The Relationship between Line Manager Training in Mental Health and Organisational Outcomes

Juliet Hassard[1¶], Teixiera Dulal-Arthur[2], Jane Bourke[3], Maria Wishart[4], Stephen Roper[4], Vicki Belt[4], Stavroula Leka[5], Nick Pahl[6], Craig Bartle[2], Louise Thomson[2,7], Holly Blake[8, 9 ¶]

[1]Queen's Business School, Queen's University Belfast, Belfast, Northern Ireland, UK.

[2]School of Medicine, University of Nottingham, Nottingham, UK.

[3]Cork University Business School, University College Cork, Cork, Ireland.

[4]Warwick Business School, Warwick University, Coventry, UK.

[5]Centre for Organisational Health & Well-being, Division of Health Research, Lancaster University, Lancaster, UK.

[6]Society for Occupational Medicine, London, UK.

[7] Institute of Mental Health, University of Nottingham, Nottingham, UK.

[8] School of Health Sciences, University of Nottingham, Nottingham, UK

[9] NIHR Nottingham Biomedical Research Centre, Nottingham, UK.

*Corresponding author

Email: holly.blake@nottingham.ac.uk

Abstract

Background: Line manager (LM) training in mental health is gaining recognition as an effective method for improving the mental health and wellbeing of workers. However, research predominantly focuses on the impacts of training at the employee-level, often neglecting the broader organisational-level outcomes. Most studies derive insights from LMs using self-reported data, with very few studies examining impacts on organisational-level outcomes.

Aim: To explore the relationship between LM training in mental health and organisational-level outcomes using company-level data from a diverse range of organisations.

Methods: This study is a secondary analysis of anonymised panel survey data from firms in England, with data derived from computer-assisted telephone surveys over four waves (2020, 1899 firms; 2021, 1551; 2022, 1904; and 2023, 1902). The analysis merged the four datasets to control for temporal variations. Probit regression was conducted including controls for age of organisation, sector, size, and wave to isolate specific relationships of interest.

Results: We found that LM training in mental health is significantly associated with several organisational-level outcomes, including: improved staff recruitment ($\beta = .317$, $p < .001$) and retention ($\beta = .453$, $p < .001$), customer service ($\beta = .453$, $p < .001$), business performance ($\beta = .349$, $p < .001$), and lower long-term sickness absence due to mental ill-health ($\beta = -.132$, $p < .05$).

Conclusion: This is the first study to explore the organisational-level outcomes of LM training in mental health in a large sample of organisations of different types, sizes, and sectors. Training LM in mental health is directly related to diverse aspects of an organisations' functioning and, therefore, has strategic business value for organisations. This knowledge has international relevance for policy and practice in workforce health and business performance.

Introduction

In the United Kingdom (UK), one in six workers experience mental health challenges, with 12.7% of all sickness absence days attributed to mental ill-health [1]. The estimated annual cost of poor employee mental health to British employers is £56 billion annually [2]. The importance of employers addressing mental health in the workplace is emphasised in both national (e.g., 'Mental Wellbeing at Work', National Institute for Health and Care Guidance [3]) and international (e.g., International Organization for Standardization 'ISO 45003' standards on psychological health and safety at work [4]) policies through the implementation of workplace mental health and wellbeing (MH&WB) practices by organisations.

There are diverse MH&WB practices that employers may utilise to promote mental health at work and prevent work-related stress, each with a different target of change. The IGLO model [5] identifies targeted areas of (behavioural and organisational) change necessary to promote mental health at work:

1. Remedial and resiliency focused strategies targeting **I**ndividual behaviour change and health management (e.g., stress management, mindfulness).
2. **G**roup-level strategies targeting improved social support, work group climate, and increased knowledge and understanding of mental health (e.g., team building exercises).
3. Improving manager's and **L**eader's knowledge, skills, and abilities to promote mental health among those they manage (e.g., line manager (LM) training).
4. Improving **O**rganisations through human-centric working conditions and enhanced job quality, underpinned by a psychosocial risk assessment (e.g., job design, job crafting, flexible work arrangements).

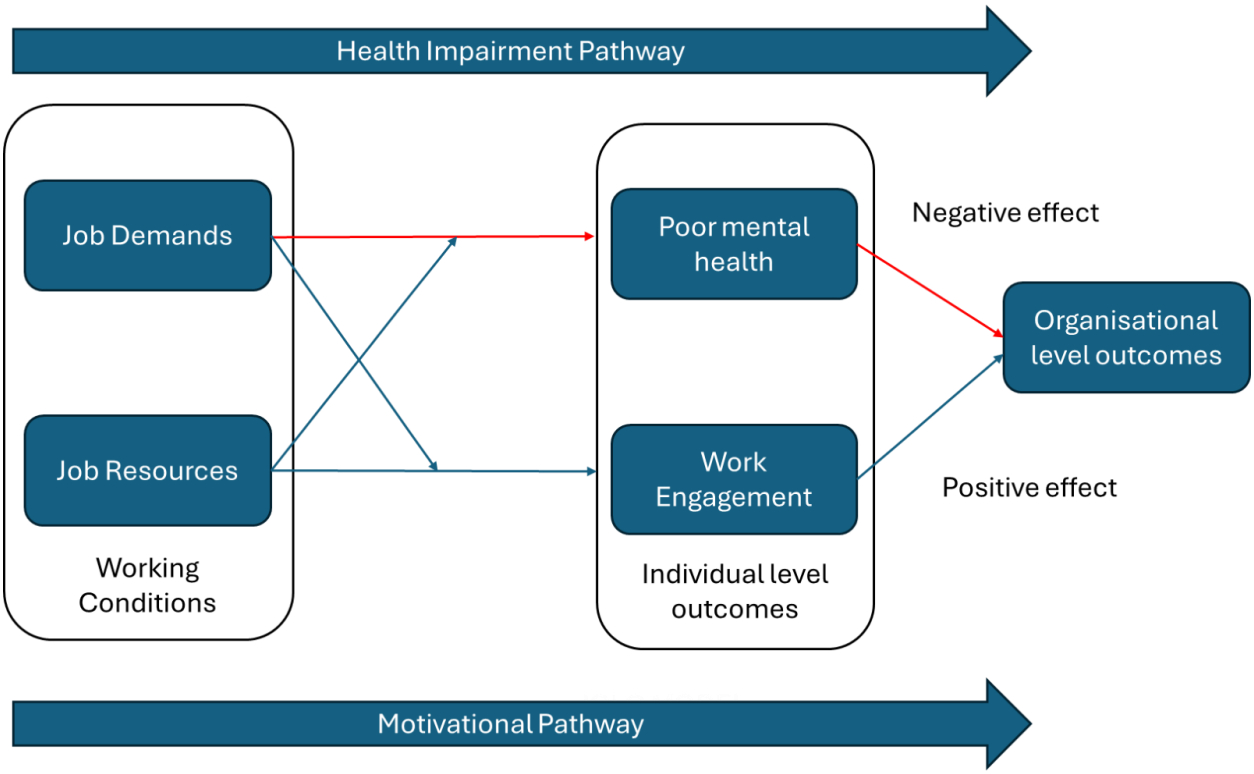
The impact and value of three of these targeted areas of change (individual, group and organisational) has been demonstrated in a burgeoning literature for both individual- (e.g., improved health and work motivation; [6-8]) and organisational-level outcomes (e.g., reduced sickness absence and decreased turnover; [9,10]).

The Job Demand Resource Model (JDR; Fig.1) [11,12]) provides a theoretical framework to understand the conceptual link between working conditions, employee mental health, and work performance and productivity outcomes. The JDR model postulates that work characteristics (categorised as either job demands or job resources) influence workers' psychological well-being and work engagement. *Job demands* are those factors that require emotional or cognitive effort, which can result in psychological or physical harm. Conversely, *job resources* refer to those physical, social, or organisational aspects of the job that may: reduce job demands and their associated physiological and psychological costs; be functional in achieving work goals; and stimulate personal growth, learning, and development [11,12]. This model postulates two pathways that help to understand the link between employees' working conditions, mental health and well-being, and organisational-level outcomes (e.g., customer service, productivity, absenteeism).

The *health impairment pathway* postulates that high job demands negatively impact employee mental health and, by extension, results in poor organisational-level outcomes. Conversely, *the motivational pathway* hypothesises that high levels of job resources improve employee motivation and engagement, and by extension, results in better organisational-level outcomes. Meta-analytic evidence using longitudinal studies finds strong evidence of the link between job demands and resources to individual-level health and motivational outcomes [13].

However, they emphasise the paucity of data examining the link between employee wellbeing and organisational-level outcomes, highlighting this as a key and pervasive gap in knowledge.

Fig. 1. Job Demand Resource Model



MH&WB practises aim to target each of these pathways in slightly different ways. From enhancing employees' health management skills, to improving and supporting their engagement and performance at work (individual-focused) to the (re)design of work environments, to minimising job demands and enhancing opportunities for job resources. Therefore, understanding and testing the postulated link between MH&WB practises and organisational level outcomes addresses an important gap in knowledge. This is particularly true of interventions targeting leaders and managers.

In 2010, Kelloway and Barling [14] highlighted the need for, and value of, manager-focused interventions to support workplace mental health promotion. More recently, manager training in mental health was specifically identified as a strong recommendation for interventions by the World Health Organization (WHO) in their guidelines on mental health at work [15]. This approach to mental health training is unique and different from Mental Health First Aid (MHFA) training [16], which has become increasingly popular and researched in recent years. MHFA training aims to upskill nominated employees from across the organisation to provide support for a work colleague who is developing a mental health problem, experiencing a worsening of a mental health problem, or is in a mental health crisis. While increasingly popular in practice, recent evidence highlights a lack of high-quality evaluative data investigating its impact on employees or the organisation [17]. MHFA training is focused on remedial care and support, in contrast to prevention focused efforts to improve employees' working conditions and management practices through the development and upskilling of line managers.

Therefore, the provision of LM training in mental health has emerged as a viable approach to improving the mental health of workers. With the rise in the prevalence of mental ill-health in the UK during the coronavirus (COVID-19) pandemic, there has since been a notable increase in the number of organisations offering LM training for mental health (2020: 50%; 2023: 59% [18]). LM training in mental health is a systematic approach to equipping LMs with the knowledge, skills, and attitudes needed to support the mental health of their team members and individuals they line manage [19]. This training may include a focus on the LMs' *own* mental health and wellbeing, as well as that of the individuals they manage [20].

Despite its increasing popularity in practice over recent years, there remains a limited (but growing) literature that has sought to investigate the impact of LM training interventions on

121 employees directly, and indirectly on their organisations. Employee-level benefits of LM training
122 in mental health have previously been reported [20-22]. Such benefits include increased
123 behavioural competencies to support those in their team with mental health challenges [20],
124 behavioural intentions to promote mental health at work [22], and increased confidence to support
125 the mental health of those they manage [21].

126 Comparatively fewer studies (e.g., [21,23]) have examined the impact and influence of LM
127 training on organisational-level outcomes (e.g., changes to productivity, turnover rates, and
128 absenteeism). To our knowledge, no studies to date have explored these relationships across a
129 diverse range of organisations by size and sector and drawing on company-level (rather than self-
130 reported employee-level) data. Understanding the impact of LM training at both employee- and
131 organisational-levels is vital to appreciating its empirical and practical value in promoting mental
132 health at work. In particular, understanding the organisational-level impact and benefit of LM
133 training informs the business case for workplace mental health promotion. Understanding the
134 economic arguments and benefits of workplace mental health promotion is an important motivator
135 for employers to implement such strategies [24,25].

136 The aim of our study was, therefore, to investigate the association between the provision
137 of LM training for mental health in organisations and organisational-level outcomes. This was
138 achieved by utilising company-level data derived from an existing longitudinal survey of British
139 employers examining their MH&WB practices. The research questions (RQs) and hypotheses (H)
140 are outlined below:

141 RQ1: Do organisations that offer LM training in MH have more, or less, sickness absence due to
142 mental ill-health compared with organisations that do not offer this?

H1: Organisations that offer LM training in MH will have less sickness absence due to mental ill-health compared with organisations that do not offer this.

RQ2: How do organisations offering LM training in MH compare with those that do not, on organisational-level outcomes (e.g., recruitment, retention, customer services, business performance).

H2: Offering LM training in MH will be associated with improved organisational-level outcomes (e.g., recruitment, retention, customer services, business performance).

Materials and Methods

This study is based on a secondary analysis of anonymised panel survey data from firms in England. Reporting was guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement [26]) (Supplementary file 1) and the Consensus-Based Checklist for Reporting of Survey Studies (CROSS) [27] (Supplementary file 2). The data were derived from UK Computer Assisted Telephone Interview (CATI) surveys (a commonly used approach for reaching business personnel), collected over four time periods. Telephone surveys were used to reduce non-response bias commonly associated with mailed surveys [28].

Interviews were conducted by call centre operatives from a UK-based independent market research company. All telephone interviewers were independently evaluated throughout the fieldwork period, using a scorecard covering all aspects of their interview. The evaluation was based either on supervisory live listening or via audio recordings of the interview. CATI processes

are evaluated annually by ISO20252 standard (for market, opinion, and social research) auditors and a minimum of 10% of interviews from each interviewer are evaluated and documented. In this study, approximately 12%-14% of interviews were subject to live listening quality control (QC), with around 5-10% of interviews undergoing full QC (listening to recordings and checking data once the survey is complete). All interviewers were trained in research methods and undertook a half-day training session prior to the study starting, involving role play and survey piloting to identify and resolve ambiguities. To minimise human error in data entry, data checking was undertaken, and outliers were identified and checked.

The data used in this study were collected in four waves as part of a broader prospective study which is funded by the UK Economic and Social Research Council and is ongoing. Wave 1: 6 January to 20 March 2020 (1899 firms), Wave 2: 28 January to 15 April 2021 (1551 firms), Wave 3: 27 January to 20 May 2022 (1904 firms) and Wave 4: 16 January to 5 May 2023 (1902 firms) all including data from non-government funded organisations with 10 or more employees. Organisations were additionally screened to ensure: (a) they were not a local or central government financed body; (b) they had been trading for three or more years. Branches and subsidiaries of larger businesses were included in the survey. Organisations with 10-19 employees were intentionally under-sampled as they accounted for most of the population universe. Larger organisations were over-sampled to ensure they were adequately represented, to reduce sampling bias and to allow more robust sub-analysis. The intention was to obtain as broad a response as possible during the data collection period, and so the final sample was the number of participants that responded between the survey opening and closing dates for each wave. Within each organisation, the most senior person with responsibility for the health and wellbeing of workers was approached and invited to participate as a representative of that organisation.

Organisations participating in Wave 1 were followed up in subsequent waves by the call centre operatives until an appointment was made or the organisation refused. However, as the study utilised unbalanced panel data rather than longitudinal data, new organisations were recruited at each wave to increase the overall sample size. In total, 118 organisations participated in the study across all four waves. The research was conducted in line with the Declaration of Helsinki. Ethical approach for this analysis was granted in August 2023 by the institutional Research Ethics Committee (Ref: HSSREC-144 21-22). Participants in the surveys provided informed oral consent which was documented by the telephone operatives. Although this is not clinical research, the senior author (HB) is trained in Good Clinical Practice (GCP). All researchers were trained in research ethics and research methods. The surveys were anonymised, and all datasets were stored on password protected files and only shared using a password protected OneDrive shared folder. The datasets were accessed on 23 August 2023.

Table 1 provides a summary of the operationalisation of our study variables. Our predictor variable was 'LM training in mental health'. Quantified as a single, dichotomous variable (coded: no= 0, yes=1). We tested four organisational-level outcome variables examining staff recruitment, customer service, retention, and business performance. All four variables were measured using a single-item question measured categorically (yes/no).

Four items quantified sickness absence related to mental ill-health trends, within the last 12 months, for the organisation. These four items allowed us to examine: (1) the presence (or absence) of sickness absence due to mental ill-health in the organisation; (2) the proportion of all sickness absence cases accounted for by mental ill-health; (3) the presence (or absence) of repeated sickness absence cases; and (4) the proportion of sickness absence for mental ill-health that was

long-term (>4 weeks). Two items were measured dichotomously (Yes/ No), and two by a reported percentage.

Table 1. Operationalisation of study variables

Construct	Item Description	Measurement Level	Sample Size (n)
Sickness absence due to mental ill-health			
Presence of sickness absence due to mental ill-health	In the last 12 months, have any staff been off sick, for any length of time, due to mental health problems, including illnesses such as bipolar disorder, depression, anxiety, or stress?	Binary	3385
Proportion of sickness absence due to mental ill-health	What proportion of sickness absence over the last 12 months was accounted for by mental health problems?	Continuous	1116
Repeated sickness absence due to mental ill-health	In the last 12 months have you had any instances where staff took repeated sickness absence because of mental health problems?	Binary	3566
Proportion of long-term sickness absence due to mental ill-health	What proportion of sickness absence due to mental health problems over the last 12 months has been long term (a single absence lasting 4 weeks or more)?	Continuous	3566

Organisational-level outcomes			
Staff recruitment	Helped with staff recruitment	Binary	3182
Customer service	Improved customer service	Binary	3178
Staff retention	Improved staff retention/ reduced staff turnover	Binary	3189
Business performance	Improved business performance	Binary	3185

For analysis purposes, the two sickness absence items measured continuously were dichotomised into 'high' and 'low' classifications. For the proportion of sickness absence (high/low), we utilised the sample mean for each annual survey wave to determine the numeric thresholds delineating high (> sample mean) and low (<= sample mean) classifications: 2020, 17%; 2021, 20%; 2022, 19%; and 2023, 22%. The same approach was utilised to specify 'high' and 'low' categorisations for our study variable examining the proportion of recurrent, long-term cases of sickness absence due to employee mental ill health within the organisation: 2020, 17%; 2021, 49%; 2022, 45%; and 2023, 40%.

We conducted probit regression analyses using SPSS Version 28 (Armonk, NY: IBM Corp) to determine the probability of specific outcomes occurring based on the presence or absence of LM training in mental health, allowing a deeper understanding of how LM training for mental health predicts various organisational-level outcomes. This analysis was deemed most appropriate due to its capacity to model binary outcomes, specifically yes/no responses, by quantifying probabilities rather than odds ratios [29]. Given the data structure of the study, probit regression was selected in preference to other viable alternatives such as logistic regression.

The four waves of data were merged for the analyses. This approach yielded several benefits such as providing increased statistical power through a larger sample size [30], allowing us to assess the stability and consistency of the relationships over time [31], and enhancing the overall generalisability of the results beyond the specific year in which data were collected [32]. As pooled panel data were used, we did not employ specific strategies to address missing data in the analysis as any missing data points were inherently handled through the nature of the dataset.

The regression analysis controlled for age of the organisation [0-10 years, 11-20 years, more than 20 years], sector [Production, Construction, Wholesale/Retail, Hospitality, Business Services and Other Services], size of the organisation [1-49 employees; 50 – 249 employees and 250+ employees] and survey wave [2020, 2021, 2022 and 2023]. This recognises that the age of the organisation, the specific sector in which an organisation operates, and its size can impact its performance, culture, decision-making processes, management practices and overall behaviour [33,34]. By controlling for these variables, we account for these differences ensuring a more accurate understanding of the relationship between the predictor and outcomes. The number and typology of organisations offering training in mental health (based on analysis of the same dataset) is detailed elsewhere [18].

Results

Table 2 provides an overview of our sample across several key demographics. After merging the four waves of data we had a final sample of n=7139. The highest proportion of participating organisations came from the business services sector, operated for more than 20 years, and fell within the micro-to-small size category. The response rates were 17% (2020) and

15% (2021- 2023). Response rate was calculated as the percentage of people who completed and answered the survey out of the total number of people invited to take part.

Table 2. Characteristics of participating organisations.

Characteristics	2020 (n=1899)	2021 (n=1551)	2022 (n=1904)	2023 (n=1902)
Sector				
Production	364 (19.2%)	362 (23.3%)	411 (21.6%)	414 (21.8%)
Construction	139 (7.3%)	111 (7.2%)	145 (7.6%)	136 (7.2%)
Wholesale, retail	402 (21.2%)	331 (21.3%)	364 (19.1%)	363 (19.1%)
Hospitality	204 (10.7%)	109 (7.0%)	187 (9.8%)	210 (11.0%)
Business services	468 (24.6%)	350 (22.6%)	431 (22.6%)	419 (22.0%)
Other	322 (17.0%)	288 (18.6%)	366 (19.2%)	360 (18.9%)
Length of Operation				
0 – 10 years	301 (16.0%)	236 (15.3%)	263 (13.9%)	250 (13.2%)
11 – 20 years	508 (27.0%)	378 (24.5%)	510 (27.0%)	541 (28.7%)
20 + years	1072 (57.0%)	929 (60.2%)	1115 (59.1%)	1097 (58.1%)
Size of Organisation				
Micro-small (<=50 employees)	1445 (76.1%)	1225 (79.0%)	1537 (80.7%)	1579 (83.0%)
Medium (51-250)	367 (19.3%)	286 (18.4%)	310 (16.3%)	286 (15.0%)
Large (>250)	87 (4.6%)	40 (2.6%)	57 (3.0%)	37 (1.9%)

RQ1: Do organisations that offer LM training in MH have more, or less, sickness absence due to mental ill-health compared with organisations that do not offer this?

To investigate RQ1, we used probit analysis to test whether organisations that offered LM training in mental health have lower reported levels of sickness absence (including, the presence (absence of) sickness absence cases and repeated cases, and high or low levels of sickness absence cases for mental health and long-standing cases (> 4 weeks; see Table 3). We observed only one significant association among the four areas of sickness absence trends tested. We found that offering LM training in mental health significantly predicted below-average levels of long-term sickness absence due to mental ill-health. Significant associations were not observed across the three other examined outcome variables for sickness absence.

Table 3. Probit regression testing the associations between LM training for MH (y/n) and organisational-level sickness absence trends due to mental ill-health.

Outcomes	Results
Presence of sickness absence due to mental ill-health (n=3385)	β .160 (.0471) LR chi^2 286.805*** Log likelihood –493.883
Proportion sickness absence due to mental ill-health (n=1116)	β -.077 (.0525) LR chi^2 41.654*** Log likelihood –414.569
	β .027 (.0803)

Repeated sickness absence due to mental ill-health (n=3566)	LR chi^2 49.490***
	Log likelihood -339.804
Proportion of long-term sickness absence due to mental ill-health (n=3566)	β -.132* (.0577)
	LR chi^2 388.557***
	Log likelihood –390.677

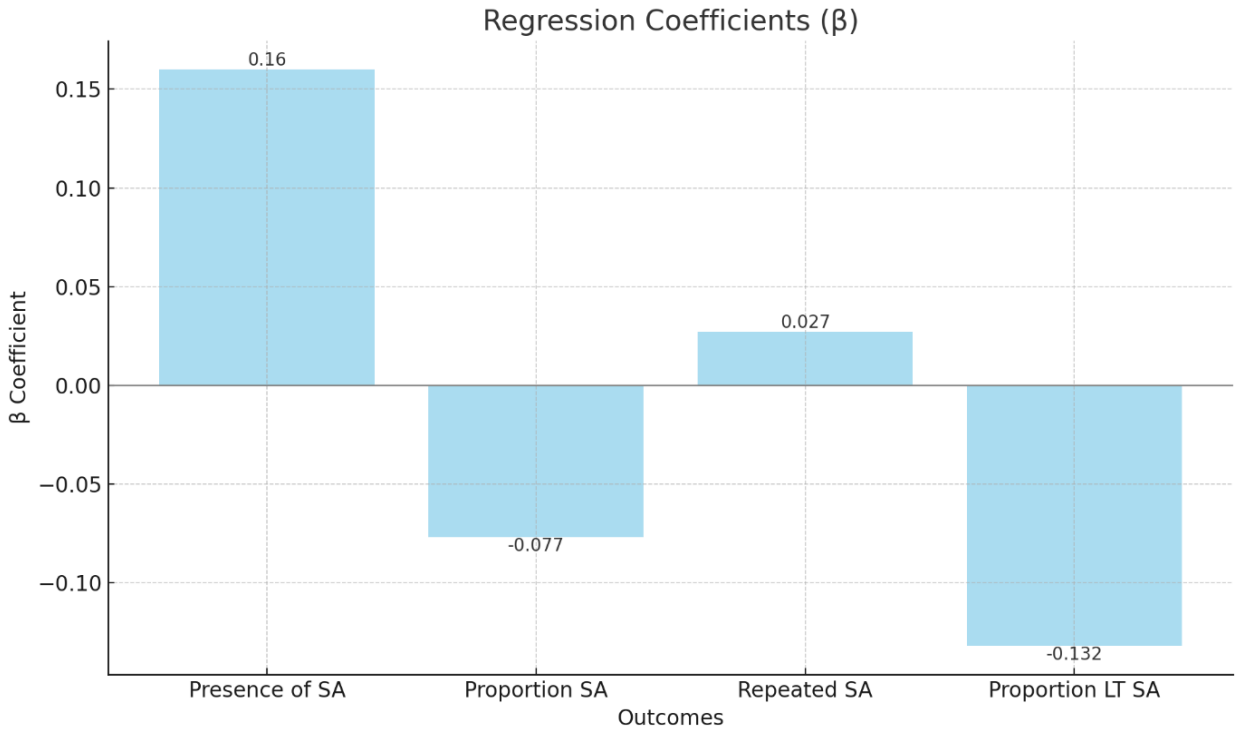
Note 1: Analysis controlled for wave, sector, size, and age of organisation.

Note 2: Standard error placed in brackets.

Note 3: LR chi^2 = Likelihood ratio chi-square

The bar chart in Fig. 2 below displays the regression coefficients which demonstrate the strength and directions of the associations between LM training for MH and the various outcomes related to sickness absence due to mental ill-health, including the presence, proportion, repeated occurrences, and long-term proportions.

Fig. 2. Probit regression testing the associations between LM training for MH (y/n) and organisational-level sickness absence trends due to mental ill-health.



Note: SA = Sickness absence due to mental ill-health; LT SA = Long-term sickness absence due to mental ill-health.

RQ2: How do organisations offering LM training in MH compare with those that do not, on organisational-level outcomes (e.g., recruitment, retention, customer services, business performance).

To explore RQ2, we used probit analysis to test whether organisations that offered LM training in MH (as compared to those that did not) reported better efforts to recruit new staff, and improved customer service, staff retention and business performance (see Table 4). We found organisations offering LM training were more likely to report a range of positive outcomes including help with staff recruitment, improved customer service, improved staff retention and improved business performance.

289 **Table 4.** Probit regression analysis testing the associations between LM training for mental
290 health (y/n) and improved organisational-level outcomes.

Dependent Variables	Results
Staff recruitment (n=3182)	β .317*** (.0467)
	LR chi^2 118.377***
	Log likelihood –484.131
Customer service (n=3178)	β .453*** (.0485)
	LR chi^2 184.147***
	Log likelihood –451.901
Staff retention (n=3189)	β .379*** (.0479)
	LR chi^2 95.828
	Log likelihood –476.803
Business performance (n = 3185)	β .359*** (.0496)
	LR chi^2 105.963
	Log likelihood –446.303

291 Note 1: Analysis controlled for wave, sector, size and age of organisation.
292 Note 2: Standard error placed in brackets.
293 Note 3: LR chi^2 = Likelihood ratio chi-square

294 The bar chart in Fig. 3 below shows the regression coefficients (β) for the associations between
295 line manager training for mental health (MH) and improved organisational-level outcomes,

including staff recruitment, customer service, staff retention, and business performance. Each bar represents the β coefficient value, indicating the strength and direction of the associations.

Fig. 3. Probit regression analysis testing the associations between LM training for MH (y/n) and improved organisational-level outcomes.

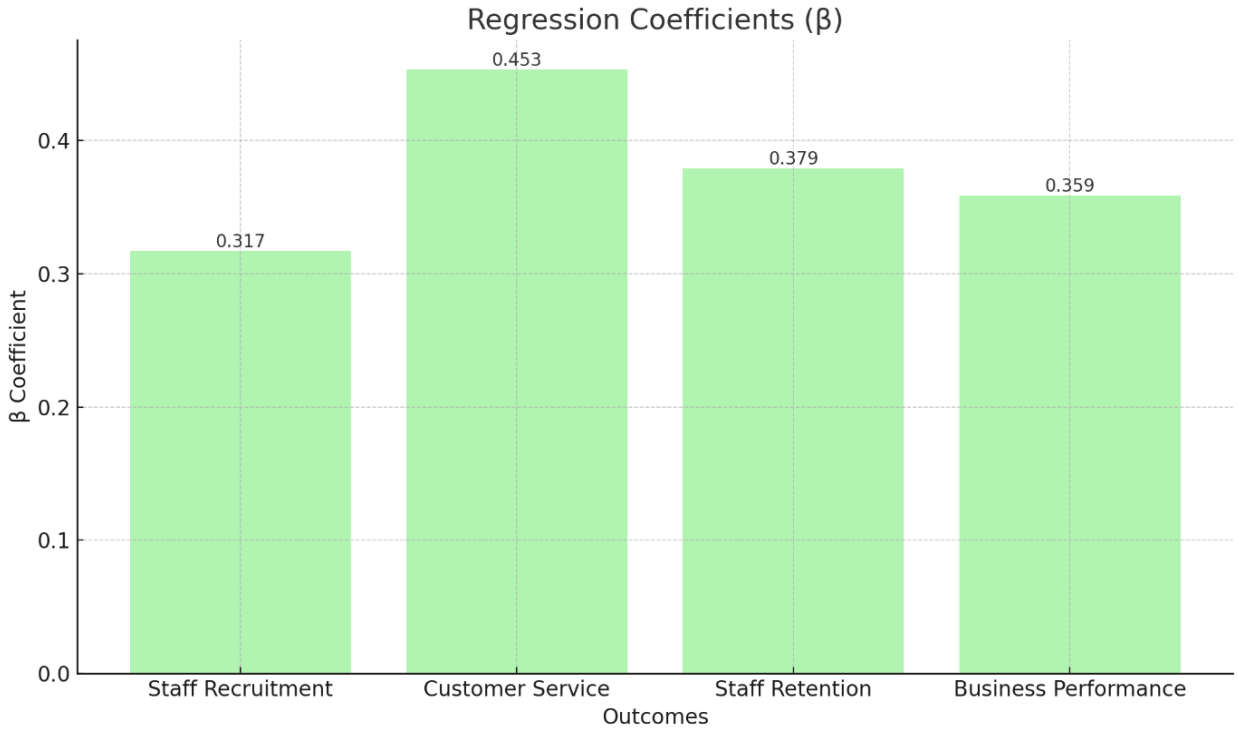


Table 5 below summarises these results and highlights how it compares to previous research and the unique contributions this study brings to the existing literature.

Table 5. Summary of key findings, comparison to previous research and research contributions.

Key Findings	Comparison to Previous Research	Research Contributions

LM training in mental health was significantly associated with below-average levels of long-term sickness absence due to mental ill-health.	Evidence shows that LM training in mental health may improve managers' self-reported capabilities to support employees with mental ill-health following return to work [21,22].	Provides an empirical example of the Chain of Impact Model by showing how the provision of LM training for mental health may translate organisation implemented interventions into improved economic outcomes for the organisation.
LM training in mental health was not associated with short-term sickness absence due to mental ill-health or repeated sickness absence due to mental ill-health.	One single site study showed that LM training in mental health reduced work-related sickness absence [21].	Our findings highlight the complexity of LM training's relationship with various kinds of sickness absences and distinguishes between its relationship with other categories of mental health related absences.
Organisations offering LM training were more likely to report improvements in staff recruitment, customer	Research shows that LM training in mental health can lead to improvements in employee-level outcomes [20].	Extends understanding of the benefits of LM training beyond employee well-being to include organisational benefits, thus broadening

service, staff retention and business performance.	our understanding of the broader impact of LM training.

306

307 **Discussion**

308 To our knowledge, this study was the first to investigate the provision of LM training for
309 mental health in organisations and its association across organisational-level outcomes including
310 sickness absence, staff recruitment and retention, customer service, and business performance.
311 We found that organisations that train their line managers in mental health have better outcomes
312 across all these areas, which has national and international relevance to research, policy, and
313 practice in workplace health.

314 A key empirical strength of this study is that we investigated these associations within a
315 diverse sample of British organisations (e.g., company size, type, and sector), using company-
316 level data. This data set allowed us to, uniquely, explore the often discussed and postulated
317 relationship between mental health and well-being practises in the workplace and wider
318 organisational performance indicators (e.g., [2, 35-37]), some of which have been rarely
319 examined in a systematic way within the wider workplace health management literature (e.g.,
320 customer service and business performance). As such, while the study was conducted with a
321 sample from England, the study makes a significant contribution to the literature in this field
322 with international relevance. Examining organisational-level outcomes is imperative as it helps
323 to build our understanding of the business case for workplace mental health promotion and, in
324 turn, its articulation to employers regarding its strategic business value. Therefore, our study
325 findings make an important contribution to addressing this key gap in knowledge.

The study objective was to explore the relationship between LM training for mental health and organisational-level outcomes using company-level data from a diverse range of organisations. We observed that the provision of LM training for mental health was, on average, associated with improvement across two key organisational performance dimensions, broadly related to workforce activity (defined by dimensions of attendance, effort, quality, and innovation) and organisational outputs (defined by dimensions of productivity, business, and customer satisfaction; [38]). These two key organisational performance dimensions can be conceptually understood to drive the economic outcomes for organisations (such as profit and shareholder value), through a *Chain of Impact Model* (Fig. 4). The Chain of Impact Model therefore provides a useful framework in which to interpret our findings and conceptualise how the provision of LM training for mental health may translate organisational-level outcomes into improved economic outcomes for the organisation.

Fig. 4. Adapted Chain of Impact Model [38] based on our study focus and findings.

We observed that, on average, the provision of LM training within organisations was associated with improved *workforce activity,* evidenced across three key indicators: below average long-term sickness absence spells due to mental ill-health, improved staff retention, and enhanced staff recruitment activities and efforts by the organisation. Our findings align with recent economic estimates observing the costs associated with increased staff turnover and recruitment initiatives due to poor employee mental health at work (e.g., [2]). Uniquely, our study demonstrates that the provision of LM training for mental health is associated with

348 improved organisational metrics regarding retention and recruitment initiatives. Collectively this
349 evidence-base highlights not only the cost of inaction in the wellbeing space, but, importantly,
350 the potential economic benefit of investing in MH&WB practices at work.

351 In relation to our four indicators of sickness absence, we observe a complex and nuanced
352 picture. We found that LM training in mental health was associated with a below average number
353 of long-term sickness absence cases within the organisation. There is growing evidence of the
354 impact of LM training in mental health on mangers' self-reported capabilities and confidence in
355 supporting employees with mental ill-health during and following their return to work [21,22, 39,
356 40]. These managerial competencies are increasingly understood as a key success factor in
357 facilitating effective return to work processes [41]. However, we did not find a significant
358 association in relation to the three other indicators of sickness absence: the *presence* (or not) of
359 staff off sick due to mental health problems (e.g., bipolar disorder, depression, anxiety, or stress)
360 and *repeated cases*, or *proportion* of sickness absence accounted for by mental ill-health in
361 general.

362 Reduction in these aspects of sickness absence may be primarily driven by prevention-
363 orientated (rather than remedial-focused) MH&WB practices. Blake and colleagues [42] noted
364 that there are few LM training initiatives that include a prevention-orientated focus (e.g.,
365 preventing stress through job quality and workload management), with most interventions
366 targeting resiliency- or remedial-focused activities (e.g., self-care, improved knowledge
367 surrounding mental health at work). Accounting for the nature, content and focus of LM training
368 (rather than just its presence or not) may provide a more nuanced understanding of its association
369 with organisational-level sickness absence indicators. We speculate that those training initiatives
370 with a strong prevention-focus (e.g., [43]) may demonstrate a significant association with these

remaining dimensions of sickness absence, as compared to those without although this is yet to be demonstrated. Testing these inferences is imperative to gathering a deeper understanding of the association between LM training and organisations' sickness absence indicators, globally.

Tamkin's Chain of Impact Model [38] theorises that these improved workforce activities should drive and influence increased organisational output metrics. While we did not test this causal pathway, we did observe that the provision of LM training for mental health was, on average, associated with improved business performance and overall customer satisfaction – both important and strategic organisational performance outcomes and precursors to improved economic outcomes. Several studies [44,45] and academic commentaries [36,37] have discussed this link, but have not tested it robustly across organisations. This is partly explained by, up until recently [46], the dearth of robust company-level data capturing both mental health and well-being practices within the organisation, as well as key productivity and performance metrics. Therefore, our early findings highlighting the association between LM training for mental health at work and strategic organisational performance outcomes are conceptually important as they provide foundational evidence for what has long been speculated regarding the costs of poor mental health at work to employers.

Strengths, Limitations and Implications for Future Research

Workforce mental health is always an important topic, but an organisational focus on mental health was particularly pertinent during the COVID-19 pandemic when population mental-ill health was rising, associated with myriad factors (e.g., viral transmission, economic uncertainty, social isolation). Our positive findings are therefore notable in the context of this global crisis. A significant strength of the study is its large sample size and diversity of organisations included. We are therefore able to report findings across sectors and sizes of

394 organisations, including sectors in which mental ill-health is prevalent, but research evidence
395 relating to workplace mental health interventions is limited (e.g., construction: [47]). Another
396 strength of the study is that around 80% of participating organisations had fewer than 50
397 employees; our study therefore includes many SMEs that are under-researched and often have
398 fewer resources to be active in mental health promotion.

399 Our findings provide a robust base from which to infer the potential benefits of LM
400 training in mental health at the organisational-level and as such, are novel, and have high
401 potential for influencing policy and practice internationally. There are several limitations within
402 this study. First, to collect this data enterprise representatives were used to quantify workplace
403 health and well-being practices, as well as organisational-level outcomes - including
404 organisational performance indicators. While this is a common feature of enterprise surveys
405 (e.g., European Survey of Enterprises on New and Emerging Risks; [48,49]), we acknowledge
406 there may be a degree of subjective bias within this self-reporting methodology. Ideally, these
407 associations would also be tested and triangulated with objective, rather than exclusively
408 subjective outcomes. We view this as an important future direction for research in this field.
409 Second, the data available within our data set allows us to test the presence (and absence) of LM
410 training for mental health at work in relation to organisational-level outcomes. However, we
411 anticipate that the nature of this training (in terms of its content, focus, and duration) and its
412 perceived quality as reported by the recipients are also important explanatory variables in
413 relation to quantifying its impact and value to the organisation. This to an important avenue of
414 future research. Third, the use of pooled panel data hinders the capacity to capture the long-term
415 impacts of LM training on organisational outcomes. Fourth, most research on LM training in
416 mental health generally explores outcomes for the manager (e.g., awareness, knowledge,

confidence, skills), and our study provides novel data by focusing on outcomes at an organisational level (e.g., indices of business performance). However, few studies have explored the way in which LM training is implemented in practice, and whether (or not) this impacts on mental health at the employee-level. There is currently inconclusive evidence that leadership training impacts on employee outcomes, due to contradictory results [50]. While employee outcomes were not the focus of our study, future research may seek to enhance the evidence-base relating to employee outcomes. Lastly, the low response rate observed across the four time points and the presence of missing data may indicate response bias and limit the generalisability of the findings.

Conclusion

Training line managers in mental health is associated with better organisational-level outcomes including long-term sickness absence, staff recruitment and retention, customer service, and business performance. This study is the first to provide confirmation of the strategic value of providing LM training in mental health for organisational-level outcomes, and as such provides novel evidence with the potential to influence policy and practice internationally. Our findings strengthen the business case for organisational investment in workplace mental health and wellbeing and have relevance for diverse stakeholders including business owners and managers, professional bodies, charities, and policymakers. This study provides evidence that taking a proactive approach to workforce wellbeing has the potential to improve a diverse range of factors associated with business productivity and performance. Our primary recommendation from this study is a clear call to action for organisations to establish workplace mental health policy that outlines the role of LMs in preventing and supporting mental health at work and

invest in (or provide access to) mental health training for their LMs. This is advocated in the WHO guidelines on mental health at work [15] but not yet consistently implemented across organisation types and sectors. New, evidence-based training in mental health for LMs has been developed [42] and is currently being tested in a cluster randomised trial [23] to explore acceptability and outcomes for managers and employees.

Acknowledgements

The data used here were originally collected as part of an Economic and Social Research Council funded project 'Workplace mental-health and well-being practices, outcomes and productivity' (Grant number: ES/W010216/1). This secondary analysis project 'Mental health at work: a longitudinal exploration of line manager training provisions and impacts on productivity, individual and organizational outcomes' was supported by the Economic and Social Research Council [The Productivity Institute: grant number: ES/V002740/1].

References

[1] Mental Health at Work. Mental Health at work: Statistics. Mental Health Foundation. 2023. Available from: https://www.mentalhealth.org.uk/explore-mental-health/statistics/mental-health-work-statistics#:~:text=1%20in%206.8%20people%20experience,in%20the%20workplace%20(14.7%25).

[2] Deloitte. Poor mental health costs UK employers up to 56 billion a year. 2022. Available from: https://www2.deloitte.com/uk/en/pages/press-releases/articles/poor-mental-health-costs-uk-employers-up-to-pound-56-billion-a-year.html

[3] National Institute for Health and Care Guidance. Mental Wellbeing at Work. NICE. March 2, 2022. Available from: https://www.nice.org.uk/guidance/ng212#:~:text=This%20guideline%20covers%20how%20to,risk%20of%20poor%20mental%20health.

[4] ISO. Occupational health and safety management. 2021. Available from: https://www.iso.org/standard/64283.html

[5] Nielsen K, Yarker J, Munir F, Bültmann U. IGLOO: An integrated framework for sustainable return to work in workers with common mental disorders. Work & Stress. 2018;32(4):400-417.

[6] Richardson KM, Rothstein HR. Effects of occupational stress management intervention programs: a meta-analysis. J Occup Health Psychol. 2008;13(1):69.

[7] Montano D, Hoven H, Siegrist J. Effects of organisational-level interventions at work on employees' health: a systematic review. BMC Public Health. 2014;14(1):1-9.

[8] Fox KE, Johnson ST, Berkman LF, Sianoja M, Soh Y, Kubzansky LD, Kelly EL. Organisational- and group-level workplace interventions and their effect on multiple domains of worker well-being: A systematic review. Work Stress. 2022.

[9] Lamontagne AD, Keegel T, Louie AM, Ostry A, Landsbergis PA. A systematic review of the job-stress intervention evaluation literature, 1990–2005. Int J Occup Environ Health. 2007;13(3):268-280.

[10] Brunner B, Igic I, Keller AC, Wieser S. Who gains the most from improving working conditions? Health-related absenteeism and presenteeism due to stress at work. Eur J Health Econ. 2019;20:1165-1180.

[11] Demerouti E, Bakker AB, Peeters MC, Breevaart K. New directions in burnout research. European Journal of Work and Organizational Psychology. 2021 Sep 3;30(5):686-91.

[12] Bakker AB, Demerouti E. The job demands-resources model: State of the art. Journal of managerial psychology. 2007 Apr 3;22(3):309-28.

[13] Lesener T, Gusy B, Wolter C. The job demands-resources model: A meta-analytic review of longitudinal studies. Work & Stress. 2019 Jan 2;33(1):76-103.

[14] Kelloway EK, Barling J. Leadership development as an intervention in occupational health psychology. Work & Stress. 2010;24(3):260-279.

[15] World Health Organization. Guidelines on mental health at work. 28 September 2022. WHO, Geneva, Switzerland. Available at: https://www.who.int/publications/i/item/9789240053052

[16] Costa, Tiago Filipe Oliveira, Francisco Miguel Correia Sampaio, Carlos Alberto da Cruz Sequeira, Isilda Maria Oliveira Carvalho Ribeiro, and Vitor Sérgio de Oliveira Parola. "Review of Mental health first aid programs." *Western Journal of Nursing Research* 43, no. 12 (2021): 1146-1156.

[17] Richardson, R., Dale, H. E., Robertson, L., Meader, N., Wellby, G., McMillan, D., & Churchill, R. (2023). Mental Health First Aid as a tool for improving mental health and well-being. *Cochrane Database of Systematic Reviews*, (8).

[18] Blake H, Hassard J, Dulal-Arthur T, Wishart M, Roper S, Bourke J, Belt V, Bartle C, Pahl N, Leka S, Thomson L. Typology of employers offering line manager training for mental health. Occupational Medicine, 2024;74(3):242–250, https://doi.org/10.1093/occmed/kqae025

[19] Martin A, Woods M, Dawkins S. How managers experience situations involving employee mental ill-health. Int J Workplace Health Manage. 2018;11(6):442-463.

[20] Gayed A, Milligan-Saville J, Nicholas J, Bryan B, Lamontagne A, Milner A, Madan I, Calvo R, Christensen H, Mykletun A, Glozier N, & Harvey S. Effectiveness of training workplace managers to understand and support the mental health needs of employees: a systematic review and meta-analysis. Occupational and Environmental Medicine. 2018;75:462-470. DOI: 10.1136/oemed-2017-104789.

[21] Milligan-Saville JS, Tan L, Gayed A, Barnes C, Madan I, Dobson M, ... & Harvey SB. Workplace mental health training for managers and its effect on sick leave in employees: a cluster randomised controlled trial. The Lancet Psychiatry. 2017;4(11):850-858.

[22] Dimoff JK, Kelloway EK, Burnstein MD. Mental health awareness training (MHAT): The development and evaluation of an intervention for workplace leaders. International Journal of Stress Management. 2016;23(2):167.

[23] Thomson L, Hassard J, Frost A, Bartle C, Yarker J, Munir F, ... & Blake H. Digital Training Program for Line Managers (Managing Minds at Work): Protocol for a Feasibility Pilot Cluster Randomized Controlled Trial. JMIR Res Protoc. 2023;12(1):e48758.

[24] Hassard J, Muylaert K, Namysl A, Kazenas A, Flaspoler E. Motivation for employers to carry out workplace health promotion: literature review. Luxembourg: Publications Office of the European Union, 2012 ISBN: 978-92-9191-999-4 doi:10.2802/50267.

[25] Law R, St George A, King L, Rissel C. Employer Perspectives of Workplace Health Promotion. 2013.

[26] von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. PLoS Med. 2007;4(10):e296.

[27] Sharma A, Minh Duc NT, Luu Lam Thang T, Nam NH, Ng SJ, Abbas KS, Huy NT, Marušić A, Paul CL, Kwok J, Karbwang J, de Waure C, Drummond FJ, Kizawa Y, Taal E, Vermeulen J, Lee GHM, Gyedu A, To KG, Verra ML, Jacqz-Aigrain ÉM, Leclercq WKG, Salminen ST, Sherbourne CD, Mintzes B, Lozano S, Tran US, Matsui M, Karamouzian M. A Consensus-Based Checklist for Reporting of Survey Studies (CROSS). J Gen Intern Med. 2021.

[28] Fowler Jr FJ, Gallagher PM, Stringfellow VL, Zaslavsky AM, Thompson JW, Cleary PD. Using telephone interviews to reduce nonresponse bias to mail surveys of health plan members. Medical care. 2002 Mar 1:190-200.

[29] Cleophas TJ, Zwinderman AH, Cleophas TJ, Zwinderman AH. Probit Regression, Binary Data as Response Rates (14 Tests). SPSS for Starters and 2nd Levelers. 2016:287-96.

[30] Eng J. Sample size estimation: how many individuals should be studied?. Radiology. 2003;227(2):309-13. https://doi.org/10.1148/RADIOL.2272012051.

[31] Rafferty A, Walthery P, King-Hele S. Analysing change over time: repeated cross-sectional and longitudinal survey data. 2015

[32] Tooth L, Ware R, Bain C, Purdie DM, Dobson A. Quality of reporting of observational longitudinal research. Am J Epidemiol. 2005;161(3):280-288.

[33] Nazarian A, Atkinson P. How size affects organizational culture in a national context. Pensee. 2013;75(12).

[34] Jain S, Gautam A. Comparison of Performance Management Systems in Public and Private Sector: A Study of Manufacturing Organizations. Int J Manag IT Eng. 2016;6:111-128.

[35] Deloitte. Refreshing the case for investment.2023. Available from: https://www2.deloitte.com/uk/en/pages/consulting/articles/mental-health-and-employers-refreshing-the-case-for-investment.html

[36] Hassard J, Thomson L, Blake H. Understanding the cost of mental health at work: an integrative framework. The SAGE handbook of organizational wellbeing. 1st edn. London: SAGE. 2021:9-25.

[37] Hassard J, Thomson L, Blake H. Understanding and Exploring the Cost of Poor Mental Health at Work for Organizations and Society. In: The Routledge Companion to Mental Health at Work. Routledge. 2023:77-96.

[38] Tamkin P. The Contribution of Skills to Business Performance. DfES publication RW39. August 2005.

[39] Lampe M. Empowering managers: are mental health training programmes the key to a healthier workplace? Science for work. November 2023. Available from: https://scienceforwork.com/blog/empowering-managers-are-mental-health-training-programs-the-key-to-a-healthier-workplace/

564 [40] Mousseau M. Elevating Leadership: The Importance of Mental Health Training in the
565 Workplace. 2023 Available from: https://www.ajg.com/us/news-and-insights/2023/oct/elevating-
566 leadership-the-importance-of-mental-health-training-in-the-workplace/

567 [41] Johnston V, Way K, Long MH, Wyatt M, Gibson L, Shaw WS. Supervisor competencies for
568 supporting return to work: a mixed-methods study. J Occup Rehabil. 2015;25:3-17.

569 [42] Blake H, Hassard J, Bartle C, Thomson L. Training for line managers should focus on
570 primary prevention of mental ill-health at work. Perspectives in Public Health. 2023
571 May;143(3):124-5.

572 [43] Blake H, Vaughan B, Bartle C, Yarker J, Munir F, Marwaha S, Daly G, Russell S, Meyer C,
573 Hassard J, Thomson L. Managing Minds at Work: Development of a Digital LM Training
574 Program. International Journal of Environmental Research and Public Health. 2022;19. DOI:
575 10.3390/ijerph19138006.

576 [44] Hassard J, Teoh K, Thomson L, & Blake H. Organizational uncertainty and stress among
577 teachers in Hong Kong: work characteristics and organizational justice. Health Promot Int.
578 2017;32(5):860-870.

579 [45] Hassard J, Teoh KR, Visockaite G, Dewe P, Cox T. The cost of work-related stress to
580 society: A systematic review. J Occup Health Psychol. 2018;23(1):1.
581 http://dx.doi.org/10.1037/ocp0000069.

582 [46] Stanfield C, Wishart M, Sissons P, Ferreira J, Roper S, Belt V. A baseline study for the
583 Mental Health and Productivity Pilot project. Enterprise Research. 2020. Available from:
584 https://www.enterpriseresearch.ac.uk/wp-content/uploads/2020/05/Employee-Wellbeing-Mental-
585 Health-and-Productivity-in-Midlands-Firms-May-2020.pdf

[47] Greiner BA, Leduc C, O'Brien C, Cresswell-Smith J, Rugulies R, Wahlbeck K, Abdulla K, Amann BL, Pashoja AC, Coppens E, Corcoran P, Maxwell M, Ross V, de Winter L, Arensman E, Aust B. The effectiveness of organisational-level workplace mental health interventions on mental health and wellbeing in construction workers: A systematic review and recommended research agenda. PLoS One. 2022 Nov 16;17(11):e0277114. doi: 10.1371/journal.pone.0277114.

[48] EU-OSHA. Third European Survey of Enterprises on New and Emerging Risks (ESENER 2019): Overview Report. 2019. Available from: https://osha.europa.eu/sites/default/files/esener-2019-overview-report.pdf

[49] EU-OSHA. European Survey of Enterprises on New and Emerging Risks – Managing safety and health at work. 2010. Available from: https://osha.europa.eu/en/publications/european-survey-enterprises-new-and-emerging-risks-managing-safety-and-health-work

[50] Aust B, Møller JL, Nordentoft M, Frydendall KB, Bengtsen E, Jensen AB, Garde AH, Kompier M, Semmer N, Rugulies R, Jaspers SØ. How effective are organizational-level interventions in improving the psychosocial work environment, health, and retention of workers? A systematic overview of systematic reviews. Scand J Work Environ Health. 2023 Jul 1;49(5):315-329. doi: 10.5271/sjweh.4097

Supporting information captions

S1 Table. STROBE Statement: checklist of items that should be included in reports of observational studies.

S2 Table. Checklist for Reporting of Survey Studies (CROSS).

607 **S1 Table.** STROBE Statement: checklist of items that should be included in reports of observational
608 studies
609

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	6
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	n/a
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-8
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	8-9
		(*c*) Explain how missing data were addressed	9
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	7
		(*e*) Describe any sensitivity analyses	n/a

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9-10
		(b) Indicate number of participants with missing data for each variable of interest	10-12
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	7-9
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	n/a
		Cross-sectional study—Report numbers of outcome events or summary measures	n/a
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16-17
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	17
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology

at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

S2 Table. Checklist for Reporting of Survey Studies (CROSS)

Section/topic	Item	Item description	Reported on page #
Title and abstract			
Title and abstract	1a	State the word "survey" along with a commonly used term in title or abstract to introduce the study's design.	2
	1b	Provide an informative summary in the abstract, covering background, objectives, methods, findings/results, interpretation/discussion, and conclusions.	2-3
Introduction			
Background	2	Provide a background about the rationale of study, what has been previously done, and why this survey is needed.	3-5
Purpose/aim	3	Identify specific purposes, aims, goals, or objectives of the study.	5-6
Methods			
Study design	4	Specify the study design in the methods section with a commonly used term (e.g., cross-sectional or longitudinal).	6
Data collection methods	5a	Describe the questionnaire (e.g., number of sections, number of questions, number and names of instruments used).	7-9
	5b	Describe all questionnaire instruments that were used in the survey to measure particular concepts. Report target population, reported validity and reliability information, scoring/classification procedure, and reference links (if any).	7-9
	5c	Provide information on pretesting of the questionnaire, if performed (in the article or in an online supplement). Report the method of pretesting, number of times questionnaire was pre-tested, number and demographics of participants used for pretesting, and the level of similarity of demographics between pre-testing participants and sample population.	n/a
	5d	Questionnaire if possible, should be fully provided (in the article, or as appendices or as an online supplement).	n/a
Sample characteristics	6a	Describe the study population (i.e., background, locations, eligibility criteria for participant inclusion in survey, exclusion criteria).	6-7
	6b	Describe the sampling techniques used (e.g., single stage or multistage sampling, simple random sampling, stratified sampling, cluster sampling, convenience sampling). Specify the locations of sample participants whenever clustered sampling was applied.	6-7
	6c	Provide information on sample size, along with details of sample size calculation.	6-7
	6d	Describe how representative the sample is of the study population (or target population if possible), particularly for population-based surveys.	7
Survey administration	7a	Provide information on modes of questionnaire administration, including the type and number of contacts, the location where the	6-7

		survey was conducted (e.g., outpatient room or by use of online tools, such as SurveyMonkey).	
	7b	Provide information of survey's time frame, such as periods of recruitment, exposure, and follow-up days.	7
	7c	Provide information on the entry process: –>For non-web-based surveys, provide approaches to minimize human error in data entry. –>For web-based surveys, provide approaches to prevent "multiple participation" of participants.	7
Study preparation	8	Describe any preparation process before conducting the survey (e.g., interviewers' training process, advertising the survey).	6-7
Ethical considerations	9a	Provide information on ethical approval for the survey if obtained, including informed consent, institutional review board [IRB] approval, Helsinki declaration, and good clinical practice [GCP] declaration (as appropriate).	8
	9b	Provide information about survey anonymity and confidentiality and describe what mechanisms were used to protect unauthorized access.	8
Statistical analysis	10a	Describe statistical methods and analytical approach. Report the statistical software that was used for data analysis.	10-11
	10b	Report any modification of variables used in the analysis, along with reference (if available).	10
	10c	Report details about how missing data was handled. Include rate of missing items, missing data mechanism (i.e., missing completely at random [MCAR], missing at random [MAR] or missing not at random [MNAR]) and methods used to deal with missing data (e.g., multiple imputation).	11
	10d	State how non-response error was addressed.	n/a
	10e	For longitudinal surveys, state how loss to follow-up was addressed.	8
	10f	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for non-representativeness of the sample.	n/a
	10g	Describe any sensitivity analysis conducted.	n/a
Results			
Respondent characteristics	11a	Report numbers of individuals at each stage of the study. Consider using a flow diagram, if possible.	11-12
	11b	Provide reasons for non-participation at each stage, if possible.	n/a
	11c	Report response rate, present the definition of response rate or the formula used to calculate response rate.	11-12
	11d	Provide information to define how unique visitors are determined. Report number of unique visitors along with relevant proportions (e.g., view proportion, participation proportion, completion proportion).	n/a

Descriptive results	12	Provide characteristics of study participants, as well as information on potential confounders and assessed outcomes.	11-12
Main findings	13a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates along with 95% confidence intervals and p-values.	n/a
	13b	For multivariable analysis, provide information on the model building process, model fit statistics, and model assumptions (as appropriate).	n/a
	13c	Provide details about any sensitivity analysis performed. If there are considerable amount of missing data, report sensitivity analyses comparing the results of complete cases with that of the imputed dataset (if possible).	n/a
Discussion			
Limitations	14	Discuss the limitations of the study, considering sources of potential biases and imprecisions, such as non-representativeness of sample, study design, important uncontrolled confounders.	19
Interpretations	15	Give a cautious overall interpretation of results, based on potential biases and imprecisions and suggest areas for future research.	20
Generalizability	16	Discuss the external validity of the results.	19
Other sections			
Role of funding source	17	State whether any funding organization has had any roles in the survey's design, implementation, and analysis.	No. Details will appear in the final published manuscript.
Conflict of interest	18	Declare any potential conflict of interest.	As above. None to declare.
Acknowledgements	19	Provide names of organizations/persons that are acknowledged along with their contribution to the research.	20