effectiveness of lowering the level of exposure to protease enzyme in the detergent industry. This was achieved by the concurrent introduction of ‘encapsulated’ (non-inhalable) enzyme, the exclusion of susceptible (atopic) workers from the workforce and a number of engineering measures to control dust. Juniper and his colleagues reported the findings in the workforce of a UK manufacturer, which included those employed in 1968 when powdered enzyme was introduced into the manufacturing process, and those first employed during the subsequent seven years following the introduction of the intervention measures in 1971 (13). Concentrations of enzyme dust were highest in 1969 and 1970 with peak levels of total dust in excess of 1200 µg/m<sup>3</sup>. Subsequently, dust levels fell substantially. The proportion of the employed non-atopic workers who developed a skin test reaction to protease fell with era of employment and the decreasing level of exposure.

Era of employment	sensitised to protease	respiratory symptoms (n)
1968-1969	41%	50
1969-1971	29%	
1971-1973	11%	3

As with the example in box 1, this study reported case numbers rather than rates of disease and did not account for any changes in the size of the at-risk population. Through its design, the study could not distinguish which of the several components of the intervention had been successful in reducing the incidence of sensitisation (in itself a proxy for occupational asthma).

Outcomes in a workforce before and after an intervention can also be compared in relation to an external population. While rates of disease in general populations at a national or regional level may be available, they may not offer the best source of comparison since they do not necessarily reflect the selection processes which apply to those working in some occupations. As an alternative, comparison may be made with workers in another occupation (see box 6).

**Box 6. Carbon disulphide and ischaemic heart disease (IHD)**

Nurminen and colleagues (14) studied the death rate from IHD during a 15 year period between 1967 and 1982 in a cohort of 343 workers exposed to carbon disulphide (CS<sub>2</sub>) in a rayon factory in Finland and compared them to the rates in the workforce of a local paper mill. Deaths from ischaemic heart disease were initially some five-fold higher in the rayon factory than in the paper mill. A measurable reduction in CS<sub>2</sub> levels in the rayon factory (Figure A) and the transfer of workers with risk factors for IHD, such as hypertension, angina and raised serum cholesterol, to work away from CS<sub>2</sub> exposure during this period were followed by a progressive decrease in the excess risk of death in the rayon factory workforce (Figure B).

Figure A: median levels of CS<sub>2</sub> in Finnish rayon factory 1965-1980

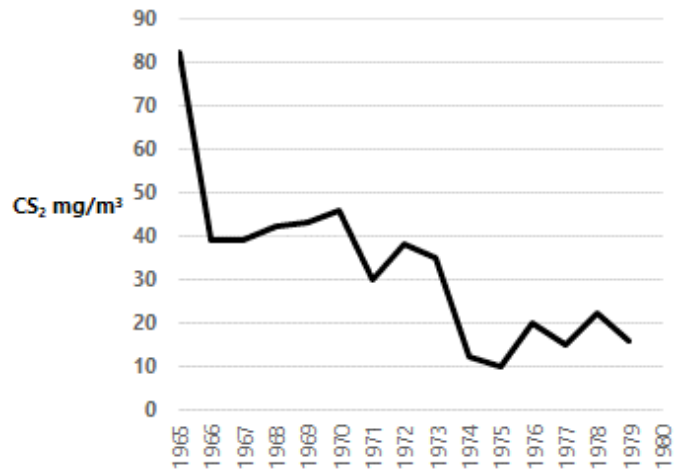
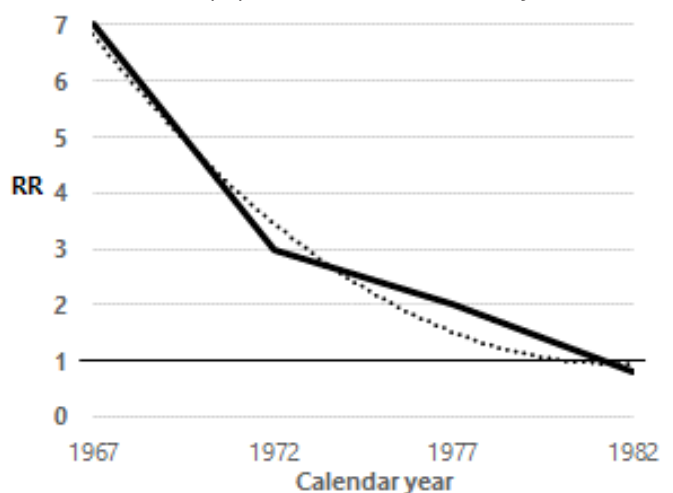


Figure B; mortality rate ratio (RR) for IHD among CS<sub>2</sub> workers relative to paper mill workers over 15 years



The authors estimated that had the death rate from IHD before 1975 continued until 1982, instead of the 19 deaths observed, 59 deaths would have occurred.

This study reported workforce rates of disease in comparison to those in a similar but unexposed workforce. The intervention here was 'complex', comprising both reductions in exposure to CS<sub>2</sub> and the removal of employees otherwise susceptible to heart disease; the report provides no information on which aspects of the intervention were considered to have been effective.

Alternatives to the experimental design may lack the level of 'internal validity' of the RCT, but where the effects appear to be large, discernible soon after the intervention and mechanistically plausible then it is reasonable to draw an inference of efficacy. With careful planning, some quasi-experimental designs can have high 'internal validity' and they tend to have greater 'external validity' than the RCT. The before-after design can be strengthened by comparison with a workforce in which the intervention has not been introduced (the 'untreated control group' design) and by increasing the numbers of observations made before and after the (non-)intervention to provide more stable estimates of incidence rates in each period (see box 7).

#### **Box 7. An intervention to reduce stress in Japanese electronics workers**

Following a company-wide survey of workplace stress, two sites (111 employees) with high mean depression scores were selected to receive a complex 'stress reduction programme'. Three further sites (183 employees) with similar depression scores were not offered the programme and acted as a referent group. Depression scores and sickness absence were measured in each group prior to the intervention and then on two subsequent occasions. The rates of each improved in the intervention group but were unchanged in the referent factories (15)

This example of an 'untreated control group' design avoids the problem of regression to the mean which is a common feature of uncontrolled study designs.

Stronger still are designs in which the intervention is applied sequentially to different workforces with measurements

made before and after the intervention in each, the 'multiple time series' (box 8). In practice, these more complex approaches are very difficult to organise and appear only rarely to have been used in the workplace setting.

Evaluation takes place in a wide range of settings that constrain researchers' choice of evaluation methods; the context may have a significant impact on how much leeway the investigator has to modify the intervention, to influence the way it is implemented, or to choose an evaluative design. In general, evaluation takes place alongside or after large-scale implementation rather than beforehand; this tends especially to be true of regulatory interventions. Strong evidence may be ignored or weak evidence rapidly taken up depending on political acceptability or fit with other ideas about what works.

#### **Box 8. Coal workers pneumoconiosis (CWP) in British coal miners**

Among the most effective intervention programmes in the UK were the measures to control levels of coal dust in UK mines following the demonstration by Jacobsen and his colleagues (16). of the relationship between the concentration of respirable coal dust and the risk of Category 2 simple CWP, with a 3.4% risk at a concentration of 4.3mg/m<sup>3</sup>. Cochrane and his colleagues had found earlier that severe loss of lung function and premature death occurred in miners with Progressive Massive Fibrosis (PMF), not with simple CWP, but that the risk of PMF increased with increasing category of simple CWP, particularly in Categories 2 and 3, a reflection of an increasing mass of coal dust retained in the lungs.

As simple CWP did not usually progress in the absence of further exposure, controlling dust to levels at which the risk of developing Category 2 CWP was low, supplemented by regular chest radiographs to identify those in whom Category 2 CWP had developed and their transfer to work where coal dust levels were considerably less, would in principle minimise the risk of PMF. The Jacobsen results provided the basis for a control limit of 4mg/m<sup>3</sup>. Regular five-yearly chest radiographs of miners allowed the identification and transfer of miners with Category 2 CWP to 'dust approved conditions'. So-called 'Special Hardship Allowance', which was part of the Industrial Injuries

Disablement Benefit, made up the earnings lost in not working at the coalface. Subsequent evaluation of the rates of development of CWP found that the proportion of the UK mining workforce found to have pneumoconiosis on regular chest radiograph surveillance showed a progressive decline.

These impressive findings might have been strengthened further by examining the incidence of outcomes in relation to the presumably sequential application of dust-control measures in different mines/coalfields.

### Evaluation of interventions as causal inference

Where an intervention is demonstrated to be effective this provides good evidence that the exposure that was controlled by the intervention was indeed causally related to the observed outcome. It follows that the most successful interventions are, in general, those where there is a clear understanding of disease aetiology and several of the examples above are of interventions based on a firm and often 'linear' aetiological evidence base. Conversely, but with the proviso that the evidence is strong, the demonstration that an intervention is *ineffective* suggests that the exposure of interest is either not causal or alone is insufficiently causal. For many workplace diseases, and perhaps particularly those of a musculoskeletal or psychological type, there is considerable uncertainty over immediate causality and it is unsurprising that interventions in these spheres are frequently demonstrated to be ineffective (see box 9).

#### Box 9. Ergonomic interventions in office workers; a systematic review

Hoe and colleagues (17) reviewed 15 published RCTs (2165 workers) that evaluated ergonomic interventions to prevent work-related upper limb or neck musculoskeletal disorders (or both) among office workers. On the basis of their review, the authors concluded that "the use of an arm support or a (computer) mouse based on neutral posture may or may not prevent work-related musculoskeletal disorders of the neck and shoulder".

The traditional response to a conclusion such as this is that more and better research is required. An alternative explanation is that the relationship between repetitive computer work and upper limb disorders is incompletely understood.

### Conclusions

1. 'Discrete' workplace interventions are applicable where there is a clearly established relationship between a modifiable exposure and a distinct adverse health outcome. Typical examples are those designed to reduce exposures to physical agents for which there is strong evidence that they are causally, strongly and singly associated with specific disease risk in a wide range of settings.
2. Most workplace interventions are of a more complex kind, comprising several interacting components targeting several organisational levels and frequently requiring changes in behaviours. In addition to the practical and methodological difficulties that any successful evaluation must overcome, complex interventions present a number of special problems for evaluators.
3. In many circumstances, interventions are introduced with the results judged solely against past experience. This type of 'before-after' comparison can easily mislead and the results require careful scrutiny.
4. Evaluation studies that employ an 'experimental' design, through a randomised control trial, potentially provide an estimate of effectiveness that is least biased. This, however, may be at the cost of generalisability, and other non- or quasi-experimental designs can also achieve high levels of internal validity.
5. For established physical hazards, the proxy outcome of reduced workplace exposures is probably appropriate. In more complex systems, where several factors interact in increasing the incidence ill health, the use of proxies as an indicator of later health outcomes can be problematic.

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## Part 2 Psychosocial interventions for work-related hazards, ill-health and disease

### Executive summary

1. We have increasing evidence that exposure to psychosocial hazards at work impacts both mental health and long-term physical health. The workplace may not be the only source of exposure and hence contributor to health outcomes, but it is a significant one and needs to carry appropriate responsibility.
2. The growing attention to social determinants of health including the use of biomarkers of inflammation and other physiological indicators of the association between stress and health is building our knowledge of causal factors.
3. While our knowledge of harmful psychosocial exposures is well developed, the understanding needed for safe and effective interventions to mitigate the risk from these known hazardous exposures is less mature. This paper considers these limitations in our current understanding to suggest a suitable precautionary approach to workplace intervention.
4. The evidence about exposure indicates that the organisation is likely to be the most effective focus for intervention but there has so far been a tendency to focus on individual factors in intervention design and evaluation. This appears to have deflected attention away from attention to the mitigation of harmful exposures (partly because it enables organisations to do what is relatively easy rather than what is necessary to reduce environmental exposures).
5. Psychosocial hazards operate at and are due to factors from multiple levels in organisations, which means that interventions to prevent, mitigate and manage psychosocial risks need to consider all these levels. Intervention that does not centre on the prevention of exposure to psychosocial hazards in the design stage can cause harm due to predictable but unintended increases in harmful work-related psychosocial exposures (such as higher demand due to the additional work requirements from the intervention).
6. The causal models underlying some large-scale (often commercial) psychosocial interventions include biases that can lead to substantial backfire effects. One source of predictable harm comes from individually framed health promotion approaches which enable victim blaming (hence worsened psychosocial exposures) through 'just world bias'. Another source is the existing approaches to absence management which contribute to evidenced harms from presenteeism. Real-time monitoring and course correction used as standard in intervention practice is a means to respond quickly to the manifestation of harm.
7. Intervention evaluation needs to recognise organisations as complex adaptive systems and consider the implementation context and the activated psychosocial mechanisms through which outcomes are achieved. This includes a recognition of the impact of boundary conditions, intervention fit and relevant workplace mechanisms (such as participation and the nature of managerial relationships which influence what has been described as the 'social cure'). Such evaluation is increasingly being delivered through the use of realist approaches such as process evaluation.
8. The current gaps in our knowledge of aetiology linking psychosocial exposure and health coupled with the complex adaptive nature of workplaces can make intervening appear daunting, so this paper concludes with questions to guide approaches to intervention, based upon the use of context specific designs that are grounded in local evidence, small scale, transparent and as simple as possible.

### Introduction

Part 1 of this series on workplace health intervention indicated that we can often have confidence about what constitutes a harmful workplace exposure, while having much less certainty about what actions/interventions are effective at reducing risk. When considering psychological health risks from workplace exposures, there is good evidence that depression, anxiety and PTSD can be linked to factors in the workplace. The HSE's evidence-based Management Standards for stress make clear that psychosocial conditions at work are a key source of risk to health and burnout has recently been added as an occupational phenomenon to the World Health Organisation's International Classification of Diseases.

The more recent evidence about biomarkers of inflammation and workplace health covered in part 1 of this series points to probable longer-term (and not immediately apparent) physical health impacts from repeated harmful psychosocial exposures. There is growing multi-disciplinary interest in and acknowledgement of the apparent dose-response association between exposure to adversity and health outcomes and its relevance for the workplace as a factor in health inequality (1-3). Longitudinal epidemiological studies using biomarkers of long-term health risk provide evidence of a well-established association between social adversity and population level health outcomes. In health psychology, the psychobiological processes linking stress and health are gaining increased attention, with a summary of the current evidence provided in the 2021 annual review of psychology (4). The HSE focus on workplace environment as the source of psychosocial hazards is consistent with the approaches developed from this evidence about the social determinants of health and some of the relevant headlines from the social determinants of health are touched upon in Appendix A to this paper.

Although the identification of psychosocial hazards is well established and the understanding of their health consequences is now substantial, the understanding needed for safe and effective interventions to mitigate the risk from these known hazardous exposures is less mature, particularly when compared with the examples of other types of work-related exposures and their mitigation (the understanding of which is based upon the long-term monitoring and evidence-based studies outlined in part 1 of this series). This lack of maturity in our knowledge about psychosocial intervention brings with it the risk of unintended harm from well-meaning intervention efforts – i.e. the concern that we will cause harm despite attempting to intervene to do good.

Identifying this risk of unintended harm from intervention is not used in this paper to recommend that we cease intervention. There are known and pressing workplace exposures that do need attention despite the relative immaturity of our knowledge about effective intervention. The purpose is to provide an overview of the key issues for psychosocial intervention design, implementation, and evaluation (many of which are unresolved) to support

the development of suitable precautionary approaches to workplace intervention to reduce harmful psychosocial exposure, balancing improvement requirements with effective attention to the risk of harm and so increase the maturity of our approach to psychosocial intervention.

### **Complexity and workplace psychosocial intervention in practice**

Part 1 of this series points to the issue of complexity in workplace intervention, indicating this is particularly significant for psychosocial factors. Approaches to psychosocial intervention often fail to recognise that organisations are complex adaptive systems which means different contexts (including between different groups in a single organisation) will respond in different ways to seemingly identical psychosocial exposures and seemingly identical interventions.

A wide range of distinct disciplines provide relevant insight into specific aspects of this complex and dynamic reality around work related health outcomes. The similarities and differences in the patterns of evidence emerging from each discipline can be triangulated to build confidence both about factors that are relevant to matters of aetiology and assessments of the plausibility of potential mechanisms for change. Such approaches can also include attention to outlier theoretical work and evidence (unlikely to be included in a single discipline systematic reviews and meta-analyses) as a means to actively mitigate the well understood confirmatory biases that can impact the research and publishing practices of any single discipline.

There have been questions raised about the proportionate responsibility workplaces have for the short- and longer-term health consequences of adverse psychosocial exposures which appears to have deflected attention away from reducing workplace psychosocial hazard exposure to a focus on initiatives directed at manifestations (e.g. absence, depression or 'health behaviours'). There has been an associated proliferation of commercial products and services that claim to address these manifestations of problems with psychosocial health at work. These claims range from reducing health problems and stress absences, to providing individual care or mitigating litigation risk.



Many 'off-the-shelf' large-scale psychosocial interventions allow organisations to 'cherry pick' what is convenient, rather than attending to reduction of the hazardous psychosocial exposures in their specific workplace. A recent systematic review of workplace interventions for common mental health problems at work indicated that there were clear gaps in the evidence base (5). Specifically, the authors mentioned a lack of available studies of interventions for any of the known workplace psychosocial hazards other than individual job control, despite the existence of six psychosocial hazards listed in the HSE Management Standards (the others being demand, support, role, relationships and change.) It is also worth mentioning that the recent review by WHEC of the managerial standards identified workplace justice and participation as additional work-related hazards implicated in health outcomes. The authors of the review (5) suggested that a significant contributor to this imbalance is employer preference for approaches that focus upon building individual 'employee resilience' or encourage absence management and return to work, rather than approaches that require changes to workplace practice and conditions.

Such a focus on manifest problems can encourage the development of interventions that inadvertently increase exposure to known workplace psychosocial hazards and hence worsen health outcomes. A key issue is the increase of hazardous levels of demand in organisations through the deployment of large health-related programmes, or through the activation of cognitive biases such as 'just world bias'<sup>1</sup> in the design assumptions made.

One harm from well-meaning workplace interventions is the potential for substantial organisational resource depletion without clear benefits, most clearly evidenced in the substantial organisational effectiveness literature on change management failures (6). In addition to these organisational effectiveness consequences, recent evidence indicates that repeated experiences of such change initiatives at work is implicated in clinical levels of distress, consistent with the HSE Managerial Standards identification of change as a psychosocial hazard at work (7). There is also a growing recognition that any change model underpinning an intervention design (and its evaluation) will need to be multi-factorial and engage meaningfully with complex adaptive

systems such as organisations and workplaces. The evidenced impact of context and perception<sup>2</sup> on intervention effectiveness, means that the use of multi-level approaches to intervention monitoring and evaluation, and recognition of the interacting causal relationships between exposure and harm, is gaining increased attention. Consequently, psychological research is increasingly focussed on identifying unintended harm from well-meaning intervention (discussed in more detail in the later section on harm).

This paper is concerned to address the apparent fallacy that working with such complexity requires complicated, elaborate and often resource-intensive workplace intervention. Instead, a precautionary approach could be enabled through the use of intervention designs that are as discrete and transparent as possible and that are focused on reducing evidenced harmful exposures (the type and level of which can be different even across different teams in a single organisation). Further risk management is supported by intervention initially on a small-scale, applying theories of change that can accommodate the complexity of the context. This encourages investment in real-time monitoring and course correction as integral to intervention implementation (it must be noted that real-time monitoring is distinct practice from post hoc evaluation studies and understanding this requirement means engaging with the difference between monitoring (e.g. real-time check in on a patient undergoing treatment) and evaluation (e.g. longer-term review of overall population health impact from a treatment protocol)).

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<sup>1</sup>Just world bias is the bias whereby it is assumed that bad things happen to people who deserve it. It serves a psychologically protective function for those observing others in difficulty but unmanaged can lead to 'victim blaming'.

<sup>2</sup>When conducting research with people and their reported experiences there is not only the researcher attempting to make sense of the evidence but also the research participants attempting to make sense of the questions they are asked, which is a source of 'confounding' described as the 'double hermeneutic'. This cannot be removed but instead has to be worked with.

### Links between work and psychological health and the implications for intervention

As indicated in the introduction, work-related stress, anxiety and depression have been shown to be related to workplace environmental exposures such as an imbalance between work demands and demand intensification on the one hand and the control and/or resources made available to manage these demands on the other. Imbalances between the effort made and the rewards received, and to other aspects of job design and working environment are also implicated. Other critical factors identified include the nature of the relationship between the employee and line manager, as well as peer support from fellow employees. Job insecurity (and consequent income insecurity) is a further factor consistently found to predict mental health difficulties in workers (3,4,8) and means we need to address the way in which policy changes can impact the operating environment for workplaces and the consequences of this on workers exposure to psychosocial hazards. Review of the factors that are evidenced to be important for workplace health reveals that many of them relate to organisational culture, processes and practices suggesting that the most effective interventions would be at the organisational rather than at the individual level.

A recent edition of the *Journal of Occupational Health Psychology* (9) includes 13 evaluations of recent workplace interventions, which predominantly apply RCT methods. Papers in this journal edition include interventions focused on social support, mindfulness, use of sanctions on safety behaviour, mental health training, organisational resources, sleep and fatigue, safety climate and the factors that inhibit training transfer. Evaluations of these interventions use a wide range of different individual self-report measures and biomarkers as proxies for probable long-term health outcome, including self-reported physical and mental health, blood pressure, workplace absence, work-life conflict and reported physical activity. The psychological causal theories underpinning these interventions are also wide-ranging, including theories of individual motivation, self-determination, self-esteem, job-demands-resources, coping styles, psychogenesis and 'felt' responsibility.

Evaluation of complex workplace interventions is not straightforward, as Part 1 of this series indicates, and

hence it has been easier to obtain research evidence about these individual factors. There is a wide range of individual level workplace psychosocial interventions that draw on different psychological causal models (explicit and implicit); some of these are evidence-based and many of them are commercial initiatives. Historically, much of the intervention research about health conditions, such as psychological health problems and musculoskeletal disorders that have more complex or unclear aetiology, often are long latency and have multiple, and in some cases have cumulative potential causal factors has involved evaluation at the individual level. This is not necessarily because the individual is the most appropriate locus of intervention when attempting to reduce environmental exposure levels, but rather because it is easier to evaluate, which leaves gaps in our understanding of workplace-level intervention and psychosocial exposures.

Although individual factors have been the most common frame used to evaluate health interventions, it has been acknowledged within psychology that this proliferation of simplified individual causal models impacts construct validity. A recently published meta-analysis of positive psychology interventions (10) indicates that the treatment effects on measures of wellbeing are much lower than has been claimed, and is evidence of the tendency towards 'over-claiming' about the causal role of individual psychological factors in health outcomes (11). A meta-analysis of systematic reviews of RCT studies of health behaviour change indicated that interventions based on psychological theories were found to be no more effective than non-theory-based interventions (12). The authors raised concerns about the limitations of using causal explanations that focus solely on individual psychological and individual behavioural factors and suggested that multi-faceted models (or theories) of change are needed. There have also been concerns over the legitimacy of assumptions of generalisability from an RCT design, due to sampling practices and excluded groups. One current illustration of the latter is the impact of the prevalence of men only samples deployed in RCT designs in safety research and the impact on safety when this is generalised to the whole population (13).

If our evidence is constrained and our causal models

and theories of change are limited or inaccurate, we are potentially misleading ourselves in making recommendations about the generalisability of any specific intervention. In addition to the issue of unintended harm from intervention raised earlier (and considered in more depth later), a failure to engage with these limitations has implications for return on research investment and decisions about whether an intervention should be scaled up or transferred to another context. This concern is consistent with the recommendations for general health behaviour change programmes which indicate that attention to conditions improving motivation, capability and opportunity need parallel attention and are all of equal importance for effective intervention design (14). A recent systematic review of behaviour change techniques has indicated that using multiple approaches in an intervention programme contributes to overall effectiveness and suggests that attempts to isolate one behaviour change technique as 'working' are flawed (15).

This is consistent with the discussion in part 1 of this series indicating that any treatment effect is an average and does not imply that all benefit equally. It is a truism that any individual may have very different and often unknown pre-existing behaviours, habits, social resources and current health status (known and unknown) compared to other individuals and we do not yet fully understand which variations are relevant to later health outcome. Health psychology has responded to these issues of variability with an increased investment in  $n=1$  studies of health intervention which are mixed method approaches to understanding how individual differences impact health outcome variability from health-related psychological and behaviour change interventions (16). These  $n=1$  studies use repeated samples over time of the same individuals, for example, Gonzalez et al (17) undertook an  $n=1$  study of a CBT intervention designed to encourage treatment compliance in people with diabetes, which evidenced that each individual studied responded differently to the intervention and exhibited different types of compliance improvement (some improved in medication adherence and others in glucose monitoring).

In considering our limited understanding of what works for psychosocial workplace health intervention, Nielsen and

Miraglia (18) suggest that research culture may have a responsibility for these gaps in evidence due to publication bias, in which RCTs are treated as the 'gold standard' for workplace psychosocial intervention evaluation studies. They suggest that studies using causal models of individual psychological factors fit more easily into the 'treatment effect' model required in prospective RCT designs. To address the problems of using an individual-focussed approach to psychosocial workplace health intervention and its evaluation, Nielsen and Miraglia (18) recommend more attention to multi-level approaches to intervention evaluation, which explicitly include attention to the impact of context on outcomes using realist methods.

### **Multi-level approaches and contextual impact on interventions; the CMO model and process evaluation for workplace psychosocial intervention.**

Realist methods are designed to work directly with the messiness of real-world system interventions. The use of realist approaches has been the primary response to the growing call for multifaceted approaches to intervention evaluation, and they are increasingly used in understanding how to undertake complex intervention in healthcare settings. The underpinning rationale of realist evaluation is that reliable knowledge development about the effectiveness of any intervention (which can be either discrete or complex-see part 1) requires suitably complex underpinning 'theories of change' that allow for the impact of context and for the existence of multiple, interacting causal pathways. Such change theories need a clear understanding of how interventions come to work (or not).

Occupational health psychology has drawn upon these realist methods to develop workplace health 'process evaluation' approaches. Nielsen & Randall (19) describe the development of process evaluation as opening the 'black box' of organisational intervention, which includes understanding context and identifying the wide range of workplace mechanisms that can influence outcome (known as the CMO model). The term 'process evaluation' describes the explicit shift away from asking the binary outcome question: "what works?" to asking the process-based question: "what works for whom in which circumstances?" (18). These studies work with complex multi-level variables and hypothesize multiple causal pathways, deploying

statistical techniques like structured equation modelling (SEM) or hierarchical linear modelling (HLM) to enable modelling and testing of these relationships. The differing causal assumptions in process evaluation and RCTs is given in overview in table 1.

**Table 1: Comparing causal assumptions between RCT and Process Evaluation**

RCT causal assumption	Sampling and randomization->trial/intervention -> outcome (or counterfactual)
Process Evaluation causal assumption	Design -> (intervention + context) -> mechanism -> range of responses -> range of outcomes

Studies using this approach to evaluation articulate two types of variable:

- *moderators*, which are the contextual factors that either hinder or enable a mechanism to be triggered;
- *mediators*, which are the mechanisms that make an intervention work and thus are approached as explanatory variables.

The way contextual factors moderate intervention process and outcomes is helpfully demonstrated by case studies from the published evaluations of workplace interventions (boxes 1-3).

### Box 1. e-learning for managers

A pilot study of a cluster RCT of guided e-learning health promotion for managers based on HSE management standards is informative and instructive (20) as the results pointed to the need for robust assessment of the impact of contextual factors to understand “what works for whom in what circumstances”. The study population was 4 clusters of services from one NHS Mental Health Trust, comprising 1116 employees and 60 managers. 424 employees consented to participate, with 3 clusters comprising 341 employees and 49 managers allocated to the intervention and 1 cluster of 83 employees and 11 managers to the comparison non-intervention cluster. The intervention was an established e-learning health promotion package for managers, “Managing Employee Pressure at Work”. The primary outcomes were rates of sickness absence, and wellbeing assessed by the Warwick Edinburgh Mental Wellbeing Scale (WEMWBS). The comparison at the end of the study was between 3 clusters (wellbeing 225 employees; sickness absence 320 employees) and 1 cluster (wellbeing 59 employees; sickness absence 73 employees). Of the two primary outcomes, HR data showed no evidence of effect on sickness absence and WEMWBS scores fell from 50.4 to 49 in the control group and from 51 to 49.8 in the intervention group, suggesting a small but non-significant effect. The authors point to a number of factors that might have adversely influenced participation and engagement in the study: for example, the study coincided with considerable organisational change in the Trust and fewer managers than anticipated participated in the study. In addition, a parallel qualitative study indicated that the managers who did participate were not representative, being highly experienced, having been in post for several years and being conversant with psychological stress in the workplace.

### Box 2. self-rostering

A self-rostering intervention in elder care work (21) was undertaken in 3 separate workplaces and each generated a different workplace health-related outcome. One context evidenced increased job control and self-reported wellbeing post implementation, the second evidenced reduced job control and lower wellbeing post implementation, and the third evidenced no change in any outcome measure. A range of contextual factors and process mechanisms (see later) shaped the way in which the intervention was managed in each setting, hence leading to very different outcomes for what was ostensibly the same intervention. Had these data been pooled at the individual level, it is likely that the intervention would have demonstrated no impact and the range of contextually dependent outputs would not have been evidenced. This illustrates the limitations of evaluating at the level of individual outcome and also challenges the use categorical claims about whether any particular intervention improves health or not as these can be misleading if context is not fully factored into the evaluation process.

**Box 3. Schwartz rounds**

In another example, Maben et al (22) studied health outcomes for employees in an organisation that had implemented a large group intervention. The context was characterised by high demands (overload) and the evaluation overall showed no improvements in health outcomes for employees in this organisation. However, there were differential health outcomes for different groups in the workplace. The health of people that had **not** participated worsened over the timeline of the intervention, whereas those that had participated in these events sustained the same (albeit not very good) health levels as at the outset of the intervention. Active manager support was identified as the variable mechanism that enabled attendance.

**Table 2: The IGLOO model and psychosocial intervention**

	<b>Prevention of exposure</b>	<b>Mitigation/Management</b>	<b>Treatment after exposure</b>	<b>Control mechanisms</b>
<b>Individual level</b>	Behaviour change practices Exposure avoidance – eg what constitutes ‘PPE’ for WRS (sleep, social cohesion, social support, technology downtime)	Workplace adjustments & RTW Mindfulness Teaching coping skills	GP and OH Medication CBT Counselling	Self-regulation Leaving organisation Using stress-related absence and sick pay provisions Speaking up about problems, Employment Tribunal action
<b>Group Level</b>	TU H&S reps – local knowledge sharing Social identity practices – the “social cure” Team Acceptance and Commitment Therapy	Social support, Social resilience (ie multi group membership eg family, friends) Work life balance	Restorative justice. Social cohesion approaches eg. Schwartz Rounds	Monitoring inclusion and discrimination (mitigating the ‘social curse’-see later) Toxin handling (eg. conflict management including work-life relationship)
<b>Leader level</b>	Selection and training of managers Managers/leaders doing the job well Availability of resources Role-modelling of good ‘healthy’ leadership and management by senior leadership Setting behavioural, attitudinal and approach expectations for managers including people management skills in KPIs	Providing leader resources and building capability Support for workplace health initiatives Participation and voice actions including with TU/worker representation Sanctions- which leaders get promoted or removed, integrated with appraisal for managers that covers people management capability		Checking in on health of direct-report employees Staff surveys TU H&S rep feedback Team demand monitoring and management. Feedback on management behaviour, attitude, approach Dismissal of managers for misconduct that increases risk of harm to employee health
<b>Organisation level</b>	Workplace and job quality improvements based on mitigating known psychosocial exposures Election of worker representatives. H&S committees. Compliance with the HSE management standards and intervention risk assessments based on them.	HR practices such as: Wellbeing policies Mental Health at Work policies Return to work policies Dignity at work policies Equalities policies Job security commitments EAP provision Occupational Health services		Monitoring risks and benefits of interventions and practices Enabling implementation course correction Incident reporting and investigation (no reporting of psychosocial incidents such as suicidal ideation, work-related suicide or reported symptoms of burnout required as yet)
<b>Operating environment</b>	Evidence development Regulation development (inc HSE/EHRC/ACAS) Employment Law provisions (NMW/Status) Trade Union advocacy	Inspection and improvement notices. Reviews of policy and impact of work systems on psychosocial exposures and health outcomes	NHS, Benefits framework, Social care Legal changes to workers contracts and conditions	Sanctions such as fines and prosecution Industrial action, class action Campaigning and awareness programmes

### Levels of intervention and psychosocial risk management in complex organisations - The IGLOO model

In recognition of the complex interacting factors that can be the focus for intervention or impact intervention outcomes, as illustrated in the case studies above, research attention has been directed to sources of variability in psychosocial context for workplace intervention. This has been integrated into the IGLOO model which articulates five relevant levels (Individual, Group, Leader, Organisation, Operating context). The IGLOO model was developed to consider the moderators and mediators relevant to the effectiveness of return to work programmes but is also applicable to other types of intervention (23).

This model has been integrated with a risk/hazard management approach (table 2) to provide a simplified overview of the multi-level context and mechanisms for psychosocial workplace interventions; many of the latter have been evaluated as workplace psychosocial interventions in themselves.

The summary set out in table 2 covers features that are available to well-resourced organisations which are the contexts often included in intervention evaluation studies. Such resources do not exist in all workplaces or for all workers. The assumption that such environments are the standard context for workplace intervention underpins the current focus on the 'good work' agenda, the limitation of which is outlined in part 1 of this series. However, it is important to bear in mind that only about 50% of UK working age people are working in such environments. The remainder of working age people are either employed in small to medium-sized enterprises (SMEs) or are self-employed, in zero hours contracts, in precarious contracts or in gig structures/platforms, none of which are likely to enable access to such contextual resources. The changing nature of workplaces has been identified as a risk to the UK track record on the management of health and safety at work (24) which raises questions about how the operating context needs to accommodate such variability and how the explicit theories of change developed will need to be different for these types of workplace. An overview of categories of 'bad work' and their varying impacts on psychosocial hazard exposure is given in Appendix B.

### Contextual boundary conditions for health intervention effectiveness

Allied to the consideration of the complexity of factors that affect intervention effectiveness, a repeated finding in process evaluation is the importance of boundary conditions. A boundary condition broadly refers to the requisite level of access to contextual resources (these can be social, relational, economic, time, health and wellbeing resources) as a necessary precondition for a positive health impact from an intervention. A few examples of the impact of boundary conditions identified in the research literature illustrate this point (box 4).

#### Box 4. Research identifying the impact of boundary conditions

- The recent validation of a questionnaire about psychosocial hazards (25) found that the same broad hazards were found to be relevant to all workplace contexts, but that there were contextual differences in how much each hazard was significant for any particular workplace; this variation in the relevance of different psychosocial hazards was associated with between-workplace variability in resource availability.
- Studies of leader influence on employee burnout had generated mixed results, which led to a process evaluation question about the role of leader resources in outcomes: Tafvelin et al (26) identified two closely associated sets of leader resources ('vigour' and 'peer support') as important boundary conditions for leaders to be able to mitigate employee burnout.
- In the context of job design interventions, skill development in social resource seeking behaviour (which underpins job crafting interventions) has been found to be helpful in mitigating work related burnout. However, the capacity to use these skills is undermined by job insecurity, suggesting that a requisite level of security functions as a boundary condition for such interventions to be effective (27).

The examples given in box 4 suggest that boundary conditions are probably a relevant consideration for apparent 'no treatment effect' outcomes from workplace psychosocial intervention and also for evidence of different outcomes in different contexts from ostensibly the same intervention as is illustrated in Box 2. This evidence also

informs results emerging from many large-scale, individually focused psychological intervention studies, hence is a highly relevant consideration for the matter of return on investment. For example, an evaluation of counselling as a behaviour change intervention for obesity indicated that this intervention actually increased health inequalities. It was effective with those who had the economic and time resources to convert the intervention into action, but not for those without these resources (28, 29). Lack of these resources (unmet boundary conditions) made it much more problematic to avoid the pressures of the ‘obesogenic’ environment.

A similar pattern emerged in the recent evaluation (30) of computer-based Cognitive Behavioural Therapy (cCBT) in which relative deprivation impacting finances and available time was a boundary condition for the effectiveness of the intervention. There was also a positive impact on treatment outcomes for those who identified with more social groups, suggesting that social resources are also an important boundary condition for the effectiveness of cCBT. The extent to which other resources (time, finances) acted as boundary conditions for access to different social groups (and other social resources) was unclear from this paper and this same concern is regularly linked to the risk of harm from the application of over-simplistic ideas of ‘social prescribing’.

These examples add further challenge to the reliance on research about individual psychology when considering work-related psychosocial health. If the significance of boundary conditions is not recognised and met as part of the design process, an intervention that may have been effective in one context may, in another context, have limited effect, or can potentially cause harm.

This concern with boundary conditions is also relevant in reviewing the growing use of organisational health intervention by “toolkit”. There is little evidence that sharing knowledge on its own has a significant impact on behaviour or outcome without the addition of considerable resource to enable effective social influencing and role modelling. Such an approach presupposes a resource capacity available in organisations to activate the content of toolkits, for example, individuals with responsibility for encouraging toolkit use amongst the workforce. There are concerns that new

working arrangements and demand intensification means that this kind of ‘knowledge activist’ resource is declining in many workplaces, so the boundary conditions necessary for effective ‘toolkit’ use are not in place. There is also evidence that such ‘knowledge activists’, even when they are present in a workplace (often in the form of Trade Union Health and Safety representatives), can be blocked from making this contribution in certain types of organisational climate (31).

### Workplace mechanisms as causal factors in intervention outcome

Clarity about relevant workplace mechanisms is central to process evaluation. This is complex because these mechanisms include psychosocial factors that both underpin differential baseline workplace health levels prior to intervention and can also lead to different outcomes from implementation of the same intervention. To illustrate, a bullying environment could be a direct cause of workplace ill health that leads to a requirement for intervention; but a bullying environment could also impact on how a different intervention (for example job design to increase job control) is likely to be perceived or trusted by employees, and so function as a mechanism that causes the failure of an otherwise well-designed intervention that had been effective in a different context.

There are two types of mechanism (18) relevant to psychosocial health interventions in workplaces. The first are **content** mechanisms, which focus on the substantive content of workplace intervention; they include approaches like job design including job crafting efforts to reduce exposure to psychosocial hazards (such as high demand or low job control) or increase access to protective factors such as social support. The second are described as **process** mechanisms, which cover the factors that impact the implementation of an intervention. Nielsen & Noblet (32) identify three broad categories of process mechanism:

- **the use of participatory approaches:** there is a considerable process evaluation and organisational development literature that examines how participatory approaches (e.g. engagement, employee voice and worker representation) support the effectiveness of an intervention;

- **the nature and style of management and leadership:** these cover social relationships with an inherent element of power and authority, which are increasingly recognised as critical to health and wellbeing at work and to organisational justice perceptions and are informed by the previous discussions of boundary condition for intervention effectiveness.
- **the approaches taken to achieve ‘intervention fit’:** practices which need to be heavily informed by the question of boundary conditions and the need for a risk management approach to implementation; the impact of intervention fit on evaluation is informed by the literature on implementation science, particularly intervention fidelity assessments (33).

### **Social identity mechanisms: social protection and social curse processes implicated in health and harm**

The growing literature on social identity and the evidence of social protection against the impact of adverse experiences from meaningful group membership is a highly relevant consideration for the functioning of process mechanisms. Lack of social cohesion and social support are identified as the highest risks for all-cause mortality (34) and group and relationship processes associated with social identity can function as a protective mechanism implicated in health outcomes, described as the ‘social cure’ (35). In considering interventions for work-related ill health and disease, it is important to recognise that the workplace is a significant source of social identity and belonging for the working age population. Social identity processes have been identified as critical to the connection between leadership and health outcomes (36, 37) and meaningful group membership makes people more open to health advice from those with whom they identify (38) which is a mechanism relevant to the work of ‘knowledge activists’ mentioned earlier.

However, the relationship between social identity and health outcomes is complex, as the powerful group dynamics that underpin the ‘social cure’ also have the potential for generating what has been described as the ‘social curse’ (39), in which group processes are implicated in harm, through factors such as the cumulative impact of micro-aggressions such as bullying or discrimination (40) on health (see Appendix A on social determinants of health).

The manifestations of these processes are impacted by the nature and style of management and leadership. Key is whether the necessary workplace relationship capacity and capability is available to mitigate these harmful group processes. For example, a recent process evaluation of employee readiness for change found that managerial span of control was negatively related to constructive managerial relationships and implicated in destructive leadership. They also found that managers’ lack of relationship capacity negatively impacted intervention readiness (41). Such evidence suggests we need to consider the extent to which these changes to working arrangement have potentially disrupted the potential for social protection against harm from known workplace psychosocial hazard exposure. We also need to consider the extent to which these changes to working relationships and structures have increased the risk of harm through activating negative social processes (see Appendix B).

### **The risk of unintended harm from workplace health interventions**

There have been growing calls to include consideration of potential adverse outcomes from psychological/mental health interventions and this needs to extend to considerations of work-related health interventions. McIntosh et al. (42) list four main categories of adverse effects:

- temporary discomfort or distress;
- longer-term distress and potential harm outweighed by benefits;
- harms that are not outweighed by benefits;
- perverse outcomes.

The last of these, perverse outcomes, can be from both the intervention itself and also the problematic curtailment of the intervention. Curtailment has been specifically identified as a risk for recidivism in forensic settings but is increasingly of concern in workplaces where health interventions consume resources without clear, quick benefit and so investment is not sustained.

As mentioned at the outset, a core issue when considering potential for unintended harm is the extent to which any workplace health intervention can activate psychosocial



hazards by increasing demand levels in already over-loaded contexts. A new health intervention implemented into an already demanding workplace, without additional resource provision, can increase job demands to unacceptable levels, add confusion and hence lower job control, and absorb all the capacity for support, so reducing its general availability, all of which can lead to the paradoxical situation where a health intervention makes the workplace environment worse for health. This indicates that the management of interventions in the workplace (intervention fit) needs to take an active (risk management) view of the boundary conditions (resources) that would need to be met for the intervention to be effective and also undertake a critical review of how such a health initiative may activate psychosocial hazards and so cause harm. An example is given in box 5.

#### **Box 5. Unintended harms from Mental Health First Aid (MHFA) programmes**

MHFA programmes implicitly frame mental health at work as an individual issue rather than a workplace design issue activating concerns about 'just world bias' as outlined earlier in this paper. They have been implemented into a variety of workplaces and it is clear from the reviews that both context and mechanism have had a substantial impact on their effect. In some contexts, an MHFA intervention has led to an increased sense of social support, but in others it has led to harm:

- MH first aiders finding themselves subject to excessive additional demand, beyond both what a "first aid" type relationship implies and also what they were trained for; this is a predictable risk to the first-aider;
- MH first aiders feeling obligated to provide counselling type services that they are not equipped to offer, after just two days' training in mental health issues; this is a predictable risk to the health of the person seeking help;
- The perverse outcome of MH first aiders being deployed as a resource in a capability dismissal process as a referral point for managers who did not want to deal with "the mentally ill"; this is a predictable risk to all parties.

These illustrations indicate that intervention implementation without prior organisational risk assessment, including awareness of the impact of boundary conditions and contextual variability on effectiveness, can lead to unintended exposure to health risks both for MH first aiders (dealing with uncontrolled high demand) and also for those asking for help (who effectively end up insufficiently supported despite asking for help).

The lack of a clear referral pathway from MHFA into other mental health provision is a further potential source of harm. The existence of such a pathway is implied in the concept of "first aid" but is not available in the context of the workplace mental health first aid programme. There is no clarity at this stage about what (if any) workplace counselling provision or EAP (organisation level issue in IGLOO model) is required for the MHFA approach to be recommended; or what wider NHS or insurance-provided mental health care is assumed/considered necessary (operating context issue in the IGLOO model).

In addition to a clear referral pathway, incident reporting is a mechanism whereby responsibility for the work-related health incidents (subject to first aid) and hence risk management transfers to the organisation. This raises questions about the importance of having an incident-reporting framework for containing the responsibility of MH first aiders (thereby mitigating the demand exposure on them). To illustrate the issue, it is worth considering what the reporting and supervision protocols should be if, for example, a colleague tells a MHFA trained person about symptoms of burnout linked to working conditions, or about workplace suicidal ideation, and what an MH first aider is accountable for in these kinds of situation. There is also the issue of vicarious trauma for the MH first aider from these experiences and hence what wider organisational and supervisory obligations should be. Given that the HSE review of MHFA indicated this approach had had little impact on how the whole organisation functioned, it does suggest that these wider considerations have impacted neither design nor implementation of MHFA programmes.

There are other potential sources of unintended harm from intervention. One consideration is the extent to which psychosocial intervention designs use misguided ideas about causal mechanism. Part 1 touched upon the unsophisticated use of absence management interventions. Those based on the assumption that a reduction in absence is a proxy for improvement in health have led to increased presenteeism and the predictable harm to health associated with such behaviour. While an effectively supported return to work in a healthy well-resourced workplace may activate the social identity benefits of work relationships, a similar absence management approach applied in the context of poor-quality working conditions may have the opposite effect. There is evidence that those in low income, low status, temporary or contract jobs return to work more rapidly after illness (43, 44) and often before they are well, potentially worsening longer-term health outcomes.

Another issue is the tendency for cognitive biases to be built into intervention design and become another source of unintended harm. This includes the ‘just world bias’, whereby individuals are assumed to be directly responsible for the impact on them of factors that are in reality outside of their control. Such a bias is evidenced in some of the contemporary interventions focused on ‘resilience’ which can predictably be experienced as unfair and also function to activate a sense of low control, both of which are well-recognised psychosocial hazards. This same bias also applies to intervention designs that centre on so called ‘individual health behaviours’.

Tauber et al. (45) found that an organisational health promotion programme that attributed individual decision-making as a cause of obesity led to worsened health indicators and warned that such a design can worsen that which it had intended to cure. These worsened health outcomes included a reduced sense of control, increased stigma, and increased workplace discrimination via ‘social curse’ processes (39). When the responsibility for health is taken by the workplace organisation, interventions tend to have better health outcomes than those focused on individual behaviour (46).

### These insights have implications for three distinct sets of audiences:

1. **Operating environment/national policy:** the existing policy context increases or reduces psychosocial exposures. This can be directly, or through the impact of regulation (or the lack of it) on the level of psychosocial hazards in working environments. It is important to consider how the HSE can further operationalise the Management Standards in order to take account of the complexity of intervention and evaluation set out in this paper, including how this can positively impact the work-related health outcomes for the 50% of workers who are excluded from high resource employment contexts, particularly given the evidence of job and income insecurity as a boundary condition for intervention effectiveness. Policy makers across domains need to consider how all bodies impacting the workplace health context can collaborate to support all organisations engaging workers (across the full range and variety of working and employment structures) to meet Health and Safety at Work intentions and obligations.
2. **Organisational practice/practitioners:** accepting the CMO and IGLOO models as indicators of factors relevant to workplace health intervention expands consideration beyond the Health and Safety and Occupational Health domains to include those who work in other organisational functions (HR, equality, diversity and inclusion, programme management, corporate governance, trade union committees). It indicates the need to focus on ensuring that all relevant practitioners are informed about sources of work-related psychosocial hazard exposures. It also requires understanding that interventions to prevent harm, mitigate risk and support workplace health need to be multi-level and multi-disciplinary in nature. There is also a need to consider how to support individuals whose health is impacted, without reinforcing the idea that individual differences are causal.
3. **Academics/researchers:** in order to develop relevant evidence on which to base both national policy and also organisational interventions to improve internal

workplace health, more process evaluation and longer-term monitoring of psychosocial exposures at work is needed (recognising the work context as a social determinant of health and including evidence on the incidence of burnout, work-related suicide and longer-latency health outcomes). Careful attention to and integration of proxies for work-related health (such as the use of biomarkers over the long term or attending to the problems with absence as a proxy) is needed, as is engagement with the complexity of the work contexts and attention to the capacity for harm from unevidenced and ill thought out intervention practice. There is also a need to explore how and when we can use the monitoring of psychosocial exposure levels as a proxy for long latency health outcomes linked with the need for long term programmes of psychosocial hazard monitoring (informed by the example in part 1 box 2).

### Intervention principles

This summary points to the need for a set of principles for a precautionary approach to intervention design and implementation to mitigate hazardous work-related psychosocial exposures and improve health outcomes. This is particularly relevant to audience 2 above (organisational practitioners) but also inform the considerations for audience 1 and 3 above.

The following questions offer a guide to support risk mitigation from intervention design and implementation:

1. What are the significant hazardous psychosocial exposures in this workplace? This does not focus upon 'what do we do about mental health?' but instead 'what workplace exposures in this context may cause psychological injury and/or compromise long term health outcomes?
  - a. Which groups, where, and how?
  - b. What sources of information do we have about this?
2. What can we stop doing? Ask this without it being a reason to reduce staff levels but instead increase capacity (often less is more and the best interventions can be to remove unnecessary work which can mitigate the issue of demand intensification that is currently so hazardous).
3. Which parts of the organisation appear to have lower hazard levels based upon the available information and what insights can these internal variations in apparent exposure have for suggesting approaches to improvement for the whole organisation?
4. What are the significant boundary conditions in this workplace that will influence intervention success: which of these are fixed (e.g. might be space), and which are adaptable (e.g. might be managerial capacity)?
5. How can the IGLOO model inform our decision-making about this matter? What level of resource can /should we invest and at what level in the system do we need to intervene?
6. What is the potential for unintended psychosocial harm (via increased exposure to psychosocial hazards) from our proposed approach to improvement? Taking known hazardous exposures in turn, how do we mitigate potential harm, for example:
  - a. Who will have additional *demands* due to this proposed *change*, what existing demands can we remove and what resources can be mobilised?
  - b. Where do we need to increase *workplace support* and how will we invest in this?
  - c. Which *roles* may become unclear, where may *job control* be reduced and which *relationships* may be compromised?
  - d. What workplace injustice perceptions may get activated?
  - e. Will the capacity for participation be sufficient?
  - f. What will be meaningful in this context and what could be experienced as blame or imposition?
7. Where should we start? How can we identify designs that are as simple and transparent as possible to be used initially on a small scale?
8. What model of change (implicit or explicit) are we deploying? How do we ensure the chosen approach allows for complex adaptation emerging in different ways across different parts of an organisation?
9. What approaches to effective monitoring and course correction are viable, both to inform necessary real-time changes to intervention and inform whether or not to scale up and if so, how?

## Appendix A

### The social determinants of health inequality

A substantial number of recent studies drawing upon longitudinal datasets (eg. UK Household Longitudinal Study, the English Longitudinal Study of Aging (ELSA) and the equivalents in other countries) indicate that social adversity predicts health outcomes at a population level (47, 48). This research has also identified some of the life path variables (again at population level) that appear to impact this association (49).

Increasing attention is being given to the mechanisms of causality underpinning the social determinants of health inequality, using biomarkers for 'biological weathering' or allostatic load. For example, a recent study has indicated that 'embodied social adversity' is a risk for health outcomes and so represents a risk factor that is distinct from known individual behavioural risks (50). Embodied social adversity is a short-hand for the growing evidence that social adversity (e.g. poverty, inequality, individual trauma, discrimination) impacts biological functions in a persisting and cumulative fashion that is not immediately apparent in other indicators of health (4). The recognition of the importance of this 'embodied social adversity' for later health outcomes underpins the use of biomarkers in studies of work and psychosocial health that are touched upon briefly in part 1 in this series (51-53). The emerging consensus is encouraging a focus on identifying the complex causal mechanisms that underpin the association between social adversity and these disease/health outcomes. There are calls for the development of a suitable range of sociomarkers (54) and considerations of how these different markers could best be triangulated to inform our understanding of the probable pathways to health outcome (individually and at a population level). The HSE management standards for work-related stress and the introduction of burnout as a distinct health condition to the International Classification of Diseases contribute to this from the perspective of the workplace.

There is in parallel some concern that acknowledging causal complexity could be used as a rationale to deny responsibility for partial impact on overall systemic contribution to adversity (55). An important means to

address this risk of inaction could be to identify robust and clear requirements for multi-level intervention, and for regulations to include guidance for employers on domain specific requirements for risk assessment, intervention design, implementation, and monitoring, informed by the literature on implementation science and 'realist evaluation'.

Two key formative longitudinal studies provide useful background to this area:

#### **1. The adverse childhood experiences (ACEs) studies, which clarified the existence of a dose-response relationship between adversity and long latency health outcomes**

The dose-response relationship underpins the insights gained from the ACEs studies (56) as they show an apparent population level dose-response association between early social adversity and later health outcomes. This ACE dose-response research has been replicated and evidenced in systematic review (57). There has also been research examining how earlier experiences are associated with later adult exposures (58).

These studies have encouraged questions about how we assess exposure and identify problematic dose levels of adversity. While it is not possible to provide full coverage of the ACEs work in this document two concerns about its implementation are relevant here as this gives pause to the way such epidemiological evidence gets translated into intervention design (59):

- This is a population-level association, which is not predictive at an individual level. There is evidence that the availability of social and relational resources, including significant trusting adult relationships, act as protective factors at the individual level.
- Using a population-level research measure to intervene directly to assess individual risk fails to understand the complex social to biological causal (and protective) mechanisms behind this population level association and so may unintentionally cause harm.

Rather than assessing individuals for their risk based on 'dose' of adversity, intervention evaluation needs

to examine what is effective in removing/reducing the exposure to risk from the environment.

## **2. The Whitehall studies, which developed the concept of status syndrome to describe social determinants in the workplace**

Equivalent longitudinal research relevant to the workplace was undertaken in the Whitehall studies, which identified the importance of the workplace for the impacts of ‘status syndrome’ (60). Status syndrome is a concept used to explain the evidence that those in lower status jobs are more likely to be unwell, which countered the previous view that executive stress was a key health problem. The concept has since been developed further, drawing on growing evidence that income inequality impacts the health of a society (61). Marmot’s “Fair Society, Healthy Lives” report (1) considered the response needed to social determinants of health inequality and outlined the domains that required intervention. These included the requirement for good work and considerable attention has since been given exploring what constitutes good work (8, 62). This has recently been updated in a 2020 report in which the changes to working arrangements is identified as a critical social determinant as outlined in appendix B (2). It is noteworthy that the emerging data about Covid19 mortality and occupation suggests an association between low paid work, exposure and risk, which is informing emerging research questions about ethnicity, structural and social factors and mortality and is consistent with this literature on work as a key social determinant of health inequality (63). This evidence has informed the recent “build back fairer” report from the institute of health equity, which indicates structural racism and poverty are implicated in differing Covid 19 health outcomes (64).

## **Appendix B**

### **Good work/bad work framing and social determinants of health at work**

In the case of workplace health, there is a risk that the ‘good work’ frame, which has been dominant in some quarters for the last decade or more, has crowded out proper attention to the nature, prevalence and consequences of ‘bad work’ in the UK. When a particular perspective or ‘frame’ becomes dominant, it can function to ‘crowd out’ other perspectives. This means that our limited capacity for attention leads to that narrative dominating to the exclusion of alternatives and has been evidenced as a source of research and intervention bias. When considering intervention, the key risk is that the dominant narrative of ‘good work’ carries in it an implicit assumption about the correct pathway for intervention, which can inhibit effective targeting, design, implementation and evaluation of interventions.

### **Prevalence of ‘bad work’ as a key consideration**

Clarity about the prevalence and types of ‘bad work’ is directly linked to concerns regarding generalisability from intervention studies. In particular, the recognition of context as a factor in intervention effectiveness means we must exercise caution in generalising the extent to which findings about individual level interventions in one type of workplace are relevant to individuals working in different types of workplace or working arrangement. Working arrangements vary widely and structural trends such as demand intensification, two tier workforces (a core of high-status employees with a wider group of workers in precarious roles), the increase in distributed and remote working arrangements, management by algorithm, monopsony conditions (where a single buyer sets the price for many suppliers hence controlling pay rates, often generating downward pressure on pay levels) self-employment and zero hours contracts bring a different set of requirements for workplace health intervention design, implementation and evaluation. It is not sufficient to evaluate e.g. a mental health intervention in a conventional workplace and assume it is readily translatable to another context.

Not all ‘bad work’ or ‘bad working contexts’ are the same. For the purposes of this paper, three broad types of ‘bad

work' are identified and considered in turn:

- poorly designed jobs/work
- poor working relationships
- precarious work (including the issue of in-work poverty).

### **Poorly designed jobs/work**

The 2012 British Skills and Employment survey (3200 respondents) published by What Works for Wellbeing (65) found that 38% of survey respondents were in jobs of poor enough quality to be a risk to their health and wellbeing (with some indication that young people were over-represented in poor quality jobs). This directs attention to poor job design as a significant factor in bad work. The authors indicated that this percentage was probably an under-estimate of the percentage of poor-quality jobs, noting a sample bias in survey respondents towards those in professional/ managerial roles (i.e. a bias towards those less likely to be in poor quality jobs). Such sample bias is common when convenience sampling is used for worker surveys, as it is easier to access responses from those in relatively stable and secure employment (who are also less likely to feel at risk from completing survey requests). Extrapolating from this survey to the UK working population of approximately 34 million could indicate that approximately 12 million workers may be exposed to the predictable psychosocial hazards activated by poor quality jobs.

Demerouti (66) in her recent keynote at the Division of Occupational Psychology Annual conference drew on extensive research using the Job Demand-Resources model. In this she indicated that while job design interventions focused on resource-seeking can improve job control, support, engagement and productivity, this is not sustainable in the context of long-term pressure and intensifying job demands. Similarly, a recent meta-analysis of engagement intervention indicated that bottom-up interventions, such as job crafting and mindfulness, could improve engagement levels and generate wellbeing benefits, but that the potential for such interventions being effective was compromised by implementation difficulties linked to resource and insecurity issues due to organisational restructuring or redundancy (67). This resonates with the concern raised about the over-

investment in studies of job control with a lack of attention both to other known psychosocial workplace hazards such as demand and relationships (5).

### **Poor working relationships**

The Simply Health/CIPD annual absence report (68) indicates that stress-related absence figures had increased in 37% of businesses surveyed over the previous year, despite an overall reduction in sickness absence levels. This finding is consistent with general surveys, such as that from the Mental Health Foundation (69), which indicated that 75% of respondents had felt overwhelmed by stress in the year prior to the survey, and that a majority reported that this was due to experiences at work. The Simply Health/CIPD annual report (68) also directly links growing stress-related absence to poor management, specifically naming demand intensification and 'management style'. This directs attention to the experience of working relationships and social cohesion at work, suggesting that jobs that may appear to be well-designed can still be problematic for health. Demand intensification inhibits access to the moderating impact of social support and is implicated in burnout. Manager, team or organisational relationship ethos can either be a source of protection (social cure) or a source of risk evidenced in bullying and other counter-productive forms of relating (social curse). Discrimination and racism at work are manifestations of social curse processes (70) that are gaining increasing attention given the emerging evidence about occupational exposure at work and the association between ethnicity and mortality (64). As underlying health conditions do not appear to account for this differential risk, this evidence is raising questions about the impact of 'weathering' from experiences of discrimination and racism and from structural racism manifesting in level and type of occupation held by different ethnic groups (71, 72).

### **Precarious jobs/work and in-work poverty**

There is evidence that growing numbers of people are working in increasingly precarious situations and that this includes jobs across a wide range of sectors, from academia to delivery work. Job security and predictability have been identified as key metrics in the recent job quality review (8) and there is a substantial literature on the impact of such insecurity on health, cognition and decision-making

(73). A growing concern is the prevalence of working poor: JRF (74) estimated there to be 3.8 million working poor, in turn impacting 7.4 million in their families. These emerging issues underpin the recent recommendation that precarious work should be recognised as a distinct social determinant of health inequality (3) and was mentioned specifically in the recent Marmot review (see Appendix A). Evidence to support this perspective is manifesting in the recent evidence of the association between certain types of occupation and COVID-19 mortality (again outlined in Appendix A). There is also increasing interest in financial precarity, health and wellbeing from a work and organisational psychology perspective as illustrated in this recent systematic review of the last 20 years research into the impact of the living wage (75).

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## What is WHEC?

The Workplace Health Expert Committee (WHEC) provides independent expert opinion to HSE by identifying and assessing new and emerging issues in workplace health. Working under an independent Chair, WHEC gives HSE access to independent, authoritative, impartial and timely expertise on workplace health.

<https://webcommunities.hse.gov.uk/connect.ti/WHEC/view?objectId=235408&exp=c1>

## WHEC membership

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Professor Peter Buckle  
Professor John Cherrie  
Professor Paul Cullinan  
Dr Emma Donaldson Feilder  
Professor Len Levy  
Dr Paul Litchfield  
Professor Martie van Tongeren  
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