



Worksite mental health interventions: a systematic review of economic evaluations

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Accepted 1 July 2012
Published Online First
3 August 2012

ABSTRACT

Objective To give an overview of the evidence on the cost-effectiveness (CE) and financial return of worksite mental health interventions.

Methods A systematic search was conducted in relevant databases. Included economic evaluations were classified into two groups based on type of intervention: (1) aimed at prevention or treatment of mental health problems among workers or (2) aimed at return to work (RTW) for workers sick-listed from mental health problems. The quality of the included economic evaluations was assessed using the Consensus Health Economic Criteria list (CHEC-list).

Results Ten economic evaluations were included in this systematic review. All four economic evaluations on the prevention or treatment of mental health problems found a positive cost-benefit ratio, although three of these studies had low to moderate methodological quality. In five out of six economic evaluation studies on RTW interventions, no favourable CE or cost-benefit balance was found. One study of moderate methodological quality reported on a positive CE balance.

Conclusions Due to a limited number of economic evaluations on worksite mental health interventions of which a majority was lacking methodological quality or lacking evidence, only a tentative conclusion can be drawn from the results of this systematic review. Worksite interventions to prevent or treat mental health problems might be cost-effective, while those RTW interventions that included a full economic evaluation aimed at depressed employees do not seem to be cost-beneficial. More high-quality economic evaluation studies of effective worksite mental health interventions are needed to get more insight into the economic impact of worksite mental health interventions.

INTRODUCTION

The prevalence of mental health problems is high¹ and rising.² Worldwide, 450 million people suffer from a mental health problem.³ In The Netherlands, the lifetime prevalence of mental health problems is over 40%.⁴ Among the working population in developed countries, the 1-year prevalence rates of mental health problems range from 10% to 18%.^{5 6} Mental health problems can affect the individual's ability to work leading to absence due to sickness, and on the longer-term work disability. In 2008, mental health problems were one of the first three leading causes of work disability,⁷ but it has been predicted that by 2020, mental health problems, in particular depression, will rate as the leading cause of work disability.⁸ Figures from The Netherlands have shown that 19% of all absence due to sickness was caused by

mental health problems.⁹ In 2005, 38% of disability benefits in The Netherlands was paid because of mental health problems.¹⁰ Due to medical consumption and lost productivity, mental health problems are associated with high costs.^{11 12} The costs of mental health problems in developed countries have been estimated at between 3% and 4% of the Gross National Product.³

Employers may benefit from interventions aimed at promoting employees' mental health. There are several types of mental health interventions for (sick-listed) workers, varying from group interventions, to counselling by a general practitioner (GP), mental health coach or occupational physician, to medication, to cognitive behavioural therapy among others. Mental health interventions can either target the working population not (or short-term) sick-listed due to mental health problems (ie, prevention and treatment), or the working population at long-term absence due to mental health problems (ie, return-to-work (RTW) interventions). More in detail, primary preventive interventions target the entire workforce in order to increase mental health and to prevent mental health problems; secondary preventive interventions target high-risk workers, and aim to reduce mental health problems and to prevent sick leave. Treatment interventions target the working population with mental health problems either at short-term absence or not. RTW interventions, finally, are focused on improving RTW of workers who are sick-listed due to mental health problems.

Several interventions have effectively been used in the prevention or treatment of mental health problems, for instance, medication or cognitive behavioural therapy.¹³ However, when focusing on worksite mental health interventions, mixed results on mental health and work productivity have been shown in several reviews.^{14–20} To illustrate, Ruotsalainen *et al*¹⁴ found small but significant effects of person-directed interventions on the reduction of stress, burnout and anxiety. However, the evidence was limited due to lack of high-quality trials. In addition, Richardson and Rothstein¹⁵ found a medium to large effect of stress management interventions on work productivity. As to RTW interventions, Van Oostrom *et al*¹⁶ in their systematic review could not draw a conclusion on the effectiveness of worksite mental health interventions because of lack of randomised controlled trials (RCTs).

Besides the effectiveness of worksite interventions aimed at promoting mental health, it is of interest for employers whether investment in the programme is cost-effective (ie, the effects on mental health or quality of life (QALYs; quality

adjusted life-years) present good value for the money invested) or cost beneficial (ie, the financial benefits, eg, due to decreased absence rates, exceed the investment costs, in other words, the 'return on investment' (ROI) is favourable). There are several reviews of economic evaluations on mental health interventions in the general population,^{20–22} but no firm conclusions could be drawn due to limited high-quality economic evaluations. As far as we know, there is no systematic overview of economic evaluations on worksite mental health interventions. Therefore, the objective of this systematic review is to give an overview of the evidence on the cost-effectiveness (CE) and financial return of interventions aimed at preventing or treating mental health problems, or to improve RTW of workers sick-listed from mental health problems.

METHODS

Search

We searched for economic evaluations of worksite mental health interventions in different databases, that is, Medline, Scopus, NHS-EED/HTA and PsychInfo. A search strategy was drawn up according to 'PICO', that is, defining search terms on Population, Intervention, Comparator/Control intervention and Outcome. The search terms were related to the population (eg, workers, working population, occupational), different types of intervention (eg, prevention, treatment, RTW) and outcome (eg, mental health, stress, CE, cost benefits, ROI, economic evaluation). No criteria were set for the content and format of the comparator or control intervention. The search was supported by a library specialist. The complete Medline search string can be found in the Appendix. The search strings for the other databases were based on this strategy.

We selected studies in English from 1 January 2000 to 14 June 2011. Inclusion criteria were: a working population (either sick-listed or not), an intervention on mental health problems (either prevention, treatment or an RTW intervention), and representing a full economic evaluation, with an outcome on CE (ie, comparing costs and effects in mental health), cost utility (ie, comparing costs and effects in quality-adjusted life-years (QALYs)), or cost benefits (ie, comparing costs and financial benefits, which are net benefits, or ROI). Articles which reported only on outcome measures or on costs (non-economic evaluations or cost studies) were excluded. Furthermore, studies on work resumption for psychiatric hospitalised patients were excluded, as well as economic evaluations on medication as solely interventional for mental health problems. Finally, economic evaluations including persons on sick leave with subgroup analyses regarding mental health problems were excluded. Only economic evaluations focusing on mental health interventions as primary target were included.

Included economic evaluations on mental health interventions were classified into two groups based on the target population of workers whether or not on absence due to sickness: (1) prevention or treatment for non-sick-listed, or short-term sick-listed workers, with or without mental health problems; (2) RTW interventions for (long-term) workers sick-listed due to mental health problems.

The selection of the studies was done by three reviewers (HH, KP, MvdB), and was first based on title and abstract. Moreover, the reference lists of the included economic evaluations, as well as related reviews were checked, and authors of related articles were contacted to ask for information on the performance of an economic evaluation. In case of uncertainty about eligibility, the publication was discussed in a joint

meeting and, if necessary, the full text was retrieved and read for eligibility.

Data extraction

From the selected economic evaluation studies, data were extracted using a predefined form on general study characteristics, characteristics of the economic evaluation and study outcome. General characteristics included authors, publication date, country, study population, intervention and control condition.

Characteristics of the economic evaluations included the design of the study (ie, economic evaluation alongside an RCT or a modelling study), the perspective from which the cost calculations were done (ie, the society including 'all' costs, or the employer), the intervention period and 'time horizon' (follow-up period), the measurement of effectiveness or financial benefits and measurement of costs, and finally, if sensitivity analyses or uncertainty analyses are carried out (ie, analyses estimating the robustness of the outcome, or indicating the variables that are the outcomes most sensitive).

Study outcome included effectiveness or financial benefits, costs and combined costs and effects (ie, incremental CE ratio, incremental cost-utility ratio (ICUR), cost difference (net costs or benefits), cost-benefit ratio, or ROI: percentage, and sensitivity analyses or uncertainty analyses). See Drummond *et al*²³ for further information on economic evaluations.

Data extraction was carried out by two sets of authors independently; half the studies by HH and KP, and the remaining by HH and MvdB. Discrepancies were resolved in a consensus meeting.

Assessment of methodological quality

The quality of the included economic evaluations was assessed using the Consensus Health Economic Criteria list (CHEC-list) (see table 1).²⁴ This checklist was developed based on a consensus procedure between international experts. The checklist contains 19 questions on different aspects of economic evaluations, for example, study design, time horizon, perspective, type of costs and effectiveness measures that are included, the way these are measured and valued, incremental analysis of costs and outcomes, discounting, sensitivity analyses, authors' conclusions and generalisability of study results. Each question can be answered 'yes' or 'no'. If the answer is 'yes', this means that the study either adequately performed the item of concern or reported the item in an appropriate way. The CHEC list was filled in by two sets of authors independently, half by HH and KP, and half by HH and MvdB. Discrepancies were resolved in a consensus meeting.

In this review, cut-off points to categorise studies into high, moderate and low quality were chosen, indicating low, moderate and high risk of bias, respectively. Studies that fulfilled >75% of the items were classified as high quality, fulfilment between >50% and ≤75% was classified as moderate quality, and ≤50% fulfilment was classified as low quality.^{34 35}

RESULTS

Study selection

The database search resulted in 3886 hits of which title and abstract were screened (see figure 1); 3868 articles were excluded for several reasons, such as: no working population, no intervention on mental health problems, or no full economic evaluation. The full texts of the remaining 18 articles were studied, of which 10 articles were included in this review. Checking reference lists of the included studies and related

Table 1 Quality scores for criteria of the CHEC list; percentage of fulfilment included economic evaluations focused on prevention or treatment and on return to work (RTW), respectively

	Prevention/treatment					Return to work							Total (% fulfilment)
	Lo Sasso <i>et al</i> ²⁵	Bittman <i>et al</i> ²⁶	Wang <i>et al</i> ⁶	Vogt <i>et al</i> ²⁷	Subtotal (% fulfilment)	Van Oostrom <i>et al</i> ²⁸	Brouwers <i>et al</i> ²⁹	Leon <i>et al</i> ³⁰	Rebergen <i>et al</i> ³¹	Schene <i>et al</i> ³²	Uegaki <i>et al</i> ³³	Subtotal (% fulfilment)	
1. Is the study population clearly described?	1	0	0	0	25	1	0	1	1	1	1	83	60
2. Are competing alternatives clearly described?	1	1	0	0	50	1	1	0	1	1	0	67	60
3. Is a well-defined research question posed in answerable form?	0	0	1	0	25	1	1	1	1	1	1	100	70
4. Is the economic study design appropriate to the stated objective?	1	1	1	0	75	1	1	0	1	1	1	83	80
5. Is the chosen time horizon appropriate in order to include relevant costs and consequences?	0	1	1	1	75	1	1	1	1	1	1	100	90
6. Is the actual perspective chosen appropriate?	1	0	1	0	50	1	0	0	1	0	1	50	50
7. Are all important and relevant costs for each alternative identified?	1	0	1	0	50	1	1	1	1	1	1	100	80
8. Are all costs measured appropriately in physical units?	0	0	0	0	0	1	1	0	1	0	1	67	40
9. Are costs valued appropriately?	1	0	0	0	25	1	0	0	1	0	1	50	40
10. Are all important and relevant outcomes for each alternative identified?	1	0	1	1	75	1	1	1	1	1	1	100	90
11. Are all outcomes measured appropriately?	1	1	0	0	50	1	0	0	1	0	1	50	50
12. Are outcomes valued appropriately?	1	0	1	0	50	1	1	0	1	0	1	67	60
13. Is an incremental analysis of costs and outcomes of alternatives performed?	1	0	1	0	50	1	1	0	1	1	1	83	70
14. Are all future costs and outcomes discounted appropriately?	1	0	1	0	50	1	0	1	1	0	1	67	60
15. Are all important variables, whose values are uncertain, appropriately subjected to sensitivity analysis?	1	0	1	0	50	1	1	1	1	0	1	83	70
16. Do the conclusions follow from the data reported?	1	0	1	0	50	1	1	0	1	0	1	67	60
17. Does the study discuss the generalisability of the results to other settings and patient/client groups?	1	0	0	0	25	1	0	0	1	1	0	50	40
18. Does the article indicate that there is no potential conflict of interest of study researcher(s) and funder(s)?	1	1	0	1	75	1	1	0	1	1	1	83	80
19. Are ethical and distributional issues discussed appropriately?	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (% fulfilment)	79	26	58	16	45	95	63	37	95	53	84	71	61

0, no; 1, yes; CHEC, Consensus Health Economic Criteria.

reviews (which were found in this search based on title and abstract), as well as inquiring with authors of related articles did not yield additional articles. Finally, four economic evaluations on the prevention or treatment of mental health problems were included,^{6 25–27} and six economic evaluations of RTW interventions for workers sick-listed due to mental health problems.^{28–33}

General study characteristics

Table 2 describes the general characteristics of the studies that evaluated the economic impact of interventions aimed at preventing or reducing mental health problems, or aimed at RTW for workers sick-listed due to mental health problems.

Prevention and treatment

Of the four economic evaluations that focused on the prevention or treatment of mental health problems, interventions consisted of enhanced care,^{6 25} a recreational music-making intervention,²⁶

and a Critical Incident Stress Management (CISM) Programme.²⁷ One of these interventions was applied to healthy long-term care workers (ie, without mental health problems),²⁶ the other interventions were among mixed groups of blue collar and white collar workers with depression,^{6 25} or having experienced a critical incident at air traffic controller work.²⁷ They all had a cost-benefit design, and one study additionally performed a cost-utility analysis.⁶ Two cost-benefit analyses from the USA reported on net benefit, or ROI, from the employers' perspective.^{6 25} In these studies, the employers' perspective was defined as follows: costs included intervention costs, and benefits were related to increased work productivity. The additional CE analysis was reported from the societal perspective⁶ in which the intervention and healthcare costs were compared with the effect on QALY. From the other two cost-benefit analyses from Denmark²⁷ and the USA,²⁶ no information was given on study perspective. Two of four economic evaluations on prevention or treatment carried out a sensitivity analysis,^{6 25}

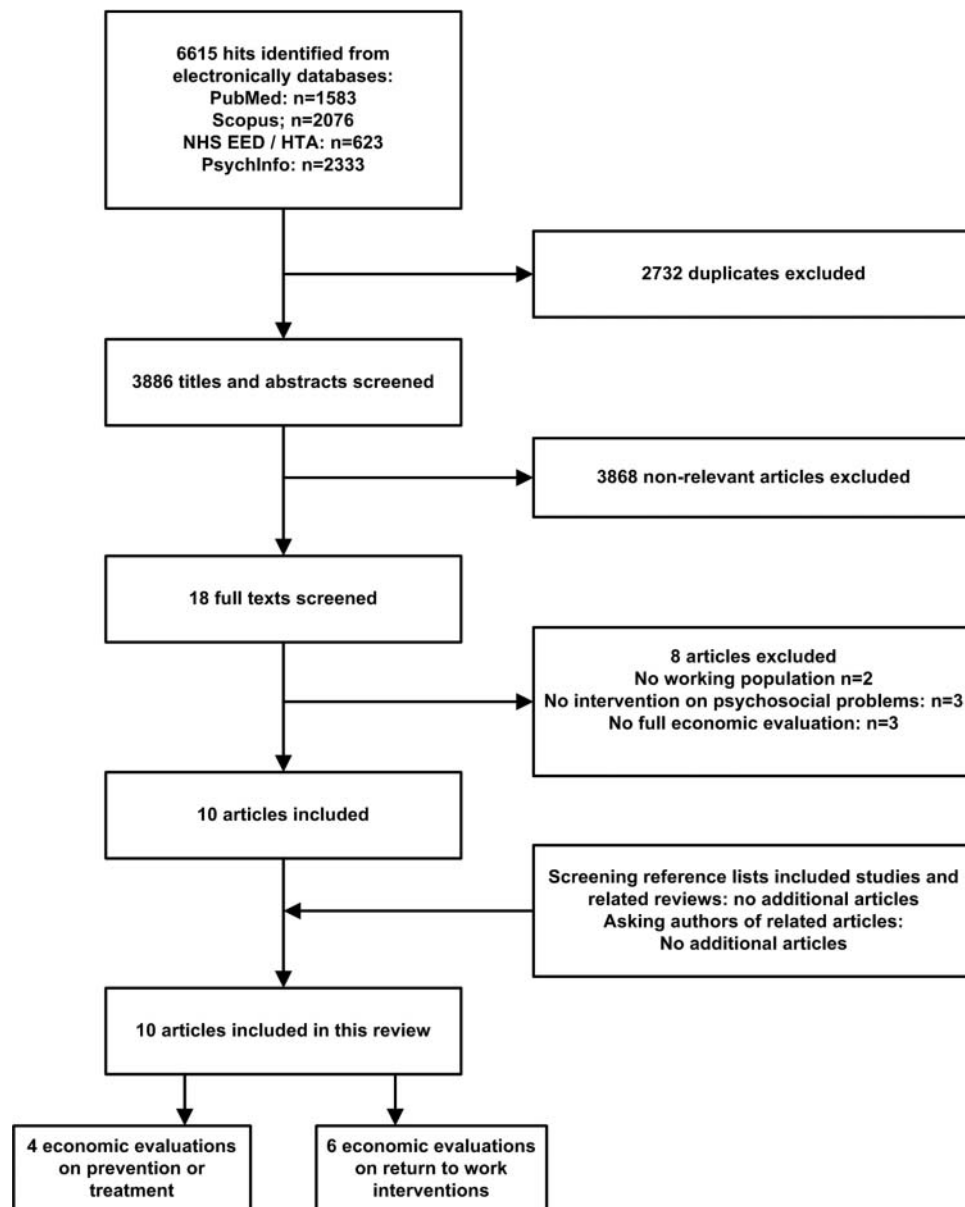


Figure 1 Flow chart: Inclusion of studies.

Table 2 General characteristics of the included economic evaluation studies on mental health interventions aimed at prevention, treatment, or return to work among (sick-listed) workers

Study	Population (N analyses)	Intervention and control condition	Design	Perspective	Intervention period/ time horizon	Effectiveness/benefits	Costs	Sensitivity or uncertainty analysis
Economic evaluation studies on mental health interventions aimed at prevention or treatment								
Lo Sasso <i>et al</i> ²⁵ ; USA	Employed primary care patients with depression (n=198)	Enhanced treatment (N=96); usual care (N=102)	CBA alongside RCT	Employer perspective	2 years	Productivity (absenteeism and presenteeism)	Intervention costs; healthcare costs (2000 US\$)	Univariate and multivariate sensitivity analyses
Bittman <i>et al</i> ²⁶ ; USA	Long-term care workers (n=112)	Recreational music making: intervention weeks 1–6 (N=43); intervention weeks 7–12 (N=41)	CBA alongside randomised cross-over study	Not stated	Intervention period: 6 weeks; follow-up: 12 weeks	Mental health: burnout and mood dimensions; satisfaction; turnover rates	Intervention costs; turnover costs (US\$; year ≤2003 (not stated))	No sensitivity analyses
Wang <i>et al</i> ⁶ ; USA	Hypothetical cohort of 40-year-old workers (N not stated)	Screening and enhanced depression care; usual care	CUA and CBA (Markov model)	Societal perspective (CUA) and employer-purchaser perspective (CBA)	Intervention period: 18 months; CUA: lifetime; CBA: 5 years	CUA: quality of life from (discounted at 3%); CBA: productivity; turnover and psychiatric hospitalisation	CUA: intervention costs; healthcare costs (discounted at 3%); CBA: intervention costs; healthcare costs (2004 US\$)	Univariate and probabilistic sensitivity analyses
Vogt <i>et al</i> ²⁷ ; Denmark	Air traffic controllers (ATCOs) who experienced a (critical) incident (N=38) from the German Air Traffic Control Services	CISM Programme: (N=18); compared with no intervention (N=20)	CBA alongside cohort study (not stated)	Not stated	5 years	RTW (short term): time between critical incident and full recovery; work performance; self-reported contribution of the CISM-programme on recovery	Intervention costs (2003 US\$)	No sensitivity analyses
Economic evaluations on interventions aimed at RTW among sick-listed workers								
Van Oostrom <i>et al</i> ²⁸ ; The Netherlands	Employees with distress, 2–8 weeks on sick leave (N=145)	Participatory RTW-intervention at occupational health services (N=73); usual care (N=72)	CEA, CUA and CBA alongside RCT	Societal perspective (CUA and CEA); employer perspective (CBA)	12 months	RTW; QALYs	Intervention costs; healthcare costs; costs of occupational health services; productivity costs (2008 €)	Univariate sensitivity analysis; uncertainty analyses
Brouwers <i>et al</i> ²⁹ ; The Netherlands	Patients with minor mental health problems on sick leave (max 3 months) (N=194)	Intervention by trained social workers on problem-solving strategies (N=98); routine GP care (N=96)	CEA, CUA and CBA alongside RCT	Not stated	Intervention period: 10 weeks; follow-up: 18 months;	Sick leave duration; functional status; health status; medical consumption	Intervention costs; direct healthcare costs; indirect costs of production losses (€; year ≤2010 (not stated))	Univariate sensitivity analyses; uncertainty analysis
Leon <i>et al</i> ³⁰ ; USA	Employees with long-term disability claims for depression (N=598)	Depression-screening programme, antidepressant medication and sessions with a psychiatrist	CBA based on a simulation study	Not stated	1 year	RTW; savings for the insurance company	Treatment costs (US\$; year ≤2002 (not stated))	Univariate sensitivity analyses
Rebergen <i>et al</i> ³¹ ; The Netherlands	Police workers on sick leave due to mental health problems (N=240)	Activating GBC by trained occupational physicians (N=125); usual care (N=115)	CEA and CBA alongside RCT	CEA: societal perspective; CBA: employer perspective	1 year follow-up	Sick leave duration	Healthcare costs; productivity costs (2003 €)	Univariate sensitivity analyses uncertainty analyses
Schene <i>et al</i> ³² ; The Netherlands	Adults with major depression and mean absenteeism of 242 days (N=62)	Addition of occupational therapy to treatment as usual (N=30); treatment as usual (N=32)	CEA, CBA alongside RCT (not stated)	Not stated	Intervention period: 48 weeks; time horizon: 12 months	Depression; work resumption; work stress; productivity	Healthcare costs (US\$; year ≤2007 (not stated))	Univariate sensitivity analyses (not stated)
Uegaki <i>et al</i> ³³ ; The Netherlands	Workers with stress-related sick leave for no longer than 3 months	Minimal intervention (MISS) by GPs (N=227); usual care (N=206)	CUA alongside cluster RCT	Societal perspective	Intervention period: 4 weeks; time horizon: 12 months	QALYs	Intervention costs; healthcare costs productivity costs; patient/family costs (2004 €)	Univariate sensitivity analyses; uncertainty analyses

CBA, cost-benefit analysis; CEA, cost-effectiveness analysis; CISM, Critical Incident Stress Management; CUA, cost-utility analysis; GBC, guideline-based care; GP, general practitioner; RCT, randomised controlled trial; RTW, return to work; QALY, quality adjusted life year.

Return to work

The six economic evaluations on RTW interventions were in the occupational health service setting,^{28 31 32} in a GP setting,^{33 29} or conducted by a psychiatrist.³⁰ One study focused on sick-listed employees from an insurance company,³⁰ one study was aimed at sick-listed police officers,³¹ and four studies contained mixed groups of absent workers. The study of Leon *et al*³⁰ was carried out in the USA, the remaining five economic evaluations on RTW interventions were from The Netherlands. If stated in the article, the cost-benefit analyses were performed from the employers' perspective, whereas the CE and cost-utility analyses were done from the societal perspective. In the latter, costs included healthcare costs (including intervention costs), and effectiveness was related to psychosocial functioning or QALY. For the cost-benefit analyses that were done from the employers' perspective, intervention costs were compared with the reduced costs due to productivity loss. Thus, healthcare costs were not included. All included economic evaluations on RTW carried out a sensitivity or uncertainty analysis.

Quality of the studies

Table 1 shows the quality of each study represented by the scoring of the CHEC list criteria. On average, 65% of the criteria were met, that is 45% for the economic evaluations on prevention or treatment,^{25 27} and 71% for the economic evaluations on RTW interventions.^{28 30 31}

Four studies were classified as high quality, three as moderate and three as low quality. Two of the four economic evaluations on prevention or treatment were classified as low quality, one as moderate quality and one as high quality. For the economic evaluations on RTW interventions, three of six were classified as high quality, two as moderate and one as low quality.

Thirteen out of 19 items were fulfilled by more than 50% of the articles. For the articles on prevention or treatment and RTW interventions, these are four and 14 items, respectively. The items that were fulfilled by more than 50% of the articles were in the field of an appropriate study design, time horizon, identification of relevant outcome measures and the absence of conflicting interests. The items that were fulfilled by 50% or less of the articles were the chosen perspective, the valuation of costs, measurement of outcomes, discussion on generalisability and an ethical discussion.

Results on the economic impact of the studies

Table 3 presents the results of the economic evaluation studies on the prevention or treatment of mental health problems, or RTW interventions among workers sick-listed due to mental health problems.

Prevention and treatment

All four economic evaluations on the prevention or treatment of mental health problems found a potentially favourable financial return, but results of three of these studies were uncertain, due to low to moderate quality.^{26 27 36} The high-quality study of Lo Sasso *et al*,²⁵ however, consistently showed a favourable financial return of enhanced care for depressed workers compared with usual care. They found that the benefits due to enhanced treatment exceeded the costs, compared with usual care, even from the most conservative assumptions in a sensitivity analysis. Benefits from increased work productivity after 1 and 2 years yield \$2100 and \$5500 per participating employee, respectively. Intervention and healthcare costs after

1 and 2 years accounted for \$735 and \$353 per participating employee, respectively. This resulted in a net benefit, after 1 year, of US\$30 per worker with an increase to US\$257 per worker after 2 years. The ROI was 302% over the course of 2 years, that is, for every dollar invested, the gain for the employer is 302% (a return of US\$ 4.02). Results of different univariate and multivariate sensitivity analyses showed that the net benefit after 2 years ranged from US\$101 to US\$494 per worker, and ROI ranged from 20% to 566%.

Wang *et al*⁶ evaluated the economic impact of enhanced depression care after depression screening. From the societal perspective, the ICUR was US\$20 000 per QALY gained (95% CI US\$9200 to US\$49 000) over the course of 5 years. The employers' perspective showed that benefits from increased productivity, reduced turnover and lower psychiatric hospitalisation (ie, US\$29.8 per employee) may exceed investments cumulative over 5 years (US\$26.9 per employee). This means a net benefit of US\$29 per worker.

Investing in recreational music-making for long-term care workers, or investing in CISM for air traffic controllers after having experienced a critical accident may lead to savings from increased work productivity.^{26 27} Bittman *et al*²⁶ and Vogt *et al*²⁷ reported on savings per worker (for every dollar invested) of \$61 annually, and \$257 after 5 years, respectively. However, the effectiveness of these interventions is uncertain, because no control group was included in the analyses, and robustness of the results was not tested in a sensitivity analyses.

Return to work

In five out of six economic evaluation studies on RTW interventions no evidence was found for a favourable CE or cost-benefit balance of RTW interventions. The study of Schene *et al*,³² however, reported on a likelihood of being 76% cost-effective. This study of moderate methodological quality analysed the economic impact of occupational therapy as an additional treatment to usual care among sick-listed adults with major depression compared with care as usual alone. The number of days until work resumption was statistically significantly smaller for the intervention group compared with the control group: 207 days vs 299 days. The net benefit per person calculated, was US\$15 and US\$11 for the intervention group compared with the control group.

Three economic evaluations, of which two of high quality and one of moderate quality, found no statically significant differences between the intervention and control group in RTW rates, QALYs and costs of productivity loss.^{28 29 33} The intervention costs were thus not compensated by the benefits from these outcome measures.

The high-quality study of Rebergen *et al*³¹ found statistically significant lower health utilisation costs (including intervention costs) for guideline-based care by occupational physicians for sick-listed police workers compared with usual care. Health utilisation costs were €2100 (SD €2000) in the intervention group, and €2700 (SD €1600) in the control group with a mean difference of €520 (95% CI €980 to €17). However, no statistically significant differences in costs due to productivity loss were found. Based on an acceptability curve, the probability of being cost-effective did not exceed 50%. Net benefits were €3600, but these results were not robust.

A simulation study on a depression-screening programme followed by treatment for employees with long-term disability claims found net benefits ranging from US\$-444 000 to US\$3 900 000 compared with usual care, which was not robust. This simulation study was of low quality. There was a large

Table 3 Study outcome of the included economic evaluations on mental health interventions that were focused on prevention, treatment or return-to-work for (sick-listed) workers

Study	Effectiveness/benefits	Costs	ICER/ICUR/CBR/net costs or benefits/ROI	Sensitivity or uncertainty analysis
Economic evaluation studies on mental health interventions aimed at prevention or treatment				
Lo Sasso <i>et al</i> ²⁵ ; USA	Incremental benefits year 1: US\$2100 per participating employee; year 2: US\$5500	Incremental costs year 1: US\$735 per participating employee; year 2: US\$353	Net benefits year 1: US\$30 per worker; year 2: US\$257 per worker; ROI over 2 years: 302%	Net benefits year 1 ranges between US\$-69 and 130 per worker; year 2: between US\$101 and US\$494 per worker; ROI over 2 years: 20–566%
Bittman <i>et al</i> ²⁶ ; USA	46% improvement burnout and mood dimensions; reduction in turnover of 18%	Intervention costs: US\$1500 per year; average costs per turnover: US\$8100	Average cost savings of US\$89100 for a single typical 100-bed facility; 'ROI': US\$60 saved for every dollar invested	No sensitivity analyses
Wang <i>et al</i> ⁶ ; USA	CUA: incremental effectiveness: 0.02 QALYs (intervention 18.8 QALYs per person; usual care: 18.7 QALYs per person); CBA: savings of US\$29800 per 1000 employees	CUA: incremental costs: US\$39.9 per person (intervention US\$3700; usual care US\$3600); CBA: costs of US\$26900 per 1000 employees	CUA: ICER US\$20000 per QALY gained; CBA: net benefits of US\$2900 per 1000 workers	CUA: univariate sensitivity analyses: ICER most sensitive to treatment costs; probabilistic sensitivity analyses: 95% CI: US\$9200 to US\$49000; CBA: results most sensitive to treatment costs
Vogt <i>et al</i> ²⁷ ; Denmark	Mean RTW intervention and control group: 4 and 1 day. 32 workers recovered 1 day faster and 5 recovered 3 days faster: total 47 days. Total savings from increased work recovery: 47×US\$ 958 (mean daily wage)=US\$45026	Intervention costs: US\$268 per worker. For 47 workers (=N at baseline): US\$12596	Cost reduction per 47 workers: US\$45026–US\$12596=US\$32430; ROI: 257%	No sensitivity analyses
Economic evaluations on interventions aimed at RTW among sick-listed workers				
Van Oostrom <i>et al</i> ²⁸ ; The Netherlands	No statistically significant differences between groups in QALYs and RTW subgroup of employees with intention to RTW: 62 days sick leave gain	No statistically significant differences between groups	ICER: €627 per 1-day reduction in sick leave; ICUR: €1846001 per QALY; CBA: net costs of €2000; subgroup analysis: ICER: €10; ICUR: €124000; CBA: €6200	Uncertainty analysis: ICER and ICUR not robust
Brouwers <i>et al</i> ²⁹ ; The Netherlands	No statistically significant difference between the groups on functional status, health status and sick leave duration	No statistically significant differences between groups	ICER: €167 and €81 per improvement health score; ICUR: €4200 per QALY gained; CBA: net costs: €11 (95% CI –1800 to 1800)	Univariate sensitivity analyses: results robust; uncertainty analyses: ICER not significant
Leon <i>et al</i> ³⁰ ; USA	5–52 non-cancer claimants RTW: savings of US\$500000–US\$5200000; 2–22 cancer claimants RTW: savings of US\$200000–US\$2200000	Total costs between US\$520000 and US\$1300000 for non-cancer claimants and between US\$418000 and US\$1044000 for cancer claimants	Net benefits between US\$-21300 and US\$3897000 for non-cancer claimants and between US\$-444400 and US\$1156000 for cancer claimants; costs offset if 5–40% of non-cancer claimants would RTW or 9–75% of cancer claimants would RTW	Large ranges in estimations for different assumptions
Rebergen <i>et al</i> ³¹ ; The Netherlands	No significant differences in days of sick leave and costs of loss of productivity; health utilisation costs: €2100 (SD €2000) in the intervention group and €2700 (SD €1600) in the control group; mean difference of €520 (95% CI €980 to €17)	Intervention costs: intervention group: €552 (SD 280); control group: €486 (SD 277); difference €66 (€2–151)	CEA: €736/day on sick leave; acceptability curve did not exceed the probability of being cost-effective of 50%; CBA: net benefit s of €3600	Univariate sensitivity analyses: overall results remain similar (robust); uncertainty analyses: not robust
Schene <i>et al</i> ³² ; The Netherlands	No statistically significant differences between groups in percentage of patients with major depression and work stress; mean number of days until work resumption intervention group: 207 days; control group: 299 days; RR=2.71 (95% CI 1.16 to 6.29)	No statistically significant differences between groups in total healthcare costs	Net benefits per person intervention group: US\$15; control group: US\$11; likelihood of being cost-effective is 76%	Univariate sensitivity analyses; results are robust
Uegaki <i>et al</i> ³³ ; The Netherlands	No statistically significant differences in QALYs between groups	No statistically significant differences in healthcare costs and productivity costs	ICER: €7400; for willingness-to-pay thresholds from €0 to €100000, the probability of being cost-effective is 0.58–0.90	Univariate sensitivity analyses: ICERs ranged between €37900 and €46100 (not robust)

CBA, cost-benefit analysis; CBR, cost-benefit ratio; CE, cost-effectiveness; CEA, cost-effectiveness analysis; CUA, cost-utility analysis; ICER, incremental cost-effectiveness ratio; ICUR, incremental cost-utility ratio; QALY, quality adjusted life year; ROI, return on investment; RR, relative risk; ; RTW, return to work; .

range in the intervention costs (ranging from US\$418 000 to US\$1 300 000), as well as in the benefits as defined by savings from insurances claimants due to RTW (ranging from US\$200 000 to US\$5 200 000). There were no significant net benefits of the depression-screening programme. Further, effectiveness of this intervention on RTW was uncertain, because no control group was included in the analyses.³⁰

DISCUSSION

Mental health problems among workers leads to productivity losses and high costs for employers. Investing in worksite mental health interventions may thus lead to financial benefits for employers, workers and members of organised labour organisations. This systematic review summarised results on the economic impact of worksite interventions to prevent or treat

mental health problems, or to improve RTW of sick-listed workers. Only 10 economic evaluations on worksite mental health interventions were found, of which the majority was of low methodological quality, or evidence on effectiveness was lacking. Therefore, no firm conclusions can be drawn from the results of this systematic review. Nonetheless, based on the results of the few existing studies including a full economic evaluation, worksite interventions to prevent or treat mental health problems seem to be cost-effective, while RTW interventions aimed at depressed employees do not seem to be cost beneficial.

Quality of the economic evaluations

In this systematic review, three studies were considered as low methodological quality, and four studies were classified as moderate quality. Due to the associated risk of bias, the results of those studies should be interpreted with caution. With regard to the different CHEC criteria, there were some quality items that were poorly met by the studies included. None of the studies on prevention or treatment (adequately) reported on the measurements of costs in physical units; for RTW interventions, 40% scored positively on this item. Moreover, only 25% and 40%, respectively, had the costs valued appropriately, or did not report on this. As to the measurement and valuation of outcomes, about 50% met this criterion. Because the way of measurement and valuation of both costs and outcomes is essential in order to understand and interpret the results of an economic evaluation, there is a strong recommendation for future researchers to adequately measure and value costs and outcomes. Future economic evaluations should pay further attention to the description of the study population, the competing alternatives, and also the generalisability of the results and ethical issues. These items were also poorly reported in the studies under review.

Evidence for effectiveness

Half the included studies on the economic impact of RTW interventions were classified as high quality, the other half was of low to moderate quality. However, the studies with high quality did not prove that investment in worksite mental health programmes among sick-listed workers was either cost-effective or yielded monetary benefits. This was probably due to lack of evidence on effectiveness of the RTW interventions included in the economic evaluations.^{28 29 33} This raises the question about the value of an economic evaluation in case of a lack of a proven intervention effect. Since the intervention costs, and even the total costs, including healthcare costs and productivity-related costs, did not differ between the study groups, the intervention will not be cost-effective. Reasons for lacking evidence may lie in the complexity of the study population, that is, workers with probable severe mental health problems, who have been sick-listed for a longer period. From previous studies, it is known that different factors predict RTW for people with mental health problems, including work-related and non-work-related factors.^{36–38} More insight is needed in effective elements of interventions, as well as different types of effects of worksite mental health programmes.

Study limitations

Although this review was performed in a systematic way using common and accepted criteria, there are some limitations that should be mentioned. First, because of heterogeneity in type of mental health interventions, study population and methodology of economic evaluations, no synthesis of the data was

possible. This makes it difficult to compare results of different economic evaluations and give an overall conclusion on the results. Instead, we decided to extensively report on the studies, and have summarised the evidence qualitatively.

Further, in the evaluation of the methodological quality of the studies, we applied the CHEC list. Although this checklist has been used before in systematic reviews on the economic evaluation,^{34 35} there are some issues worth discussing. First, all criteria are counted with the same weightage, while not all criteria are independent. One can imagine that some items contribute to potential bias of results more obvious than other items. However, it is difficult to find reliable weightages for each of the items. Second, although the scoring was done by two sets of reviewers independently, the scoring is quite subjective. Moreover, the scoring is dichotomous. Third, the cut-off points to categorise studies into low, moderate and high quality were arbitrary, although these cut-off points have been used in previous systematic reviews of economic evaluations studies using the CHEC list.^{34 35} However, because all studies are scored in the same way by the same reviewers, the CHEC scores and the categorising can be used appropriately to mutually compare the risk of bias of the different economic evaluations that are included in this review.

Finally, in spite of the systematic search strategy, including the search in diverse electronic databases, reference check and contact with authors, we cannot exclude the possibility of having missed some economic evaluations on mental health interventions. For example, due to limitations in the language of publication and date of publication, economic evaluations on this topic might have been missed. By our focus on economic evaluations, studies that have examined the effectiveness of worksite mental health interventions, but did not evaluate the economic impact of the intervention were excluded. Therefore, from the results of his systematic review, we cannot draw conclusions on the general effectiveness of workplace mental health interventions.

CONCLUDING REMARKS

Due to a limited number of included economic evaluations, of which the majority was of low methodological quality, or evidence on effectiveness was lacking, only a tentative conclusion can be drawn from the results of this systematic review. Worksite interventions to prevent or treat mental health problems might be cost-effective, while RTW interventions aimed at depressed employees do not seem to be cost beneficial on the basis of those studies that included a full economic evaluation. As mentioned before, these tentative conclusions have to be taken with caution. Therefore, more high-quality economic evaluations of effective worksite mental health interventions are needed to gain more insight into the financial benefits of worksite mental health interventions. Before analysing this economic impact, there should first be ample evidence for the effectiveness of worksite mental health interventions.

Contributors All authors contributed to the work undertaken to generate this paper and have seen and approved the final manuscript.

Competing interests None.

Provenance and peer review Not commissioned; externally peer reviewed.

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