WORKING FOR A HEALTHY FUTURE

An economic analysis of workplace interventions that promote mental wellbeing in the workplace

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Executive Summary

Introduction

The National Institute for Health and Clinical Excellence has been asked by the Department of Health to develop public health intervention guidance aimed at promoting employees' mental health. The guidance will provide recommendations for good practice, based on the best available evidence of effectiveness, including cost-effectiveness. It is aimed at all employers (in both the private and public sector), employees and the organisations that represent them.

Given the scarcity of relevant economic evidence revealed in the preceding economic review, the purpose of this study is to use economic modelling techniques to generate cost-effectiveness evidence to assist NICE with the development of guidance.

Method

The studies included in the effectiveness review considered an extremely varied range of individual-level and organisational-level interventions. The measurement of health outcomes across the studies was equally varied. Despite the number of different outcome measures used, no study measured health effects in terms of QALYs gained. As a consequence, a rather pragmatic approach is adopted for the economic modelling.

- To generate incremental cost-effectiveness ratios (ICERs) broadly in line with the NICE reference case, it is necessary to base the analysis on only 3 studies from the effectiveness review (these are shown in the table below), where health outcomes are measured on a scale that can be converted, directly or indirectly, into QALYs gained.
- To generate estimates of the net-benefits to employers of work-site interventions that promote mental wellbeing in the workplace, evidence from the effectiveness review and other sources in the literature is used, in conjunction with standard methods to value health-related changes in foregone productivity due to absenteeism and presenteeism.

A single willingness-to-pay value from an American study is also used to provide an indication of the net-benefits of interventions to promote the mental wellbeing of employees from a social perspective.

Modelled interventions from effectiveness review

Study	Intervention Type	Intervention Component
Intervention 1: Bergdahl et al (2005)	Individual – stress management programme	• Group session per week for seven weeks (2-hr duration). Four groups of 6-7. • 2 psychologists per group per session. • Handouts for each session (unspecified).
Intervention 2: Jones and Johnston (2000)	Individual – stress management programme	• 6 group sessions (2-hr duration). • 1 trained facilitator per session. • Handouts for each session (unspecified). • Incentives to participate (one-off prize and reimbursement of travel expenses).
Intervention 3: Butterworth et al (2006)	Individual – stress management programme	• Health coaching with minimum of 1 initial session + 2 follow-up contacts; each session = 30 minutes. • Each session run by trained health professional (unspecified). • Independent verification (unspecified).

Results

The results of the economic analysis are summarised in the following key evidence statements:

Evidence Statement 1
Work-site interventions to promote the mental wellbeing of employees can reduce absence costs by between £145 and £1,295 per affected employee per year, and reduce presenteeism costs by between £350 and £3,865 per affected employee per year. Note: there is considerable uncertainty surrounding the estimated reductions in presenteeism costs. Such interventions can therefore save employers between £495 and £5,160 per affected employee per year.

Evidence Statement 2

The net-benefit to employers of implementing interventions to promote the mental wellbeing of employees ranges from negative £220 to positive £1,155 per affected employee participating in the programme, incorporating solely the intervention-induced reductions in absence costs.

Including the intervention-induced reductions in presenteeism as well, the net-benefit to employers ranges from positive £130 to positive £5,020 per affected employee participating in the programme.

Evidence Statement 3

For the 3 modelled interventions, ICERs range from about £3,470 per QALY gained to £15,030 per QALY gained. However, these values do not include any benefits accruing to employers due to reductions in absenteeism and presenteeism.

When the benefits of intervention-induced reductions in absenteeism and presenteeism are included in the cost component of the ICER, the ratios become negative – i.e. relative to the baseline of 'do nothing' all 3 modelled interventions are dominant, resulting in reduced costs and increased health benefits.

There is, however, considerable uncertainty surrounding the combining of effectiveness evidence on intervention-induced reductions in absenteeism and presenteeism with effectiveness evidence on intervention-induced QALY gains, since both sets of evidence are sourced from different studies.

Evidence Statement 4

The net (social) benefit of interventions to promote the mental wellbeing of employees ranges from positive £115 to positive £420 per participating employee. This indicates that such interventions increase total social welfare.

These are conservative estimates, since (i) the value to the employer of intervention-induced reductions in absenteeism and presenteeism are not included and (ii) any savings in NHS resources due to reductions in work-related stress, depression and anxiety are also not included.

There is nonetheless considerable uncertainty surrounding the estimates, since they are based on a single WTP value from an American stated preference survey.

Conclusions

The results of the economic modelling support the business case for implementing work-site interventions to promote the mental wellbeing of employees.

Due to the lack of a consistent and robust effectiveness evidence on which to base the economic evaluation, a pragmatic approach to the modelling is adopted. However, this necessitates the adoption of a number of assumptions, which inevitably increases the uncertainty surrounding the results. Consequently, the evidence statements listed above should only be viewed as indicative, and the underlying uncertainty should be taken into account when developing guidelines to promote the mental wellbeing of employees in the workplace.

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1. INTRODUCTION

1.1. Background

The National Institute for Health and Clinical Excellence ('NICE' or 'the Institute') has been asked by the Department of Health (DH) to develop public health intervention guidance aimed at promoting employees' mental health. The guidance will provide recommendations for good practice, based on the best available evidence of effectiveness, including cost-effectiveness. It is aimed at all employers (in both the private and public sector), employees and the organisations that represent them. The guidance will support the following National Service Framework (NSF): "Mental Health" (DH, 1999).

1.2. The Need for Guidance

Mental wellbeing is "*…a state of wellbeing in which the individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community*." (WHO, 2004). Employees will typically experience short periods of stress and anxiety in the workplace, without it affecting their mental wellbeing. However, exposure to chronic stress and anxiety at work can be detrimental to mental wellbeing. Moreover, a number of diseases and disorders (e.g. coronary heart disease, musculoskeletal disorders and mental illness) are related to psychosocial conditions in the workplace (Marmot et al., 1991).

According to the most recently available Labour Force Survey (relating to 2004-05) an estimated 509,000 people in Britain believed they were suffering from stress, depression or anxiety that made them ill. Furthermore, these conditions were caused or made worse by their current or past work (Jones et al., 2006). As a result, an estimated 12.8 million working days (full-day equivalents) were lost. Each person suffering from stress, depression or anxiety took, on average, an estimated 30.9 days off over the 12 month period 2004-05 (equivalent to an annual loss of 0.55 days per worker). Stress, anxiety and depression is thus the second most commonly reported cause of sickness absence in Britain, behind musculoskeletal disorders.

The most recent survey of 'absence management' from the Chartered Institute of

Personnel and Development found that absence costs employers (across a range of economic sectors), on average, £598 per worker per year – equivalent to about £75 per day of absence (CIPD, 2006)[1]. The cost of absence is highest in the 'public services' sector, which includes police, fire, education, health, etc., at £680 per worker per year. The cost of absenteeism, however, captures only a portion of the impact of employee health on an organisation's productivity. Presenteeism – being present at work, but working at a reduced capacity due to a health complaint – may account for a larger proportion of total health-related productivity losses than absenteeism (Collins et al, 2005).

In 2005 national surveillance schemes put the incidence of work-related mental health problems in Britain at about 6,400 new cases per year. The most recent survey of work-related illnesses undertaken for the Health and Safety Executive (HSE), however, estimates that about 195,000 people reported that they had first experienced work-related stress, depression or anxiety in the previous 12 months (Jones et al., 2006). The incidence of work-related mental health problems in Britain is therefore almost certainly higher than the figure suggested by national surveillance schemes.

Employees in the public sector – in particular, administration, defence, education, and health and social work - had some of the highest rates of self-reported stress, anxiety and depression (Jones et al., 2006). The main risk factors include employees with heavy workloads and employees facing tight deadlines. Employees who receive a lack of support at work, or are being physically attacked or threatened at work, are also at an increased risk of stress, depression or anxiety (Jones et al., 2006).

There is evidence to suggest that investment in healthy working practices and the health and wellbeing of employees improves productivity and is cost effective for business and wider society (Coats and Max, 2005; Dunham, 2001). In addition, given that employees in lower paid jobs are more likely to experience poor working conditions, improvements in the quality of work and working conditions may help reduce health inequalities (Siegrist and Marmot 2004).

[1] The survey also reports rates of absenteeism across the surveyed organisations; the average rate (all causes) across all reporting organisations was 8 days absence per worker per year. The costs of absence include: occupational sick pay, statutory sick pay, costs of replacement labour, overtime costs, costs of reduced performance, and administration.

1.3. This Study

A review of the economic literature relating to workplace interventions that promote mental wellbeing in the workplace, found (Boyd et al, 2007):[2]

- No research published since 1990 reporting the cost-effectiveness, cost-utility or cost-benefit of worksite interventions that directly promote mental wellbeing in the workplace.
- Very limited research published since 1990 reporting the cost-effectiveness, cost-utility or cost-benefit of worksite wellness or health promotion programmes that contain a component that explicitly addresses the mental wellbeing of employees (typically, through an initiative(s) to manage work-related stress).

Given the scarcity of relevant economic evidence, the purpose of this study is to undertake economic modelling to generate cost-effectiveness evidence to assist NICE with the development of guidance on workplace interventions that promote mental wellbeing in the workplace.

1.3.1. Approach to Economic Analysis

A total of 67 studies meet the inclusion criteria for the effectiveness review. These studies considered an extremely varied range of individual-level and organisational-level interventions. The measurement of health outcomes across the studies was equally varied. As a consequence, it was not possible for the effectiveness review team to use meta-analytical techniques to synthesis the effectiveness evidence. A pragmatic approach to the economic modelling is therefore adopted. Specifically:

- To generate incremental cost-effectiveness ratios (ICERs) broadly in line with the NICE reference case, it has been necessary to base the analysis on a restricted set of studies from the effectiveness review (see Table 1), where health outcomes are measured on a scale that can be converted, directly or indirectly, into QALYs gained.
- To generate estimates of the benefits to employers of work-site interventions that

[2] The scope of the review can be found at Appendix A.

promote mental wellbeing in the workplace, available evidence from the effectiveness review relating to the impact of such interventions on absenteeism[3] is used (see Table 1), in conjunction with standard methods to value health-related gains / losses in productivity. The impact on presenteeism[4] of work-site interventions to promote the mental wellbeing of employees is analysed using available information from the literature (see Table 2); the effectiveness review did not reveal any relevant evidence relating to presenteeism.

Table 1: Effectiveness evidence for economic analysis

Source of effectiveness data for cost-utility analysis:
Jones, M. and Johnston, D. Evaluating the impact of a worksite stress management programme for distressed student nurses: a randomised control trial. Psychology and Health. 2000; 15: 689-706. [Effectiveness Review Paper ID 3323]
Bergdahl, J., Larsson, A., Nilsson, L-G., et al. Treatment of chronic stress in employees: subjective, cognitive and neural correlates. Scandinavian Journal of Psychology. 2005; 46: 395-402. [Effectiveness Review Paper ID 532]
Butterworth, S., Linden, A., McClay, W. and Leo, M. Effect of motivational interviewing-based health coaching on employees' physical and mental health state. Journal of Occupational Health Psychology. 2006; 11(4): 358-365. [Effectiveness Review Paper ID 940]
Source of effectiveness data for analysing the effects of interventions on absenteeism:
Jones, M. and Johnston, D. Evaluating the impact of a worksite stress management programme for distressed student nurses: a randomised control trial. Psychology and Health. 2000; 15: 689-706. [Effectiveness Review Paper ID 3323]
Berkhout, A., Boumans, N., Van Breukelen, G., et al. Resident-oriented care in nursing homes: effects on nurses. Journal of Advanced Nursing. 2004; 45(6): 621-632. [Effectiveness Review Paper ID 543]
Maes, S., Verhoeven, C., Kittel, F. and Scholten, H. Effects of a Dutch work-site wellness-health program: The Brabantia Project. American Journal of Public Health. 1998; 88: 1037-1041. [Effectiveness Review Paper ID 4238]

[3] The cost to employers of unplanned sickness absence.

[4] The cost to employers of reduced productivity while employees, with a health condition, are at work.

Table 2: Evidence for analysing economic impact of presenteeism

Source of data for analysing the effect of work-related stress, depression or anxiety on presenteeism:
Burton, W., Conti, D., Chen, C., et al. The role of health risk factors and disease on worker productivity. Journal of Occupational and Environmental Medicine. 1999; 41: 863-877.
Collins, J., Baase, C., Sharda, C. et al. The assessment of chronic health conditions on work performance, absence and total economic impact for employers. Journal of Occupational and Environmental Medicine. 2005; 47: 547-557.
Greenberg, P., Stiglin, L., Finkelstein, S. and Berndt, E. The economic burden of depression. Journal of Clinical Psychiatry. 1993; 54: 405-418.
Ozminkowski, R., Goetzel, R., Crown, W. et al. Results of the Wellness Inventory (Formerly the Work Productivity Short Instrument or WPSI) at Corp XYZ. 2000; Ann Arbour, MI: The MEDSTAT Group.
Source of effectiveness data for analysing the effects of interventions on presenteeism:
Burton, W., Chen, C., Conti, D., et al. The association of health risks with on-the-job productivity. Journal of Occupational and Environmental Medicine. 2006; 47: 769-777.
Mills, P., Kessler, R., Cooper, J. and Sullivan, S. Impact of a health promotion programme on employee health risks and work productivity. American Journal of Health Promotion. 2007; 22(1): 45-53.

The costs of the interventions considered in the economic analysis are actually incurred entirely by the employer. Thus, it is possible to determine the net cost to the employer of introducing a specific intervention:

Net cost to employer	*equal*	Total incremental cost of the intervention
	less	Incremental productivity gains from reduced absenteeism
	less	Incremental productivity gains from reduced presenteeism

If the productivity gains from reduced absenteeism plus presenteeism exceed the total cost of the intervention, then the net cost to the employer will be negative – in other words, the employer will accrue a positive net-benefit from introducing the intervention. In order to allow for this possibility in the cost-utility analysis, two numerators are used when computing the ICERs: one based on the total incremental cost of the intervention and one based on the net incremental cost of the intervention.

Since the impacts on employers of work-site interventions that promote mental wellbeing in the workplace are used as an input to the cost-utility analysis, they are analysed first.

1.3.2. Currency Conversion

Where necessary, all monetary values are converted from local currencies to pounds sterling (GBP) and adjusted to 2007 Q3 prices. This involves:

- First, converting values reported in local currencies to GBP using an appropriate historical conversion rate[5].
- Second, inflating values in GBP to 2007 Q3 prices[6].

[5] Exchange rates were obtained from: http://www.oanda.com/convert/fxhistory.

[6] Price indices obtained from: http://www.statistics.gov.uk/statbase/tsdataset.asp?vlnk=229&More.

2. IMPACTS ON EMPLOYERS

2.1. Introduction

Employers incur a number of costs as a result of work-related ill health among their workforce. These costs include loss of productivity, payments to absent workers during periods of absence, administration costs, recruitment costs, and compensation payments and associated insurance premiums. The cost to employers of work-related ill health in Britain in 2001-02 was estimated at £1.5 billion[7].

This section looks at the cost to employers of work-related depression, anxiety or stress, as well as the possible benefits of work-site interventions aimed at promoting employees' mental health. Two categories of cost are quantified:

1. Costs arising from sickness absence (**absenteeism**).
2. Costs arising from impairment of productivity while at work (**presenteeism**).

A third cost to employers associated with work-related ill health – the costs of labour turnover[8] – is not considered; the effectiveness review did not reveal any evidence relating to labour turnover among the studied workers.

2.2. Absenteeism

Broadly, if an employee is absent as a result of unplanned illness the employer has two options:

1. Take action to maintain output.
2. Accept a reduction in output (i.e. do nothing).

Both options entail costs; additional costs in the former case and lost (output) income in the latter case. A series of case studies conducted by the Operations Unit at the HSE

[7] Interim up-date of the "The Costs to Britain of Workplace Accidents and Work-related Ill Health in 1995-96", HSE (available at www.hse.gov.uk).

[8] Broadly, the labour turnover process can be broken down into four phases: 1. Separation. 2. Temporary cover. 3. Acquisition. 4. Knowledge transfer and training. During each of these phases costs are incurred by the employer.

suggest that most employers will chose to maintain output because, for example, they face penalties for failing to meet output targets, operate integrated (team-orientated) production processes, or are concerned about loss of reputation.

In choosing to maintain output when a worker is absent, an employer has several options:

- Other workers could put in extra hours at the standard wage rate (part-time workers) or a higher wage rate (full-time workers).
- The sick worker could put in extra hours to make up for lost work upon their return.
- The employer could postpone non-urgent tasks and re-assign workers.
- Temporary replacement staff could be hired.

The option chosen by an employer will depend on the anticipated duration of the absence, as well as the nature of the production process, the market in which they operate and the time of year (and thus when other workers are away or peaks in demand are expected). The cost of sickness absence is thus driven by the choices made by the employer. In general, using internal cover on a temporary basis is the least costly option for covering sickness absence, followed by paying overtime for extra hours worked; using external agencies or contract staff is the most expensive option (Bevan and Hayday, 2001).

2.2.1. Methodology

The main steps involved in estimating the effect on absenteeism of work-site interventions that promote mental wellbeing in the workplace are outlined below; the information flows are highlighted in Figure 1. The basic data can be found in Appendix B.

Baseline:

Step 1.	Collect data on the number of days (full-day equivalents) lost on average per worker per year due to self-reported stress, depression or anxiety caused or made worse by the current or most recent job. Source: the most recent year for which this data is available is 2004-05 (Jones et al, 2006). Mean, lower and upper 95 CI absence rates are obtained, disaggregated by occupational major group and broad industrial sector. [**Output**: work days lost per worker per year.]
Step 2.	Estimate the mean, lower and upper 95 CI number of full-day equivalents lost by a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: work

days lost per 1,000 workers per year.]

Step 3. Estimate the daily cost to an employer of an unplanned sickness absence, by occupational major group and broad industrial sector.

To estimate the cost of an unplanned sickness absence several approaches are used in order to capture the full range of possible employer responses, as outlined above:

- For the central case, the conventional Human Capital Method is used, where the cost to an employer of an unplanned sickness absence is assumed equivalent to the total cost of employing the absent worker (Cooper and Rice, 1976).
- As a sensitivity test, the approach of Koopmanschap et al (1995) is used to define a lower bound estimate (see below for further explanation).
- As a sensitivity test, the approach of Nicholson et al (2006) is used to define an upper bound estimate (see below for further explanation).

a. Collect data on gross hourly pay. Source: the most recent year for which this data is available is the Annual Survey of Hours and Earnings (ASHE) for 2007 (ONS, 2007). Median gross hourly wage rates are obtained, disaggregated by occupational major group and broad industrial sector. Due to the skewed distribution of earnings data (as evident from Table 3 and Table 4 in Appendix B), median values are preferred to mean values, since they are influenced less by the extreme values. [**Output**: pay (£) per hour.]

b. Collect data on 'non-labour' costs not captured by the gross hourly pay data (e.g. employers' social contributions; vocational training costs, other Expenditures). Source: Eurostat. [Output: non-labour costs as a % of total labour costs.]

c. Use data obtained in Steps 3a and 3b to estimate total (median) labour costs per hour, disaggregated by occupational major group and broad industrial sector. [**Output**: total labour costs (£) per hour.]

d. Collect data on paid hours worked per week. Source: the most recent year for which this data is available is the ASHE for 2007 (ONS, 2007). Median paid hours worked per week are obtained, disaggregated by occupational major group and broad industrial sector. [**Output**: paid hours worked per week.]

e. Estimate the total labour costs per work day, disaggregated by occupational major group and broad industrial sector. [**Output**: total labour cost (£) per work day *equals* paid hours worked per week *divided* by 5 *times* total labour costs (£) per hour.]

Step 4. Compute the annual cost to the employer from absenteeism in a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: total annual cost (£) of unplanned sickness absence due to work-related stress, depression or anxiety *equals* total labour cost (£) per work day *times* work days lost per 1,000 workers per year.]

Note: the central case combines the mean estimate of average days lost per worker due to self-reported stress, depression or anxiety caused or made worse by current or most recent job with the median gross hourly wage rate and the median number of paid hours worked per week.

Intervention:

Step 5. Search the effectiveness review evidence for information on the effect of interventions to promote the mental wellbeing of employees on absenteeism.

The available evidence from the effectiveness review suggests that work-site interventions can reduce the rate of absenteeism due to work-related stress, depression or anxiety by between 5% and 46% at follow-up (see Table 3). These values represent the relative change between the intervention and control groups, derived by applying the percentage change in the control group to the observed baseline level of absenteeism in the intervention group, and then contrasting this with the observed value for the intervention group at follow-up. [**Output**: % change in baseline rate of absenteeism by intervention.]

Step 6. Re-calculate the number of days (full-day equivalents) lost on average per worker per year due to self-reported stress, depression or anxiety caused or made worse by the current or most recent job: post-intervention rate of absenteeism *equals* the baseline rate of absenteeism *times* (1 *minus* the effectiveness %). [**Output**: work days lost per worker per year post-intervention.]

Note: the calculations are not performed with respect to any of the specific interventions listed in Table 3, but rather with respect to a 'hypothetical' work-site intervention, covering the full range of effectiveness values derived from Table 3 – that is: a 5% and 45% reduction in baseline absenteeism due to work-related stress, depression or anxiety (as well as intermediary reductions of 15%, 25% and 35%). This is done so that a plausible range of possible reductions in absenteeism can be included in the cost-utility analysis in Section 3.

Step 7. Repeat Steps 2, 3 and 4 using the post-intervention rates of absenteeism, by occupational major group and broad industrial sector. [**Output**: post-intervention total annual cost (£) of unplanned sickness absence due to work-related stress, depression or anxiety.]

Note: it is assumed that the hypothetical intervention is equally effective across all occupations and industrial sections.

Step 8. Determine the employer benefits of reduced absenteeism from the hypothetical intervention in a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: reduction in total annual cost (£) of unplanned sickness absence due to work-related stress, depression or anxiety *equals* output from Step 4 *minus* output from Step 3.]

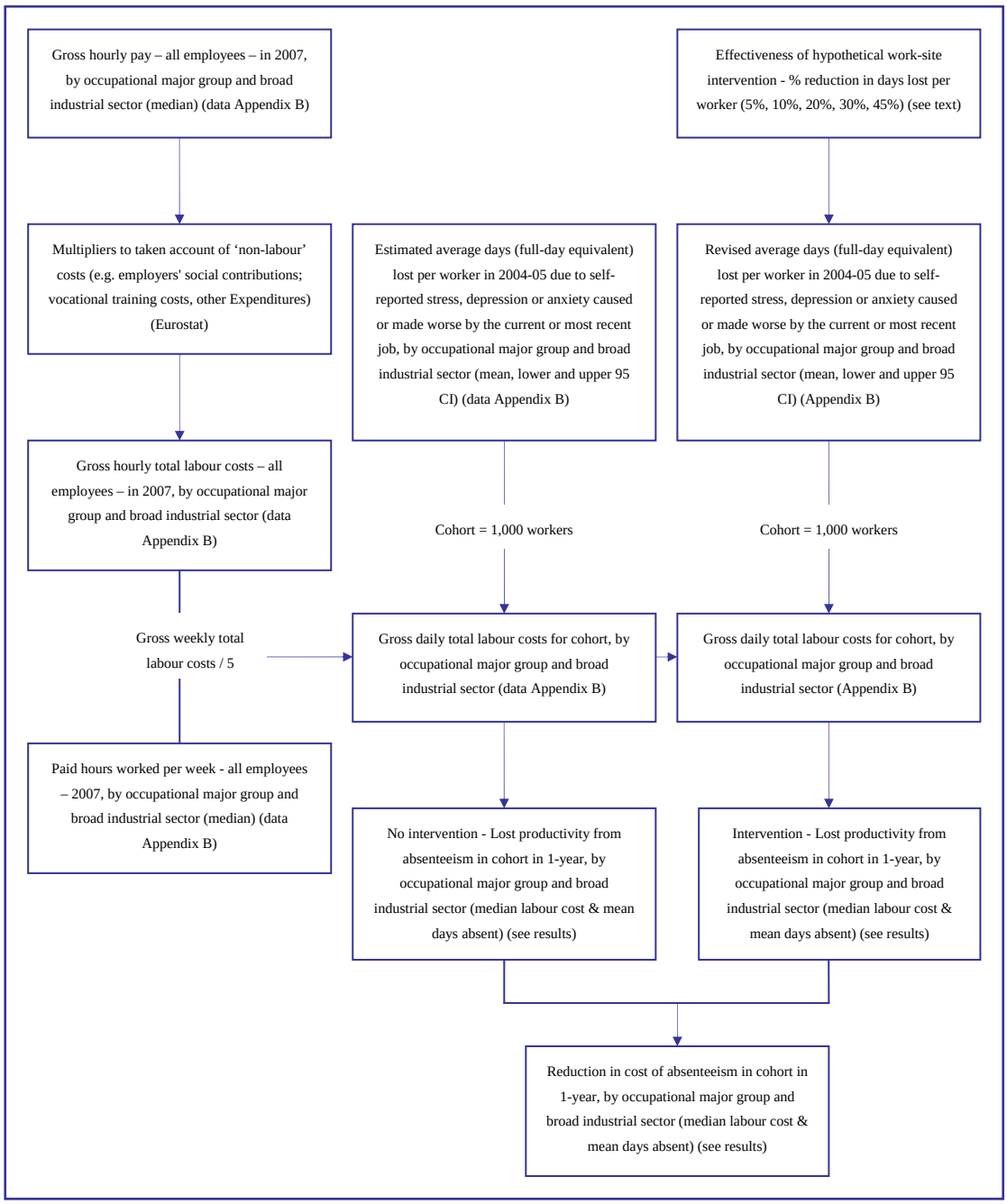
Note: the results are calculated for a 1-year period only. The impact of the hypothetical intervention on work-related stress, depression or anxiety is thus essentially an annual benefit, and specifically, the annual benefit to employers once the full incremental effect of the intervention is realised, assuming that the full incremental effect is maintained for a full year.

Table 3: Evidence on effectiveness of interventions to reduce absenteeism

Study	Intervention Type	Intervention Component	Outcome Measure of Interest	Baseline Effect	Effect of Intervention
Jones and Johnston (2000)	Individual – stress management programme	• 6 group sessions (2-hr duration). • 1 trained facilitator per session. • Handouts for each session (unspecified). • Incentives to participate (one-off prize and reimbursement of travel expenses).	Sickness absence (days sick leave)	Sick leave in 6 months pre-intervention. Intervention (n=40): mean = 1.4. Controls (n=39): mean = 2.0.	Sick leave in 6 months post-intervention. Intervention (n=40): mean = 2.6. Controls (n=39): mean = 3.9.
Berkhout et al (2004)	Organisational measures	Implementation of resident-oriented care in nursing homes. Change in working practices by: • assigning individual resident to an individual care-giver; • use of the nursing process; • extended number of tasks and improved communication.	Sickness absence (days sick leave)	Sick leave in 6 months pre-intervention. Treatment (n=147): mean = 0.83. Controls (n=147): mean = 0.56.	16 months after start of intervention - sick leave in last 6 months. Treatment (n=147): mean = 0.68. Controls (n=147): mean = 0.85.
Maes et al (1998)	Combined - individual and organisational	• Half-hour session three times a week - mainly exercise, with 1 in 6 sessions health education (year 1). • Physical activity sessions (health education discontinued) (year 2-3). • Health exhibition (year 3) plus 40 hours training in social skills and leadership. • On-site exercise facilities. • Smoking policy for cafe, information corner with posters, videos, provision of healthy food, etc. • Incentives offered, e.g. t-shirts, sports bags, weekend at health resort. • Management 'wellness committee' developed proposals for modifying organisational functions.	Sickness absence (% absenteeism)	Intervention (n=133): mean = 15.8%. Controls (n=129): mean = 14.3%.	After 2 years. Intervention (n=133): mean = 7.7%. Controls (n=129): mean = 9.5%.

Note: "unspecified" means that no further detail is provided in the study on that component.

Figure 1: Approach to estimating costs of absenteeism and the cost savings (benefits) from hypothetical work-site intervention to promote employee's mental wellbeing



Note: "all employees" means the weighted average across all male and female workers, both full-time and part-time.

As well as performing the calculations for a cohort of 1,000 workers, the analysis is also undertaken for a cohort of 1,000 sufferers of work-related stress, depression or anxiety. As noted above, in 2004-05 an estimated 288,000 (95 CI: 264,000 to 312,000) sufferers of stress, depression or anxiety caused or made worse by work took an estimated 12.8 million (95 CI: 11.1 to 14.5 million) days (full-day equivalent) off work in the UK (Jones et al, 2006). This equates to an average of 30.9 (95 CI: 27.4 to 34.5) working days (full-day equivalent) absence per sufferer; the average estimated days of work lost per worker is only 0.55 (95 CI: 0.48 to 0.63) (see Table 30 and Table 31 in Appendix B). Note: since the average days lost per sufferer due to self-reported stress, depression or anxiety caused or made worse by a current or most recent job is only available as an average across all industrial sections and occupational groups, it is not possible to provide results disaggregated by occupations or sections for this cohort.

2.2.2. Results

Results for each major occupational group are shown in Table 4 for a cohort of 1,000 workers. For every 1,000 workers in each occupational group, the estimated value of lost productivity from absence due to stress, depression or anxiety caused or made worse by work is shown in column 2. The highest costs are experienced by "associate professional & technical occupations", with productivity losses of, on average, £83 per worker per year. The lowest costs are experienced by "sales and customer service occupations", with productivity losses of, on average, £19 per worker per year. Over all occupations, the average productivity loss is about £42 per worker per year.

The productivity gains (employer benefits) from the hypothetical intervention are shown in columns 3 through 7 (and in Figure 2). As the effectiveness of the intervention is assumed constant across all occupations, the size of the productivity gain is determined by the estimated value of lost productivity. Over all occupations, the average productivity gain ranges from about £2 (effectiveness = 5%) to £19 (effectiveness = 45%) per worker per year.

Results for each industrial section are shown in Table 5 for a cohort of 1,000 workers. Looking at column 2, the largest decrement in productivity is experienced by "public administration and defence", with productivity losses of, on average, £122 per worker per year. The lowest costs are experienced by "wholesale and retail trade", with productivity losses of, on average, £18 per worker per year. Over all industrial sections, the average

productivity loss is about £42 per worker per year.

Again, the productivity gains from the hypothetical intervention are shown in columns 3 through 7 (and in Figure 3). The largest (smallest) benefits accrue to those sections experiencing the largest (smallest) costs from absenteeism.

Table 4: Estimated cost of absence in cohort of 1,000 workers (central case) in each major occupational group, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Major Occupational Group	Estimated Cost of Absence in Cohort (mean absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	15 % Reduction in Absence Rate per Worker	25 % Reduction in Absence Rate per Worker	35 % Reduction in Absence Rate per Worker	45 % Reduction in Absence Rate per Worker
1	76,876	3,844	11,531	19,219	26,907	34,594
2	68,221	3,411	10,233	17,055	23,877	30,699
3	82,590	4,129	12,388	20,647	28,906	37,165
4	44,076	2,204	6,611	11,019	15,426	19,834
5	*	*	*	*	*	*
6	23,406	1,170	3,511	5,852	8,192	10,533
7	19,405	970	2,911	4,851	6,792	8,732
8	21,011	1,051	3,152	5,253	7,354	9,455
9	26,110	1,306	3,917	6,528	9,139	11,750
All occupations	41,485	2,074	6,223	10,371	14,520	18,668

Note: * indicates that sample numbers are too small to provide reliable estimates. 1 = Managers and senior officials; 2 = Professional occupations; 3 = Associate professional & technical occupations; 4 = Administrative and secretarial occupations; 5 = Skilled trades occupations; 6 = Personal service occupations; 7 = Sales and customer service occupations; 8 = Process, plant and machine operatives; and 9 = Elementary occupations.

If the cohort comprises 1,000 sufferers of work-related stress, depression or anxiety as opposed to 1,000 workers, the productivity costs and benefits of the hypothetical intervention increase significantly, since the number of working days lost per case is about 67 times higher than the number of working days lost per worker. For the central case assumptions – i.e. the median gross wage rate combined with the mean number of working days lost per case – the average productivity loss across all occupations / industrial sections is about £2,875 per sufferer per year. The average productivity gain from the hypothetical intervention ranges from about £145 (effectiveness = 5%) to

£1,295 (effectiveness = 45%) per sufferer per year.

Table 5: Estimated cost of absence in cohort of 1,000 workers (central case) in each industrial section, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Section	Estimated Cost of Absence in Cohort (mean absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	15 % Reduction in Absence Rate per Worker	25 % Reduction in Absence Rate per Worker	35 % Reduction in Absence Rate per Worker	45 % Reduction in Absence Rate per Worker
A & B	*	*	*	*	*	*
C & E	*	*	*	*	*	*
D	32,596	1,630	4,889	8,149	11,409	14,668
F	*	*	*	*	*	*
G	18,429	921	2,764	4,607	6,450	8,293
H	*	*	*	*	*	*
I	27,679	1,384	4,152	6,920	9,688	12,455
J	79,656	3,983	11,948	19,914	27,879	35,845
K	40,091	2,005	6,014	10,023	14,032	18,041
L	121,926	6,096	18,289	30,482	42,674	54,867
M	46,140	2,307	6,921	11,535	16,149	20,763
N	73,314	3,666	10,997	18,329	25,660	32,991
O	*	*	*	*	*	*
All sectors	42,783	2,139	6,417	10,696	14,974	19,252

Note: * indicates that sample numbers are too small to provide reliable estimates. A & B = Agriculture, hunting, forestry and fishing; C & E = Extractive and utility supply; D = Manufacturing; F = Construction; G = Wholesale and retail trade; H = Hotels and restaurants; I = Transport, storage and communication; J = Financial intermediation; K = Real estate, renting and business activities; L = Public administration and defence; M = Education; N = Health and social work; O = Other community, social and personal services.

Figure 2: Estimated benefits (productivity gains), by occupational major group, of hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort of workers per year) (cohort of 1,000 workers)

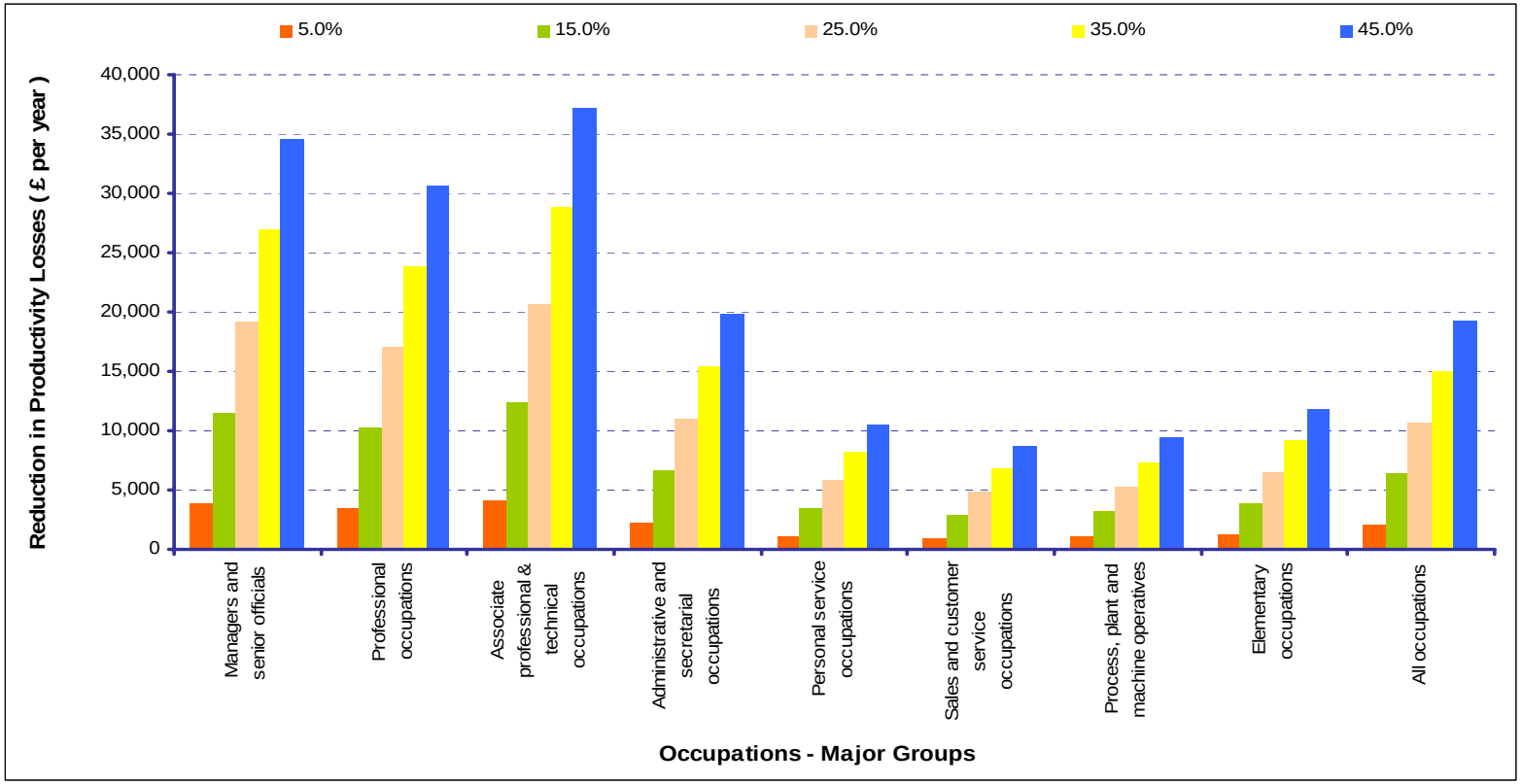
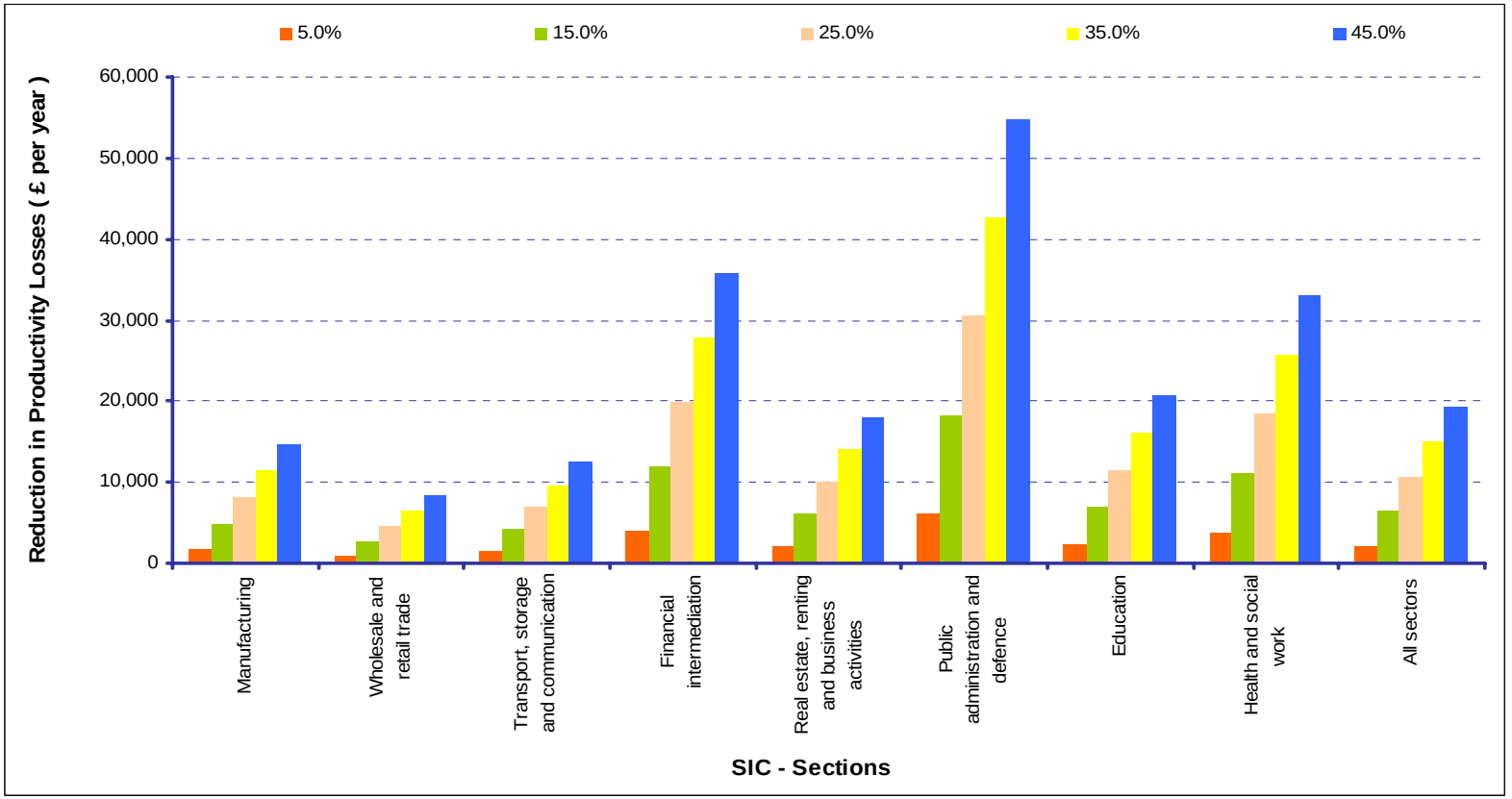


Figure 3: Estimated benefits (productivity gains), by industrial section, of hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort of workers per year) (cohort of 1,000 workers)



2.2.3. Sensitivity Analysis

The sensitivity of the results to the central case assumptions is tested below. Specific assumptions that are varied relate to: the baseline rate of absenteeism from work-related stress, depression or anxiety; and the approach to valuing productivity gains / losses from changes in absenteeism and presenteeism.

Baseline Rate of Sickness Absence

Table 6 and Table 7 show the estimated productivity costs of absence due to stress, depression or anxiety caused or made worse by work, based on the lower and upper 95% CI absence rate per worker, as opposed to the mean rate per worker. The results by occupational group are found in Table 6; the results by industrial section are found in Table 7. Looking at all occupations / industrial sections, the average productivity loss ranges from about £36 (lower 95 CI) to £48 (upper 95 CI) per worker per year. The productivity loss is about £42 per worker per year when using the mean baseline rate of absenteeism. The benefits of the hypothetical intervention now range from under £2 per worker per year (5% effectiveness) to about £22 per worker per year (45% effectiveness).

If the cohort comprises 1,000 sufferers of work-related stress, depression or anxiety as opposed to 1,000 workers, the productivity costs across all occupations / industrial sections range from about £2,550 (lower 95 CI) to £3,210 (upper 95 CI) per sufferer per year. The benefits of the hypothetical intervention now range from about £127 per worker per year (5% effectiveness) to about £1,445 per sufferer per year (45% effectiveness).

Method to Valuing Productivity Losses

Two alternative approaches to the conventional method for valuing the costs to employers of sickness absence – the Human Capital Method (HCM) – are proposed in the literature:

- Pauly et al (2002) argue that the HCM is only appropriate for workers performing discrete and measurable tasks in isolation; however, it fails to take into account the inter-dependence of job functions. Many jobs in the economy require workers to function as members of a team, where both the timing and performance of one worker affects that of others. As a result, when certain job characteristics are present (e.g. a perfect substitute worker cannot be found at the same level of

compensation, or production occurs in a 'team' setting) the consequences to employers of sickness absence could be significantly higher than a worker's total labour cost. Nicholson et al (2006) derived a set of multipliers that can be applied to a worker's gross wages to reflect the true costs of sickness absence to an employer. A multiplier of 1.00 suggests a simple job where productivity losses from absence are equal to the sick worker's gross wage rate; a multiplier greater than 1.00 suggests that a worker's absence affects the performance of others, in which case productivity losses are greater than the sick worker's gross wage rate. For short-term absence of 3-days, Nicholson et al estimate that the weighted average multiplier across 35 occupations is 1.44.

- In contrast to Pauly et al (2002), Koopmanschap et al (1995) argue that the HCM overestimates the true cost of lost productivity from sickness absence, since short-term absences may be partially compensated with greater effort or unpaid overtime. The authors proposed the so-called 'friction cost method' to estimate only the actual lost production, as opposed to the potential lost production. In their base-case estimations, Koopmanschap et al estimate the indirect costs of short-term sickness absence to be 80% of the average value of production (the gross wage rate)[9].

The calculations using the HCM presented above essentially assume a multiplier of 1.00. The sensitivity of the results to this assumption are tested using a multiplier of 0.80 and 1.44 – reflecting the two alternative approaches to the HCM for valuing productivity losses from absenteeism. Table 8 presents the results for a cohort of 1,000 workers assuming the mean rate of baseline absence in the workforce. Table 9 presents the results for a cohort of 1,000 workers using lower and upper 95 CI rate of baseline absence in the workforce. Given the linear nature of the model, a multiplier of 0.80 reduces all effects (absence costs and intervention benefits) by 20%, whereas a multiplier of 1.44 increases all effects by 44%.

[9] The friction cost method has been criticised in the literature for being inconsistent with neoclassical economic theory (see, for example, Johannesson and Karlsson, 1997).

Table 6: Estimated cost of absence in cohort of 1,000 workers (lower and upper 95% CI for baseline absenteeism) in each major occupational group, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Major Occupational Group	Estimated Cost of Absence in Cohort (lower 95 CI absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	Estimated Cost of Absence in Cohort (upper 95 CI absence rate per worker) - No Intervention	45 % Reduction in Absence Rate per Worker
1	47,663	2,383	104,552	47,048
2	46,010	2,300	90,433	40,695
3	55,453	2,773	110,906	49,908
4	29,135	1,457	58,270	26,221
5	*	*	*	*
6	10,887	544	35,381	15,922
7	9,496	475	29,726	13,377
8	7,396	370	35,298	15,884
9	12,789	639	38,899	17,505
All occupations	35,172	1,759	47,798	21,509

Note: * indicates that sample numbers are too small to provide reliable estimates. 1 = Managers and senior officials; 2 = Professional occupations; 3 = Associate professional & technical occupations; 4 = Administrative and secretarial occupations; 5 = Skilled trades occupations; 6 = Personal service occupations; 7 = Sales and customer service occupations; 8 = Process, plant and machine operatives; and 9 = Elementary occupations.

Table 7: Estimated cost of absence in cohort of 1,000 workers (lower and upper 95% CI for baseline absenteeism) in each industrial section, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Section	Estimated Cost of Absence in Cohort (lower 95 CI absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	Estimated Cost of Absence in Cohort (upper 95 CI absence rate per worker) - No Intervention	45 % Reduction in Absence Rate per Worker
A & B	*	*	*	*
C & E	*	*	*	*
D	17,875	894	47,317	21,293
F	*	*	*	*
G	8,873	444	27,302	12,286
H	*	*	*	*
I	8,509	425	47,157	21,220
J	41,035	2,052	118,277	53,224
K	21,101	1,055	59,081	26,587
L	73,156	3,658	166,263	74,819
M	27,308	1,365	65,915	29,662
N	51,320	2,566	91,643	41,239
O	*	*	*	*
All sectors	36,272	1,814	49,293	22,182

Note: * indicates that sample numbers are too small to provide reliable estimates. A & B = Agriculture, hunting, forestry and fishing; C & E = Extractive and utility supply; D = Manufacturing; F = Construction; G = Wholesale and retail trade; H = Hotels and restaurants; I = Transport, storage and communication; J = Financial intermediation; K = Real estate, renting and business activities; L = Public administration and defence; M = Education; N = Health and social work; O = Other community, social and personal services.

Table 8: Alternative approaches to valuing absenteeism - estimated cost of absence in cohort of 1,000 workers (mean rate of baseline absenteeism) and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (all occupations / industrial sections) (£ per cohort per year)

Assumed Multiplier	Estimated Cost of Absence in Cohort (mean absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	15 % Reduction in Absence Rate per Worker	25 % Reduction in Absence Rate per Worker	35 % Reduction in Absence Rate per Worker	45 % Reduction in Absence Rate per Worker
Human Capital Method (multiplier = 1.00)	42,783	2,139	6,417	10,696	14,974	19,252
Koopmanschap et al (1995) (multiplier = 0.80)	34,226	1,711	5,134	8,557	11,979	15,402
Nicholson et al (2005) (multiplier = 1.44)	61,607	3,080	9,241	15,402	21,562	27,723

Table 9: Alternative approaches to valuing absenteeism - estimated cost of absence in cohort of 1,000 workers (lower and upper 95% CI for baseline absenteeism) and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (low and high effectiveness) (all occupations / industrial sections) (£ per cohort per year)

Assumed Multiplier	Estimated Cost of Absence in Cohort (lower 95 CI absence rate per worker) - No Intervention	5 % Reduction in Absence Rate per Worker	Estimated Cost of Absence in Cohort (upper 95 CI absence rate per worker) - No Intervention	45 % Reduction in Absence Rate per Worker
Human Capital Method (multiplier = 1.00)	36,272	1,814	49,293	22,182
Koopmanschap et al (1995) (multiplier = 0.80)	29,018	1,451	39,434	17,745
Nicholson et al (2005) (multiplier = 1.44)	52,232	2,612	70,982	31,942

2.3. Presenteeism

The health of employees not only affects work-related absence, it also affects their productivity while at work. Indeed, Burton et al (1999) found the vast majority of productivity loss associated with health risks was the result of presenteeism (decreased work performance while at work) as opposed to short-term disability absence. Other research found the costs of presenteeism to an employer to substantially exceed the costs of absenteeism (see, for example, Collins et al, 2005 and Goetzel et al, 2004). In this

section the cost of presenteeism in a cohort of 1,000 workers and a 1,000 sufferers of work-related stress, depression or anxiety is estimated on the basis of evidence from the published literature.

2.3.1. Methodology

The main steps involved in estimating the effect on presenteeism of work-site interventions that promote mental wellbeing in the workplace are outlined below; the information flows are highlighted in Figure 4. The basic data can be found in Appendix B.

Baseline:

Step 1.	Collect data on the prevalence and rates of self-reported stress, depression or anxiety caused or made worse by current or most recent job. Source: the most recent year for which this data is available is 2004-05 (Jones et al, 2006). Mean, lower and upper 95 CI prevalent data are obtained, disaggregated by occupational major group and broad industrial sector. [**Output**: rates of work-related stress, depression or anxiety per 100 workers.]
Step 2.	Estimate the mean, lower and upper 95 CI number of cases of work-related stress, depression or anxiety in a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: number of cases of work-related stress, depression or anxiety per 1,000 workers.]
Step 3.	Search the effectiveness review evidence to identify information relating to the affect of work-related stress, depression or anxiety on the productivity of employees while at work. No relevant evidence was revealed, so a brief literature search was undertaken, which found 4 relevant studies (time constraints placed on the analysis ruled out a systematic literature review): • Burton et al (1999) found that on-the-job productivity losses among distressed workers averaged 4.72 more hours per week relative to non-distressed workers. This is equivalent to about 13% of total hours worked per week, given that the median number of hours worked per week in 2007 in the UK across all occupations / industrial sections is 37.0 per worker. • Greenberg et al (1993) estimated that workers lose as much as 20% of their productivity because of poor concentration, memory lapses, indecisiveness, fatigue, apathy, and lack of self-confidence when depressed – i.e. for every 100 hours worked, about 80 hours would result in full output, while 20 hours would result in no output. • Ozminkowski et al (2000) found that among the studied population of workers, self-reported losses in productivity on days when employees were at work, but suffering from depression, averaged about 25% - i.e. for every 100 hours worked, 75 hours would result

in full output, while 25 hours would result in no output.

- Collins et al (2005) found that among those workers in their sample that choose "depression, anxiety and stress" as their primary work-related health condition, productivity impairment averaged about 36% - i.e. for every 100 hours worked, 64 hours would result in full output, while 36 hours would result in no output.

[**Output**: % of paid hours lost while at work due to work-related stress, depression or anxiety.]

Step 4. Collect data on the median paid hours worked per week, disaggregated by occupational major group and broad industrial sector, and estimate the number of paid hours worked per day. Source: ONS (2007). [**Output**: paid hours worked per day.]

Step 5. Estimate the number of paid hours an employee is at work per year, by occupational major group and broad industrial sector. It is assumed that an employee takes 8 days sick leave per year (CIPD, 2006). It is also assumed that an employee takes a further 30 days off work per year for annual leave and public holidays. [**Output**: paid hours at work per employee per year *equals* paid hours worked per day *times* (52 weeks *times* 5 days *less* 38 days).]

Step 6. Estimate the number of paid work hours at work lost per year due to work-related stress, depression or anxiety in cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: number of paid hours lost per 1,000 workers per year *equals* the number of cases of work-related stress, depression or anxiety per 1,000 workers *times* (paid hours at work per employee per year *times* % of paid hours lost while at work due to work-related stress, depression or anxiety).]

Note: the number of paid work hours at work lost per year because of work-related stress, depression or anxiety is modelled for the following three levels of productivity impairment: minus 10% (i.e. 10 % of all paid worked hours result in zero output), minus 25% and minus 40%. The range of values used is designed to encompass the evidence collected during Step 3.

Step 7. Estimate the total labour costs per hour worked, disaggregated by occupational major group and broad industrial sector.

a. Collect data on gross median hourly pay. Source: ONS (2007). [**Output**: pay (£) per hour.]

b. Collect data on 'non-labour' costs not captured by the gross hourly pay data. Source: Eurostat. [**Output**: non-labour costs as a % of total labour costs.]

c. Use data obtained in Steps 7a and 7b to estimate total median labour costs per hour, disaggregated by occupational major group and broad industrial sector. [**Output**: total labour costs (£) per hour.]

Step 8. Compute the annual cost to the employer from presenteeism in a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: total annual cost (£) of impaired productivity while at work due to work-related stress, depression or anxiety *equals* total labour cost (£) per paid hour *times* the number of paid hours lost per 1,000 workers per year.]

Note: to estimate the cost of presenteeism as a result of work-related depression, anxiety or stress, the conventional HCM is used for the central case. As with the absence costs, the central case also combines the mean estimate of the prevalence of self-reported stress, depression or

anxiety caused or made worse by current or most recent job in the workforce, with the median gross hourly wage rate and the median number of hours worked per week. Again, the sensitivity of the results to the use of the HCM is tested using the multipliers of Koopmanschap et al (1995) and Nicholson et al (2006).

Intervention:

Step 9. Search the effectiveness review evidence for information relating to the effectiveness of work-site interventions on reducing presenteeism due to work-related stress, depression or anxiety. No relevant evidence was found, so a brief literature review was conducted, which found the following two relevant studies (time constraints placed on the analysis ruled out a systematic literature review):

- Burton et al (2006) investigated the association between changes in a number of work-related health risk factors and changes in presenteeism in a sample of about 7,000 employees over a period of 2-years between 2002 and 2004. They found that for each risk factor a employee no longer faced, productivity would increase by 1.9%. Looking specifically at stress as a risk factor, a move from high to low stress improved self-reported productivity by 3.1%. Burton et al (2005) found similar results in a study of one-time Health Risk Appraisal participants; each change (addition / removal) in a health risk factor was associated with a 2.4% change (increase / decrease) in self-reported productivity while at work. Note: the above effects are not induced by a particular intervention.
- Mills et al (2007) studied the affect of a work-site multi-component health promotion programme on a sample of 618 employees over a period of 12 months. They found that the mean reduction of 0.45 in health risk factors (of which one was stress) was associated with a mean increase of about 10% in on-the-job productivity. In other words, for each risk factor that an employee no longer faced, productivity while at work was estimated to increase by about 22%. Note: the above effect is not specific to a reduction in work-related stress, depression or anxiety, but rather represents the mean effect over the observed mean reduction in a range of health risk factors, one of which is work-related stress.

[**Output**: % improvement the productivity of employees suffering from work-related stress, depression or anxiety while at work.]

Step 10. Re-calculate the number of paid work hours at work lost per year due to work-related stress, depression or anxiety in cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: post-intervention number of paid hours lost per 1,000 workers per year *equals* the number of cases of work-related stress, depression or anxiety per 1,000 workers *times* (paid hours at work per employee per year *times* (% of paid hours lost while at work due to work-related stress, depression or anxiety adjusted for the output of Step 9)).]

Note: similar to the analysis of absenteeism, the calculations are not performed with respect to a specific intervention, but rather with respect to a 'hypothetical' work-site intervention, covering the full range of effectiveness values identified in Step 9 - that is: a 2% and 22% improvement

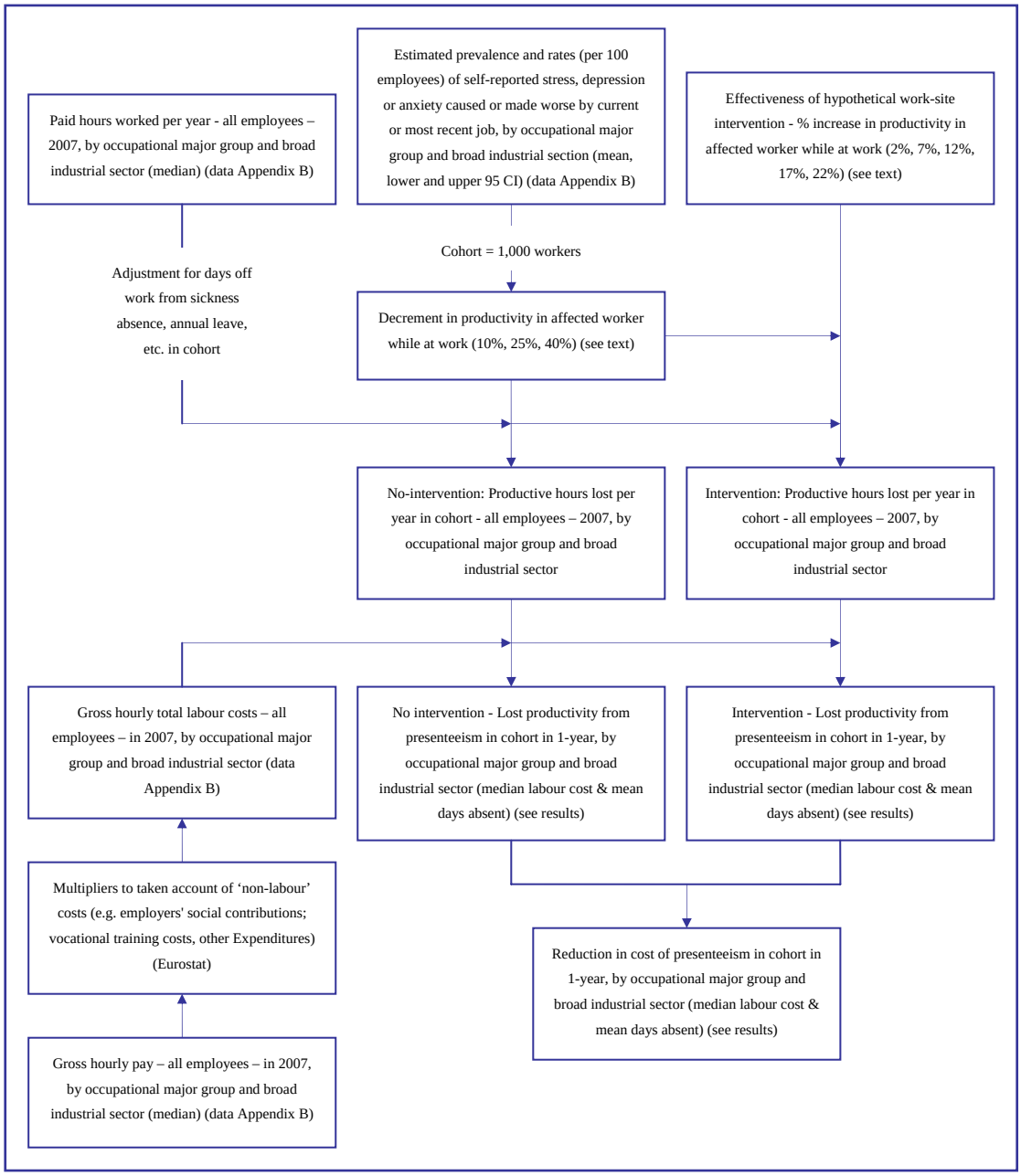
	in the baseline productivity of employees suffering with work-related stress, depression or anxiety (as well as intermediary improvements of 7%, 12% and 17%).
Step 11.	Repeat Steps 7 and 8 using the post-intervention number of paid work hours at work lost per year in cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: post-intervention total annual cost (£) of impaired productivity while at work due to work-related stress, depression or anxiety.] Note: it is assumed that the hypothetical intervention is equally effective across all occupations and industrial sections.
Step 12.	Determine the employer benefits of reduced presenteeism from the hypothetical intervention in a cohort of 1,000 workers in each occupational major group and broad industrial sector. [**Output**: reduction in total annual cost (£) of presenteeism due to work-related stress, depression or anxiety *equals* output from Step 8 *minus* output from Step 11.] Note: similar to the analysis of absenteeism, the results are calculated for a 1-year period only. The impact of the hypothetical intervention on work-related stress, depression or anxiety is thus essentially an annual benefit, and specifically, the annual benefit to employers once the full incremental effect of the intervention is realised, assuming that the full incremental effect is maintained for a full year.

2.3.2. Results

Results for each major occupational group are shown in Table 10 for a cohort of 1,000 workers. For every 1,000 workers in each occupational group, the estimated value of lost productivity from presenteeism due to stress, depression or anxiety caused or made worse by work is shown for 3-levels of baseline productivity impairment from the literature – minus 10%, 25% and 40%. The highest costs are experienced by "professional occupations", with productivity losses of, on average, £84 to £336 per worker per year. The lowest costs are experienced by "elementary occupations", with productivity losses of, on average, £8 to £31 per worker per year. Over all occupations, the weighted average productivity loss is about £27 to £109 per worker per year.

Results for each industrial section are shown in Table 11 for a cohort of 1,000 workers. The largest decrement in productivity is experienced by "public administration and defence", with productivity losses of between £61 and £246 per worker per year. The costs of presenteeism are very similar for "financial intermediation". The lowest costs are experienced by "wholesale and retail trade", with productivity losses of between £12 and £48 per worker per year. Over all industrial sections, the weighted average productivity loss is about £28 to £113 per worker per year.

Figure 4: Approach to estimating costs of presenteeism and the cost savings (benefits) from hypothetical work-site intervention to promote employee's mental wellbeing



Note: "all employees" means the weighted average across all male and female workers, both full-time and part-time.

The productivity gains (employer benefits), by major occupational group, from the hypothetical intervention are shown in Table 12 (baseline productivity impairment = minus 25%). As the effectiveness of the intervention is assumed constant across all occupations, the size of the productivity gain is determined by the estimated value of lost productivity. Thus the largest gains in on-the-job productivity are experienced by "professional occupations"; the smallest are experienced by "elementary occupations". Over all occupations, the weighted average productivity gain ranges from about £4 (effectiveness = 2%) to £46 (effectiveness = 22%) per worker per year.

Table 10: Estimated cost of presenteeism in cohort of 1,000 workers (central case) in each major occupational group (£ per cohort per year)

	10 % Productivity Impairment	25 % Productivity Impairment	40 % Productivity Impairment
Major Group	**Median Wage Rate - Mean Prevelance Rate**	**Median Wage Rate - Mean Prevelance Rate**	**Median Wage Rate - Mean Prevelance Rate**
1	61,993	154,983	247,973
2	83,959	209,899	335,838
3	50,545	126,363	202,180
4	24,473	61,183	97,893
5	10,956	27,389	43,823
6	10,425	26,062	41,700
7	9,468	23,670	37,871
8	12,919	32,298	51,676
9	7,788	19,471	31,153
All occupations	27,272	68,179	109,087

Note: 1 = Managers and senior officials; 2 = Professional occupations; 3 = Associate professional & technical occupations; 4 = Administrative and secretarial occupations; 5 = Skilled trades occupations; 6 = Personal service occupations; 7 = Sales and customer service occupations; 8 = Process, plant and machine operatives; and 9 = Elementary occupations.

The productivity gains, by industrial section, from the hypothetical intervention are shown in Table 13 (baseline productivity impairment = minus 25%). As with the major occupational groups, the largest (smallest) benefits accrue to those industrial sections experiencing the largest (smallest) costs from presenteeism.

Table 11: Estimated cost of presenteeism in cohort of 1,000 workers (central case) in each industrial section (£ per cohort per year)

	10 % Productivity Impairment	25 % Productivity Impairment	40 % Productivity Impairment
Section	**Median Wage Rate - Mean Prevelance Rate**	**Median Wage Rate - Mean Prevelance Rate**	**Median Wage Rate - Mean Prevelance Rate**
A & B	*	*	-
C & E	*	*	-
D	21,198	52,995	84,792
F	15,619	39,048	62,477
G	12,040	30,100	48,160
H	*	*	-
I	21,959	54,896	87,834
J	60,828	152,070	243,312
K	34,563	86,407	138,251
L	61,451	153,627	245,804
M	47,459	118,647	189,835
N	41,569	103,923	166,277
O	17,222	43,055	68,888
All sectors	28,125	70,312	112,500

Note: * indicates that sample numbers are too small to provide reliable estimates. A & B = Agriculture, hunting, forestry and fishing; C & E = Extractive and utility supply; D = Manufacturing; F = Construction; G = Wholesale and retail trade; H = Hotels and restaurants; I = Transport, storage and communication; J = Financial intermediation; K = Real estate, renting and business activities; L = Public administration and defence; M = Education; N = Health and social work; O = Other community, social and personal services.

Table 12: Estimated cost of presenteeism in cohort of 1,000 workers (central case) in each major occupational group assuming 25% decrement in on-the-job productivity, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Major Group	Estimated Cost of Presenteeism in Cohort (mean prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	7% Productivity Improvement	12% Productivity Improvement	17% Productivity Improvement	22% Productivity Improvement
1	154,983	9,299	32,546	55,794	92,990	102,289
2	209,899	12,594	44,079	75,564	125,939	138,533
3	126,363	7,582	26,536	45,491	75,818	83,399
4	61,183	3,671	12,848	22,026	36,710	40,381
5	27,389	1,643	5,752	9,860	16,434	18,077
6	26,062	1,564	5,473	9,382	15,637	17,201
7	23,670	1,420	4,971	8,521	14,202	15,622
8	32,298	1,938	6,783	11,627	19,379	21,316
9	19,471	1,168	4,089	7,009	11,682	12,851
All occupations	68,179	4,091	14,318	24,545	40,908	44,998

Note: 1 = Managers and senior officials; 2 = Professional occupations; 3 = Associate professional & technical occupations; 4 = Administrative and secretarial occupations; 5 = Skilled trades occupations; 6 = Personal service occupations; 7 = Sales and customer service occupations; 8 = Process, plant and machine operatives; and 9 = Elementary occupations.

Table 13: Estimated cost of presenteeism in cohort of 1,000 workers (central case) in each industrial section assuming 25% decrement in on-the-job productivity, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Section	Estimated Cost of Presenteeism in Cohort (mean prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	7% Productivity Improvement	12% Productivity Improvement	17% Productivity Improvement	22% Productivity Improvement
A & B	*	*	*	*	*	*
C & E	*	*	*	*	*	*
D	52,995	3,180	11,129	19,078	31,797	34,977
F	39,048	2,343	8,200	14,057	23,429	25,772
G	30,100	1,806	6,321	10,836	18,060	19,866
H	*	*	*	*	*	*
I	54,896	3,294	11,528	19,763	32,938	36,232
J	152,070	9,124	31,935	54,745	91,242	100,366
K	86,407	5,184	18,145	31,106	51,844	57,028
L	153,627	9,218	32,262	55,306	92,176	101,394
M	118,647	7,119	24,916	42,713	71,188	78,307
N	103,923	6,235	21,824	37,412	62,354	68,589
O	43,055	2,583	9,042	15,500	25,833	28,416
All sectors	70,312	4,219	14,766	25,312	42,187	46,406

Note: * indicates that sample numbers are too small to provide reliable estimates. A & B = Agriculture, hunting, forestry and fishing; C & E = Extractive and utility supply; D = Manufacturing; F = Construction; G = Wholesale and retail trade; H = Hotels and restaurants; I = Transport, storage and communication; J = Financial intermediation; K = Real estate, renting and business activities; L = Public administration and defence; M = Education; N = Health and social work; O = Other community, social and personal services.

Figure 5: Estimated benefits (productivity gains from baseline levels of presenteeism), by occupational group, of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort of workers per year) (cohort of 1,000 workers)

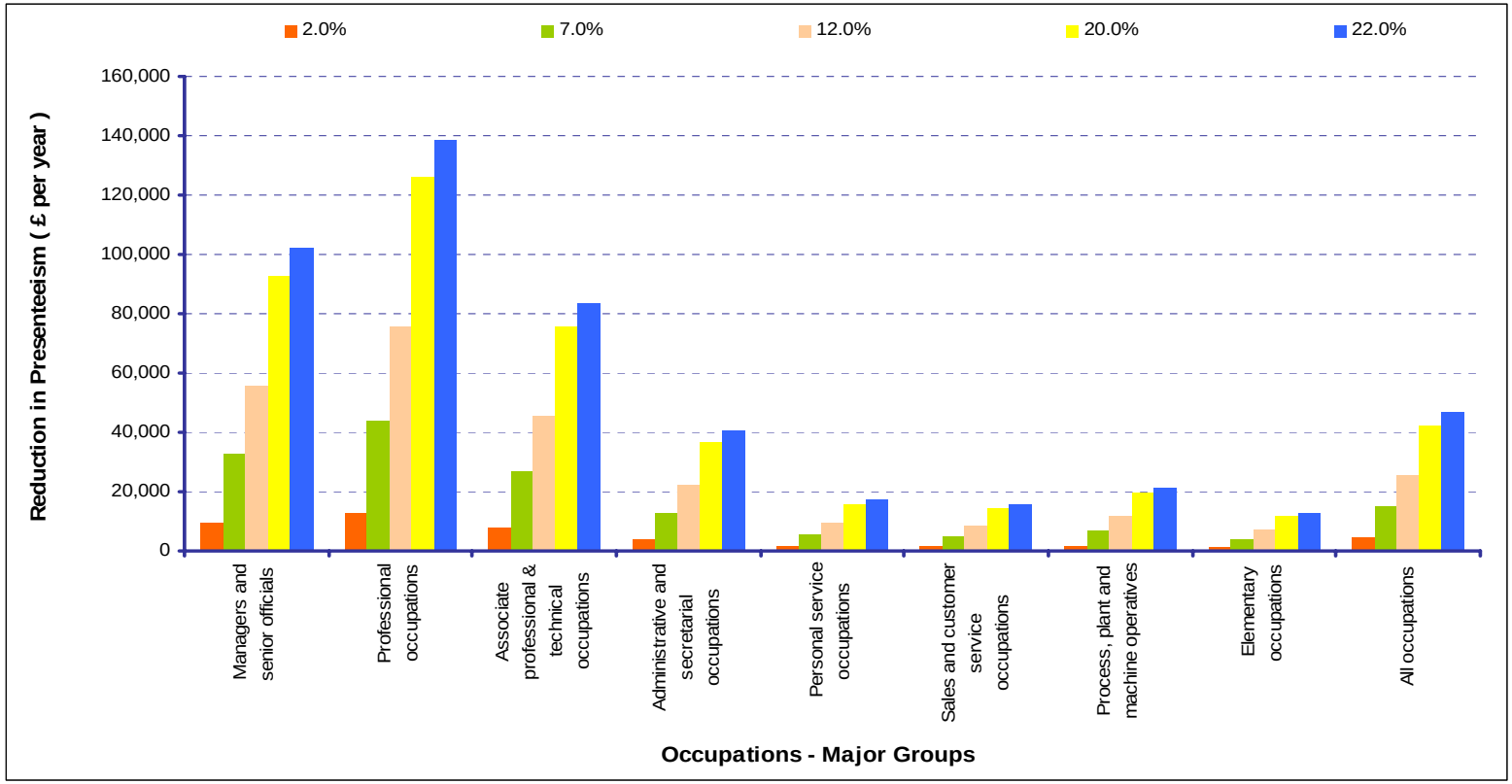
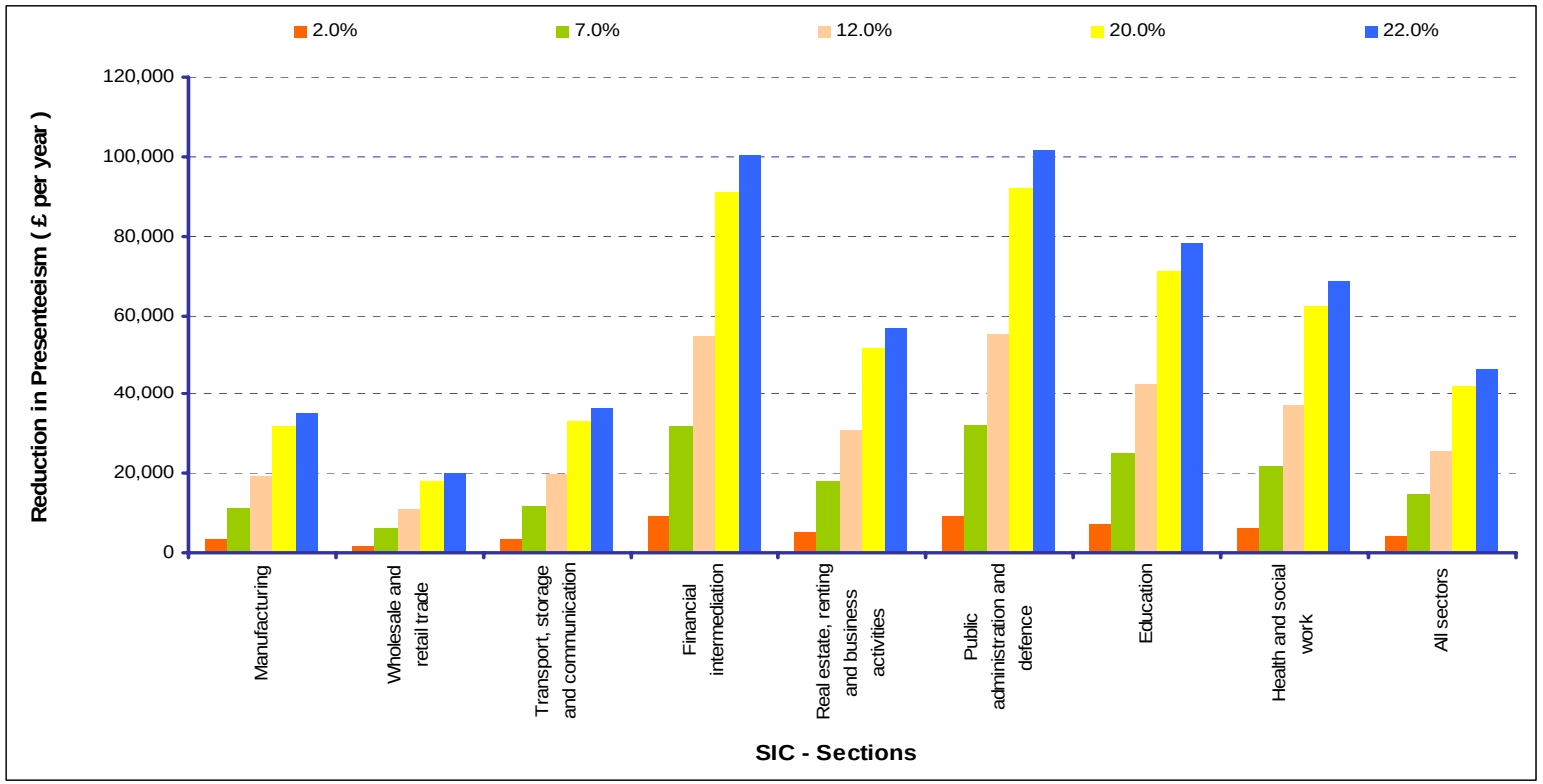


Figure 6: Estimated benefits (productivity gains from baseline levels of presenteeism), by industrial section, of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort of workers per year) (cohort of 1,000 workers)



If the cohort comprises 1,000 sufferers of work-related stress, depression or anxiety as opposed to 1,000 workers, the costs of presenteeism and benefits of the hypothetical intervention both increase significantly, since the decrement in productivity is experienced by 1,000 people as opposed to solely 12 people[10]. For the central case assumptions – i.e. the median gross wage rate combined with the mean prevalence rate – the cost of presenteeism across all occupations / industrial sections ranges from £2,345 (10% decrement in productivity) to £9,375 (40% decrement in productivity) per sufferer per year; the loss is £5,860 per sufferer per year assuming a decrement in productivity of 25%. Relative to a baseline productivity impairment of 25%, the average productivity gain from the hypothetical intervention ranges from about £350 (effectiveness = 2%) to £3,865 (effectiveness = 22%) per sufferer per year.

2.3.3. Sensitivity Analysis

The sensitivity of the results to the central case assumptions is tested below. Specific assumptions that are varied relate to: the baseline prevalence rate in the working population; and the approach to valuing productivity losses.

Baseline Prevalence Rate

Table 14 and Table 15 show the estimated costs of presenteeism due to stress, depression or anxiety caused or made worse by work, based on the lower and upper 95% CI prevalence rate per worker, as opposed to the mean rate per worker. The results by occupational group are found in Table 14; the results by industrial section are found in Table 15.

Looking at all occupations / industrial sections, the average productivity loss due to presenteeism ranges from about £65 (lower 95 CI) to £75 (upper 95 CI) per worker per year. The productivity loss is close to £70 per worker per year when using the mean prevalence rate in the workforce. The benefits of the hypothetical intervention now range from just under £4 per worker per year (2% effectiveness) to about £50 per worker per year (22% effectiveness).

[10] For every 100 people working in the last 12-months (2004-05) 1.20 reported stress, depression or anxiety caused or made worse by current or most recent job (see Appendix B).

Table 14: Estimated cost of presenteeism (assuming 25% decrement in productivity) in cohort of 1,000 workers (lower and upper 95% CI for baseline absenteeism) in each major occupational group, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Major Group	Estimated Cost of Presenteeism in Cohort (lower 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	Estimated Cost of Presenteeism in Cohort (upper 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	22% Productivity Improvement
1	125,924	7,555	184,042	121,468
2	179,913	10,795	249,879	164,920
3	104,063	6,244	148,662	98,117
4	51,770	3,106	75,302	49,699
5	16,434	986	38,345	25,308
6	16,803	1,008	34,293	22,633
7	16,387	983	31,213	20,600
8	19,590	1,175	45,005	29,703
9	13,092	786	25,849	17,060
All occupations	62,498	3,750	73,861	48,748

Note: * indicates that sample numbers are too small to provide reliable estimates. 1 = Managers and senior officials; 2 = Professional occupations; 3 = Associate professional & technical occupations; 4 = Administrative and secretarial occupations; 5 = Skilled trades occupations; 6 = Personal service occupations; 7 = Sales and customer service occupations; 8 = Process, plant and machine operatives; and 9 = Elementary occupations.

Table 15: Estimated cost of presenteeism (assuming 25% decrement in productivity) in cohort of 1,000 workers (lower and upper 95% CI for baseline absenteeism) in each industrial section, and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (£ per cohort per year)

Section	Estimated Cost of Presenteeism in Cohort (lower 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	Estimated Cost of Presenteeism in Cohort (upper 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	22% Productivity Improvement
A & B	*	*	*	*
C & E	*	*	*	*
D	39,746	2,385	66,244	43,721
F	22,313	1,339	55,783	36,817
G	22,360	1,342	37,840	24,975
H	*	*	*	*
I	35,521	2,131	77,501	51,150
J	106,449	6,387	190,087	125,458
K	66,467	3,988	106,347	70,189
L	125,695	7,542	188,543	124,438
M	94,917	5,695	142,376	93,968
N	86,603	5,196	121,244	80,021
O	26,033	1,562	60,077	39,651
All sectors	64,453	3,867	76,172	50,273

Note: * indicates that sample numbers are too small to provide reliable estimates. A & B = Agriculture, hunting, forestry and fishing; C & E = Extractive and utility supply; D = Manufacturing; F = Construction; G = Wholesale and retail trade; H = Hotels and restaurants; I = Transport, storage and communication; J = Financial intermediation; K = Real estate, renting and business activities; L = Public administration and defence; M = Education; N = Health and social work; O = Other community, social and personal services.

Method to Valuing Productivity Losses

Two alternative approaches to the conventional HCM method for valuing the costs of presenteeism are tested – namely the approach of Pauly et al (2002) / Nicholson et al (2006) and the approach of Koopmanschap et al (1995).

Table 16 presents the results for a cohort of 1,000 workers assuming the mean prevalence rate of stress, depression or anxiety caused or made worse by work. Table 17 presents the results for a cohort of 1,000 workers using lower and upper 95 CI prevalence rates. As noted above in the section on absence costs, given the linear nature of the model, the multiplier of Koopmanschap et al (0.80) reduces all effects (presenteeism costs and intervention benefits) by 20%, whereas the multiplier of Nicholson et al (1.44) increases all effects by 44%.

Table 16: Alternative approaches to valuing presenteeism - estimated cost of presenteeism in cohort of 1,000 workers (mean prevalence rate) and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (assuming 25% decrement in on-the-job productivity) (all occupations / industrial sections) (£ per cohort per year)

Assumed Multiplier for Absenteeism	Estimated Cost of Presenteeism in Cohort (mean prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	7% Productivity Improvement	12% Productivity Improvement	17% Productivity Improvement	22% Productivity Improvement
Human Capital Method (multiplier = 1.00)	70,312	4,219	14,766	25,312	42,187	46,406
Koopmanschap et al (1996) (multiplier = 0.80)	56,250	3,375	11,812	20,250	33,750	37,125
Nicholson et al (2005) (multiplier = 1.44)	101,250	6,075	21,262	36,450	60,750	66,825

Table 17: Alternative approaches to valuing presenteeism - estimated cost of presenteeism in cohort of 1,000 workers (lower and upper 95% CI prevalence rate) and the benefits of the hypothetical work-site intervention to promote the mental wellbeing of employees (low and high effectiveness) (assuming 25% decrement in on-the-job productivity) (all occupations / industrial sections) (£ per cohort per year)

Assumed Multiplier for Absenteeism	Estimated Cost of Presenteeism in Cohort (lower 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	2% Productivity Improvement	Estimated Cost of Presenteeism in Cohort (lower 95 CI prevalence rate ; 25% decrement in productivity) - No Intervention	22% Productivity Improvement
Human Capital Method (multiplier = 1.00)	64,453	3,867	76,172	50,273
Koopmanschap et al (1996) (multiplier = 0.80)	51,562	3,094	60,937	40,219
Nicholson et al (2005) (multiplier = 1.44)	92,812	5,569	109,687	72,393

2.4. Key Findings

2.4.1. Absenteeism

- Over all occupations / industrial sections, the cost of absenteeism due to stress, depression or anxiety caused or made worse by work is about £42 per worker per year. That is, sickness absence due to work-related stress depression or anxiety costs employers about £42 per year averaged over all workers they employ.
    - In terms of occupational major groups: The highest absence costs are experienced by “associate professional & technical occupations” (absence costs = £83 per worker per year); the lowest costs are experienced by “sales and customer service occupations” (absence costs = £19 per worker per year).
    - In terms of industrial sections: The highest absence costs are

experienced by "public administration and defence" (absence costs = £122 per worker per year); the lowest absence costs are experienced by "wholesale and retail trade" (absence costs = £18 per worker per year).

- The savings in absence costs from a hypothetical work-site intervention to promote the mental wellbeing of employees ranges from about £1.8 (assumed effectiveness = 5%) to £19 (assumed effectiveness = 45%) per worker per year. As the effectiveness of the intervention is assumed constant across all occupations / industrial sections, the size of the productivity gain is directly proportional to the estimated absence cost by occupation / industrial section. That is, the occupations / industrial sections with the highest (lowest) absence cost per worker have the largest (smallest) cost saving per worker from the intervention.
- If the cohort comprises 1,000 sufferers of work-related stress, depression or anxiety, the cost of absenteeism, across all occupations / industrial sections is about £2,875 per sufferer per year. The average savings in absence costs from the hypothetical intervention ranges from about £145 (assumed effectiveness = 5%) to £1,295 (assumed effectiveness = 45%) per sufferer per year.
- The above estimates define the 'central case' (assumptions = Human Capital Method used to value each hour of sickness absence, based on the median gross wage rate, the median paid hours worked per week, and the mean rate of absence per worker per year). Using two alternative approaches to valuing each hour of sickness absence in combination with the lower and upper 95 CI rate of absence per worker per year, the savings in absence costs from the hypothetical work-site intervention now ranges from about £1.5 (assumed effectiveness = 5%) to £32 (assumed effectiveness = 45%) per worker per year.
- It should be noted that improvements in absence levels due to stress, depression or anxiety caused or made worse by work cost savings, brought about by the hypothetical intervention, are based on evidence from three studies identified from the effectiveness review.

2.4.2. Presenteeism

- Over all occupations / industrial sections, the cost of presenteeism due to stress, depression or anxiety caused or made worse by work is about £27 (10% decrement in productivity) to £109 (40% decrement in productivity) per worker per year. That is, reductions in the on-the-job productivity of employees suffering from work-related stress depression or anxiety costs employers about £27 to £109 per year averaged over all workers they employ.
    - In terms of major occupational groups: The highest presenteeism costs are experienced by “professional occupations” (productivity losses = £84 to £336 per worker per year); the lowest costs are experienced by “occupations” (productivity losses = £8 to £31 per worker per year).
    - In terms of industrial sections: The highest presenteeism costs are experienced by “public administration and defence” (productivity losses = £61 to £246 per worker per year); the lowest costs are experienced by “wholesale and retail trade” (productivity losses = £12 to £48 per worker per year).
- The productivity gain (reduction in presenteeism) from a hypothetical work-site intervention to promote the mental wellbeing of employees ranges from about £4 (assumed effectiveness = 2%, assumed baseline productivity impairment = 25%) to £46 (assumed effectiveness = 22%, assumed baseline productivity impairment = 25%) per worker per year. As with absenteeism, the occupations / industrial sections with the highest (lowest) presenteeism cost per worker have the largest (smallest) productivity gain per worker from the intervention.
- If the cohort comprises 1,000 sufferers of work-related stress, depression or anxiety, the cost of presenteeism across all occupations / industrial sections ranges from £2,345 (10% decrement in productivity) to £9,375 (40% decrement in productivity) per sufferer

per year. Relative to a baseline decrement in productivity of 25%, the productivity gain from the hypothetical intervention ranges from about £350 (assumed effectiveness = 2%) to £3,865 (assumed effectiveness = 22%) per sufferer per year.

- The above estimates define the 'central case'. Using two alternative approaches to valuing each hour of productive work lost in combination with the lower and upper 95 CI prevalence rate per worker, the productivity gain from the hypothetical work-site intervention now ranges from about £3 (assumed effectiveness = 2%, assumed baseline productivity impairment = 25%) to £72 (assumed effectiveness = 22%, assumed baseline productivity impairment = 25%) per worker per year.
- It should be noted that both the impact of work-related stress, depression or anxiety on productivity while at work, and the improvement in baseline productivity brought about by the hypothetical intervention, are based on only a handful of studies not identified through a systematic review.
- Furthermore, the above effectiveness values were not derived from intervention-induced improvements in on-the-job productivity due specifically to reductions in work-related stress, depression or anxiety; but rather represent observed improvements in on-the-job productivity resulting from reductions in exposure to a range of health risk factors at work, one of which is work-related stress.

3. COST-UTILITY ANALYSIS

3.1. Introduction

The studies included in the effectiveness review considered an extremely varied range of individual-level and organisational-level interventions. The measurement of health outcomes across the studies was equally varied – with at least 15 different outcome measures used. Despite the number of different outcome measures used, no study measured health effects in terms of QALYs gained. As a consequence, a rather pragmatic approach is adopted to generating incremental cost-effectiveness ratios (ICERs), in which the analysis is based on a restricted set of studies from the effectiveness review (recall Table 1) where health outcomes are measured on a scale that can be transformed into QALYs gained.

3.2. Methodology

The main steps involved in generating incremental cost-effectiveness ratios for work-site interventions that promote mental wellbeing in the workplace are outlined below.

Step 1. Identify those studies in the effectiveness review where the health outcomes are measured on a scale that can be converted, directly or indirectly, into QALYs gained.

Of the 67 studies included in the effectiveness review, only two used an outcome measure that could be directly converted into utility values from which QALYs gained could be estimated:

- Butterworth et al (2006) used the Short Form (SF-12) Health Survey; and
- Atlantis et al (2004) used the Short Form (SF-36) Health Survey.

However, it was only possible to map the scores from Butterworth et al (2006) onto the SF-6D six-dimensional health classification, from which utility values are calculated.

A further 5 studies used an outcome measure that could be indirectly converted into QALYs gained following the method of Lave et al (1998), Simon et al (2000, 2001a and 2001b) (see Box 1 for a description of this method). The 6 studies are:

- Bond and Bunce (2000) and Jones and Johnston (2000) both used the Beck Depression Inventory (BDI); and
- Maes et al (1998), Wilson et al (2001) and Bergdahl et al (2005) all used the SCL-90.

However, Bond and Bunce (2000) could not be used as the BDI scores at baseline and follow-up were below the threshold for 'depression free'. For similar reasons Maes et al (1998) could not be used. Wilson et al (2001) did not report SCL-90 scores are follow-up, so it could also not be used.

Thus, in total, evidence from only 3 studies in the effectiveness review could be used as a basis for the cost-utility analysis – namely: Bergdahl et al (2005) (henceforth referred to as intervention **1**), Jones and Johnston (2000) (intervention **2**) and Butterworth et al (2006) (intervention **3**). Details of these 3 studies are provided in Table 18.

Step 2. Estimate the QALYs gained from the interventions implemented in each of the three studies.

a. For each of the 3 interventions, calculate the relative change in score / utility level between the intervention and control groups, by applying the percentage change in the control group to the observed baseline score / utility level in the intervention group, and then contrasting this with the observed score / utility level for the intervention group at each follow-up:

- Intervention 1: Intervention and control group score at baseline = 0.72; intervention group score at follow-up (5 weeks) = 0.57; control group score at follow-up (5 weeks) = 0.69.
- Intervention 2: Intervention and control group score at baseline = 9.20; intervention group score at 1st follow-up (7 weeks) = 5.20; control group score at 1st follow-up (7 weeks) = 11.26; intervention group score at 2nd follow-up (19 weeks) = 4.00; control group score at 2nd follow-up (19 weeks) = 9.00.
- Intervention 3: Intervention and control group utility level at baseline = 0.752; intervention group utility level at follow-up (12 weeks) = 0.801; control group utility level at follow-up (12 weeks) = 0.754.

b. For Intervention 1 and Intervention 2 calculate the number of DFDs gained between baseline and the last follow-up for a cohort of 1,000 workers, using the method presented in Box 1. In addition, calculate the number of DFDs gained from the last follow-up until the end of the year. Together these estimates provide an indication of the incremental effect of the intervention in its first year.

Note: it is assumed that the intervention is implemented at the beginning of the year. It is further assumed that the incremental effect at the last follow is maintained until year end.

c. For Intervention 1 and Intervention 2 transform the number of DFDs gained by the cohort at follow-up and over the first year into QALYs gained, assuming that each DFD gained results in between about 0.00055 and 0.00110 additional QALYs (see Box 1).

Note: for the central case each DFD gained is assumed to result in about 0.00082 additional QALYs, which is the mid-point of the above values.

d. For Intervention 3 calculate the QALYs gained between baseline and the last follow-up for a cohort of 1,000 workers. In addition, calculate the QALYs gained from the last follow-up until the end of the year.

Note: it is assumed that the intervention is implemented at the beginning of the year. In addition, it is assumed that utility levels in the intervention and control groups change linearly between baseline and follow-up. It is further assumed that the incremental effect at the last follow is maintained until year end. Also, given the single year time horizon for the analysis,

QALYs gained over the course of the year are not discounted.

Step 3. Calculate the total costs of implementing each of the interventions for a cohort of 1,000 workers. Detailed unit costs and total costs per employee for Intervention 1, Intervention 2 and Intervention 3 can be found in Table 42, Table 43 and Table 44, respectively, in Appendix C.

Step 4. Calculate the ICERs for each of the 3 interventions. Three sets of ratios are estimated for each intervention, each one employing a different measure of cost in the numerator:

$$\text{ICER}_{i\,=\,1,2,3} = \frac{\text{total cost}_{\text{intervent.}} - \text{total cost}_{\text{baseline}}}{\text{effect}_{\text{intervent.}} - \text{effect}_{\text{baseline}}}$$

Where:

$i = 1$ = Numerator defines the total incremental cost of the intervention.

$i = 2$ = Numerator defines the total incremental cost of the intervention *less* incremental productivity gains from reduced absenteeism (from Section 2.2).

$i = 3$ = Numerator defines the total incremental cost of the intervention *less* incremental productivity gains from reduced absenteeism *less* incremental productivity gains from reduced presenteeism (from Section 2.3).

The latter measure of incremental cost ($i = 3$) defines the net cost to the employer of implementing the intervention. If the net cost to the employer is negative, this implies that the employer will accrue a net-benefit from implementing the intervention.

Note: the baseline cost is assumed equal to zero – i.e. the incremental cost-effectiveness of each intervention is measured relative to "doing nothing". Since all the costs of each of the 3 interventions are incurred in a single year, discounting is not necessary.

Note: the central case values for intervention-induced reductions in absenteeism and presenteeism are used when computing the ICERs using numerator $i = 2$ and $i = 3$. Recall that the productivity gains estimated in Sections 2.2 and 2.3 are assumed to be typical of work-site interventions to promote the mental wellbeing of employees. By integrating these productivity gains into the estimated ICERs it is assumed that Interventions 1-3 will lead to reductions in absenteeism and presenteeism similar to those found in the evidence reviewed in Section 2.

Note: when including the benefits of reduced absenteeism and presenteeism costs into the ICER numerator, it is assumed that these cost savings change linearly between baseline (no cost saving) and follow-up (full cost saving realised). It is further assumed that the full cost saving at the last follow-up is maintained until year end.

Box 1: Derivation of Depression Free Days (DFD) and QALYs gained

The method of Lave et al (1998) uses depression severity data from two (or more) consecutive outcome assessments to estimate depression severity for each day during an interval (by linear interpolation). Using the SCL-90 as a example, days with an SCL-90 depression score of 0.50 or less are considered 'depression free'. On days with an SCL-90 depression score of 2.00 or higher the subject is considered 'fully symptomatic.' Days with intermediate severity scores are assigned a value between 0.50 (depression free) and 2.00 (fully symptomatic) by linear interpolation – e.g. days with an SCL-90 score of 1.25 would be considered 50% depression free. Values at each follow-up interval are then summed to yield the total number of Depression-free Days (DFDs) during the follow-up period.

Three measures of DFDs are currently found in the literature:

- The SCL-90 derivation of DFDs – as explained above (e.g. Simon et al, 2000 and 2001b);
- The BDI derivation of DFDs - if subjects have a BDI score of 22 or higher, they are assumed to lack a DFD, when scoring 8 or lower, they are assumed to have a full DFD, and if they score between 8 and 22, the day is weighted proportionately (e.g. Lave et al, 1998); and
- The Hamilton Rating Scale Depression (HRSD) derivation of DFDs – if subjects have a HRSD score of 22 or higher, they are assumed to lack a DFD, when scoring 7 or lower, they are assumed to have a full DFD, and if they score between 7 and 22, the day is weighted proportionately (e.g. Lave et al, 1998; and Simon et al 2001a).

The transition from fully symptomatic depression (no DFD) to full remission (full DFD) is associated with an improvement in health utility of between 0.2 and 0.4 - i.e. an increase of 0.2 to 0.4 quality-adjusted life years per year (Wells and Sherbourne, 1999; Unutzer et al 2000; Revicki and Wood, 1998; Fryback et al 1993; and Pyne et al, 1997). Each DFD gained is therefore assumed to result in between about 0.00055 (0.2 *divided* by 365) and 0.00110 (0.4 *divided* by 365) additional QALYs (Rost et al, 2005).

Table 18: Description of Intervention and Components

Study	Intervention Type	Intervention Component	Outcome Measure of Interest	Effect at Baseline	Effect at Intervention
Intervention 1: Bergdahl et al (2005)	Individual – stress management programme	• Group session per week for seven weeks (2-hr duration). Four groups of 6-7. • 2 psychologists per group per session. • Handouts for each session (unspecified).	SCL-90	Treatment (n=20): mean score = 0.72. Controls (n=17): mean score = 0.82.	At 5-weeks: Treatment: mean score = 0.57. Controls: mean score = 0.70.
Intervention 2: Jones and Johnston (2000)	Individual – stress management programme	• 6 group sessions (2-hr duration). • 1 trained facilitator per session. • Handouts for each session (unspecified). • Incentives to participate (one-off prize and reimbursement of travel expenses).	BDI	Treatment (n=40): mean score = 9.2. Controls (n=39): mean score = 9.4 .	At 7-weeks: Treatment: mean score =4.2. Controls: mean score = 11.5. At 19-weeks: Treatment: mean score =4.0. Controls: mean score = 9.2.
Intervention 3: Butterworth et al (2006)	Individual – stress management programme	• Health coaching with minimum of 1 initial session + 2 follow-up contacts; each session = 30 minutes. • Each session run by trained health professional (unspecified). • Independent verification (unspecified).	SF-12 (PCS and MCS)	Treatment (n=145): mean SF-6D value = 0.752. Controls (n=131): mean SF-6D value = 0.834.	At 3-months: Treatment: mean SF-6D value = 0.801. Controls: mean SF-6D value = 0.836.

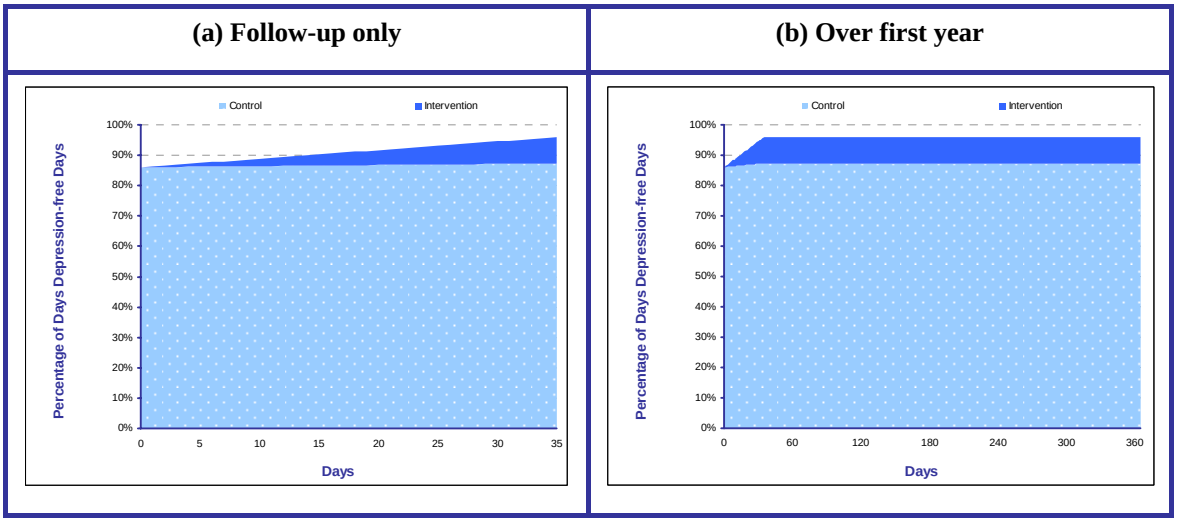
Note: "unspecified" means that no further detail is provided in the study on that component.

3.3. Results

Figure 7 and Figure 8 show the percentage of days at baseline and follow-up, and up to 1-year post introduction of the intervention, for respectively, Intervention 1 and Intervention 2. The dark blue shaded area in each panel defines the total DFD gain from the intervention. For example, looking at panel (a) in Figure 7, at baseline 86% of all days experienced by both the intervention and control groups are depression free. At follow-up 96% of all days experienced by the intervention group are depression free, whereas on 87% of days in the control group are depression free. Over the 35 day follow-up period, an individual in the control group experiences a total of about 31 DFDs; the intervention group a total of about 33 DFDs. Thus, during the follow-up period the intervention results in gain of about 2 DFDs per subject.

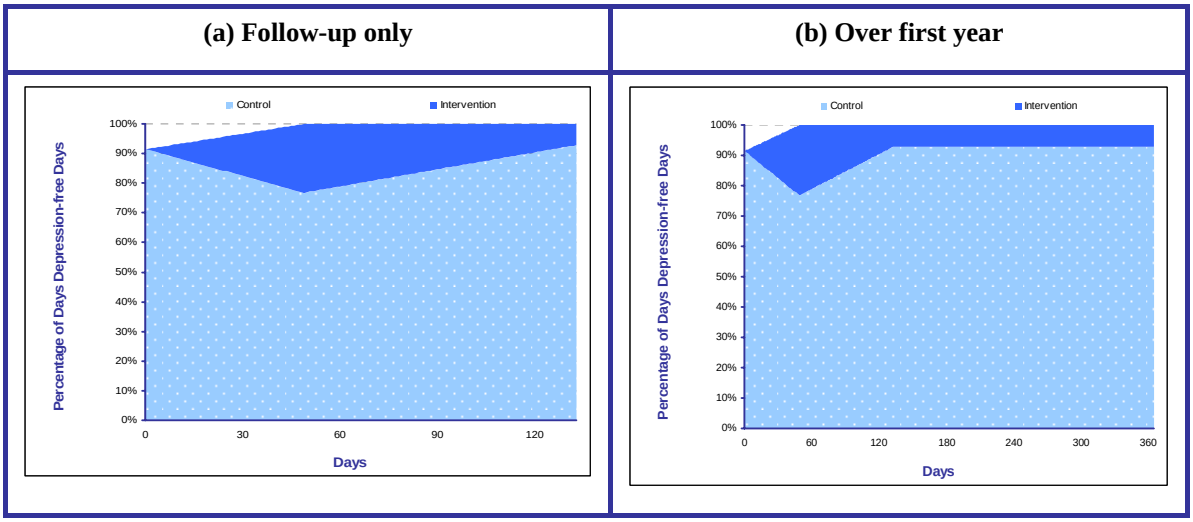
The total DFD gain in a cohort of 1,000 workers subject to Intervention 1 and Intervention 2 is shown in Table 19. The total DFD gain in the cohort after 1-year is about 30,150 with Intervention 1 and about 35,050 with Intervention 2.

Figure 7: Intervention 1: Bergdahl et al (2005): Mean percentage gain of depression-free days during follow-up and up to 1-year post introduction of intervention (darker blue area defines gain in DFDs from intervention)



Note: for panel (b) it is assumed that the effect at follow-up is maintained in cohort until end of 1-year.

Figure 8: Intervention 2: Jones and Johnston (2000): Mean percentage gain of depression-free day during follow-up and up to 1-year post introduction of intervention (darker blue area defines gain in DFDs from intervention)



Note: for panel (b) it is assumed that the effect at follow-up is maintained in cohort until end of 1-year.

Table 19: Total DGD gain in cohort of 1,000 workers subject to Intervention 1: Bergdahl et al (2005); and Intervention 2: Jones and Johnston (2000)

Intervention	Total DFD Gain (first year)	Total DFD Gain (follow-up only)
	(DFD per cohort)	(DFD per cohort)
1: Bergdahl et al (2005)	30,160	1,560
2: Jones and Johnston (2000)	35,045	18,473

Note: the last follow-up with Intervention 1 occurred at week 5; the last follow-up with Intervention 2 occurred at week 19.

The QALYs gained by a cohort of 1,000 workers subject to Intervention 1 and Intervention 2 are shown in Table 20. The estimated QALY gain at 1-year for the cohort of workers subject to Intervention 1 and Intervention 2 is, respectively, about 24.3 QALYs (0.0243 per worker) and 28.4 QALYs (0.0284 per worker).

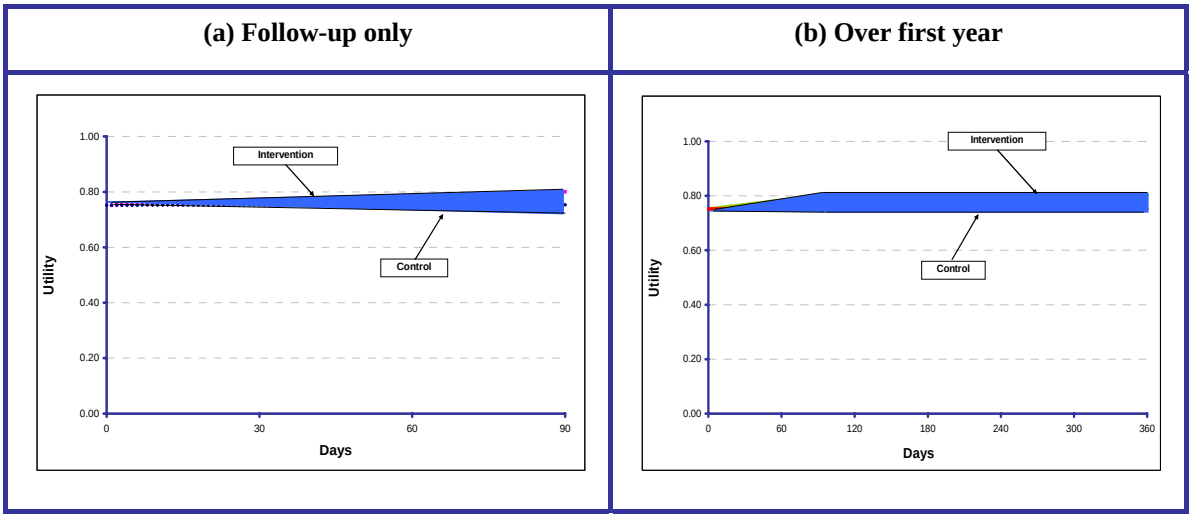
Table 20: Total QALY gain in cohort of 1,000 workers subject to Intervention 1: Bergdahl et al (2005); and Intervention 2: Jones and Johnston (2000)

Intervention	Total QALY Gain (first year)	Total QALY Gain (follow-up only)
	(QALY gains per cohort)	(QALY gains per cohort)
1: Bergdahl et al (2005)	24.3	1.3
2: Jones and Johnston (2000)	28.4	15.1

Note: each DFD gained is assumed to result in about 0.00082 (0.3 divided by 365) additional QALYs, which is the mid-point of the values observed in the literature (see Box 1).

Figure 9 shows the mean utility level of a worker subject to Intervention 3 and a worker in the control group, at baseline and follow-up (3-months), and up to 1-year post introduction of the intervention. The dark blue shaded area in each panel defines the total utility gain from the intervention. The QALY gain at follow-up and at 1-year for a cohort of 1,000 workers is, respectively, about 5.9 (0.0059 per worker) and 40.6 (0.0406 per worker).

Figure 9: Intervention 3: Butterworth et al (2006): Gain in utility (SF-6D) during follow-up and up to 1-year post introduction of intervention (darker blue area defines QALY gain from intervention)



Note: for panel (b) it is assumed that the effect at follow-up is maintained in cohort until end of 1-year.

Based on the unit costs reported in Appendix C, the estimated costs of each intervention for a cohort of 1,000 workers are as follows:

- Intervention 1: £365,850 (£366 per participant);
- Intervention 2: £141,850 (£142 per participant); and
- Intervention 3: £140,820 (£141 per participant).

With the exception of Intervention 2, these costs are incurred mainly by the employer. The subjects of Intervention 2 are student nurses who, strictly speaking, are not workers. It is assumed that the opportunity cost of their time to participate in the intervention is valued at £6 per hour – the median gross wage rate for 'hotels and restaurants'. This cost is not incurred by an employer, but rather by the nurses themselves. Nevertheless, if the intervention were to be implemented in another employment setting, the employer would incur costs when workers participate in the intervention during paid work hours. A more generalised total cost for Intervention 2 is £209,120 (£209 per participant)[11].

It should also be noted that the costs are basically all recurring; for all 3 interventions nearly 95% of the total costs are incurred every time the intervention is run. Hence, there is little scope for employers to reduce total costs by spreading any non-recurring costs over a number of intervention runs; this is at least true with respect to the 3 interventions modelled.

For each of the 3 interventions modelled, the total cost, QALYs gained and ICER are presented in Table 21. The ICERs range from £3,470 per QALY gained (Intervention 3) to £15,031 per QALY gained (Intervention 1). If the more generalised total cost for Intervention 2 of £209,120 is used, the ICER for this intervention increases from £4,998 per QALY gained to £7,368 per QALY gained. Table 22 presents the ICERs in terms of £ per DFD gained for Interventions 1 (£12 per DFD gained) and 2 (£4 per DFD gained). If the more generalised total cost for Intervention 2 is used, the ICER increases to £6 per DFD gained.

[11] This assumes that the value of employee time is valued at the median gross wage rate averaged over all industrial sections, adjusted for non-labour costs (as is the case with Intervention 1 and 3), and there is no longer any need to reimburse employees for travel expenses to participate in the intervention.

Table 21: Total intervention cost, QALY gain and ICER per cohort of 1,000 workers (central case)

Intervention	Method to Measuring QALY Gain	Total Cost of Intervention	Total QALY Gain (first year)	ICER (i = 1)
		(£ per cohort)	(QALY gains per cohort)	(£ per QALY gained)
1: Bergdahl et al (2005)	Indirect - DFD	365,848	24.3	15,031
2: Jones and Johnston (2000)	Indirect - DFD	141,850	28.4	4,998
3: Butterworth et al (2006)	Direct - SF-6D	140,818	40.6	3,470

Note: i = 1 means the numerator in the ICER is the total incremental cost of the intervention. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

Table 22: Total intervention cost, depression-free days (DFDs) gained and ICER per cohort of 1,000 workers (central case)

Intervention	Cost of Intervention to Employers	Total DFD Gain (first year)	ICER (i = 1)
	(£ per cohort)	(DFD per cohort)	(£ per DFD avoided)
1: Bergdahl et al (2005)	365,848	30,160	12
2: Jones and Johnston (2000)	141,850	35,045	4

Note: i = 1 means the numerator in the ICER is the total incremental cost of the intervention. Also, the denominator in the ICER is the total DFD gained over the first year of the intervention, and not just over the follow-up period.

Table 23 and Table 24 show the impact on the estimated ICERs of including the benefits to the employer of including intervention-induced reductions in absenteeism and presenteeism in the numerator of the ratio. The net cost to the employer of each intervention is shown in Table 24. In all three cases, even when considering the high estimated benefits from reductions in absenteeism and presenteeism, the net costs are positive; in other words, employers do not accrue net-benefits from implementing the interventions. From Table 24:

- The lowest net cost (to the employer) of Intervention 1 is about £311,800;
- The lowest net cost (to the employer) of Intervention 2 is about £87,800; and
- The lowest net cost (to the employer) of Intervention 3 is about £86,750.

However, these net cost estimates must be interpreted with caution. Firstly, they only include the value to the employer of intervention-induced reductions in absenteeism and presenteeism for 1-year. To the extent that each intervention induces a permanent reduction in absence levels and presenteeism among the workforce, the estimates in Table 24 will overstate the net cost to the employer. Furthermore, the results presented in Table 23 and Table 24 are for a cohort of 1,000 workers. As seen in Sections 2.2 and 2.3, if the cohort comprises a 1,000 cases of work-related stress, depression and anxiety, the benefits of intervention-induced reductions in absenteeism and presenteeism are significantly higher. Table 25 and Table 26 illustrate the impact on net employer costs and the ICERs if the cohort comprised of 1,000 sufferers as opposed to 1,000 workers. Now, even when considering the low estimated benefits from reductions in absenteeism and presenteeism, the net costs to employers are negative; in other words, employers accrue a net-benefit from implementing the interventions (see Table 26). Relative to the baseline of 'do nothing' all three interventions are dominant, resulting in reduced costs and increased health benefits.

Table 23: Total intervention cost less benefits associated with reductions in absenteeism, QALY gain and net ICER per cohort of 1,000 workers (central case)

Intervention	Net Cost of Intervention in First Year (low)	Net ICER (low) (i = 2)	Net Cost of Intervention in First Year (high)	Net ICER (high) (i = 2)
	(£ per cohort per year)	(£ per QALY gained)	(£ per cohort per year)	(£ per QALY gained)
1: Bergdahl et al (2005)	363,709	14,813	346,596	12,810
2: Jones and Johnston (2000)	139,711	4,811	122,598	3,093
3: Butterworth et al (2006)	138,679	3,340	121,566	2,138

Note: i = 2 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

Table 24: Total intervention cost less benefits associated with reductions in absenteeism and presenteeism, QALY gain and net ICER per cohort of 1,000 workers (central case)

Intervention	Net Cost of Intervention in First Year (low)	Net ICER (low) (i = 3)	Net Cost of Intervention in First Year (high)	Net ICER (high) (i = 3)
	(£ per cohort per year)	(£ per QALY gained)	(£ per cohort per year)	(£ per QALY gained)
1: Bergdahl et al (2005)	360,545	14,813	311,791	12,810
2: Jones and Johnston (2000)	136,547	4,811	87,793	3,093
3: Butterworth et al (2006)	135,515	3,340	86,761	2,138

Note: i = 3 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism *less* the incremental productivity gains from reduced presenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate + 2 % improvement in baseline on-the-job productivity. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate + 22 % improvement in baseline on-the-job productivity. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

Table 25: Total intervention cost less benefits associated with reductions in absenteeism, QALY gain and net ICER per cohort of 1,000 sufferers (central case)

Intervention	Net Cost of Intervention in First Year (low)	Net ICER (low) (i = 2)	Net Cost of Intervention in First Year (high)	Net ICER (high) (i = 2)
	(£ per cohort per year)	(£ per QALY gained)	(£ per cohort per year)	(£ per QALY gained)
1: Bergdahl et al (2005)	222,154	- 1,706	- 927,395	- 157,266
2: Jones and Johnston (2000)	- 1,844	- 9,355	- 1,151,393	- 142,751
3: Butterworth et al (2006)	- 2,875	- 6,569	- 1,152,424	- 99,881

Note: i = 2 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

Table 26: Total intervention cost less benefits associated with reductions in absenteeism and presenteeism, QALY gain and net ICER per cohort of 1,000 sufferers (central case)

Intervention	Net Cost of Intervention in First Year (low)	Net ICER (low) (i = 3)	Net Cost of Intervention in First Year (high)	Net ICER (high) (i = 3)
	(£ per cohort per year)	(£ per QALY gained)	(£ per cohort per year)	(£ per QALY gained)
1: Bergdahl et al (2005)	- 41,517	- 1,706	- 3,827,774	- 157,266
2: Jones and Johnston (2000)	- 265,514	- 9,355	- 4,051,771	- 142,751
3: Butterworth et al (2006)	- 266,546	- 6,569	- 4,052,803	- 99,881

Note: i = 3 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism *less* the incremental productivity gains from reduced presenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate + 2 % improvement in baseline on-the-job productivity. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate + 22 % improvement in baseline on-the-job productivity. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

3.4. Sensitivity Analysis

In deriving DFDs from the BDI and SCL-90 scores for Interventions 1 and 2, and subsequently transforming the estimated total DFDs into QALYs gained, a number of assumption were made with respect to specific parameters. These assumptions are tested below. Sensitivity analysis is conducted with respect to the thresholds that define 'depression free' and 'fully symptomatic'. For both thresholds, the values used in the central analysis are increased and decreased by 10%.

In the central case, the transition from fully symptomatic (no DFD) to full remission (full DFD) is assumed to be associated with an improvement in health utility of 0.3 - i.e. an increase of 0.3 quality-adjusted life years per year. Sensitivity analysis is conducted using values of 0.2 and 0.4 quality-adjusted life years per year, reflecting the full range of values in the literature.

The results of these sensitivity tests for Interventions 1 and 2 are presented in, respectively, Table 27 and Table 28.

Table 27: Intervention 1: Bergdahl et al (2005): QALY gain and ICER per cohort of 1,000 workers (plus and minus 10% in the boundaries that define a DFD ; low and high values for the loss of QALY associated with 1-year of depression)

Boundaries for Defining a Depression-free Day	Loss of QALY associated with 1-yr of depression		
	0.2	0.3	0.4
	(QALY gains per cohort)	(QALY gains per cohort)	(QALY gains per cohort)
DFD boundaries expanded by 10%	14	21	28
Central case boundaries	16	24	32
DFD boundaries contracted by 10%	19	29	39
ICER (i = 1)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	26,304	17,536	13,152
Central case boundaries	22,547	15,031	11,273
DFD boundaries contracted by 10%	18,789	12,526	9,394
Net ICER (low) (i = 3)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	25,923	17,282	12,962
Central case boundaries	22,220	14,813	11,110
DFD boundaries contracted by 10%	18,516	12,344	9,258
Net ICER (high) (i = 3)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	22,418	14,945	11,209
Central case boundaries	19,215	12,810	9,608
DFD boundaries contracted by 10%	16,013	10,675	8,006

Note: i = 1 means the numerator in the ICER is the total incremental cost of the intervention. i = 3 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism *less* the incremental productivity gains from reduced presenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate + 2 % improvement in baseline on-the-job productivity. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate + 22 % improvement in baseline on-the-job productivity. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

Table 28: Intervention 2: Jones and Johnston (2000): QALY gain and ICER per cohort of 1,000 workers (plus and minus 10% in the boundaries that define a DFD ; low and high values for the loss of QALY associated with 1-year of depression)

Boundaries for Defining a Depression-free Day	Loss of QALY associated with 1-yr of depression		
	0.2	0.3	0.4
	(QALY gains per cohort)	(QALY gains per cohort)	(QALY gains per cohort)
DFD boundaries expanded by 10%	21	32	43
Central case boundaries	19	28	38
DFD boundaries contracted by 10%	11	16	21
ICER (i = 1)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	6,616	4,411	3,308
Central case boundaries	7,496	4,998	3,748
DFD boundaries contracted by 10%	13,202	8,801	6,601
Net ICER (low) (i = 3)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	6,369	4,246	3,185
Central case boundaries	7,216	4,811	3,608
DFD boundaries contracted by 10%	12,708	8,472	6,354
Net ICER (high) (i = 3)	(£ per QALY gained)	(£ per QALY gained)	(£ per QALY gained)
DFD boundaries expanded by 10%	4,095	2,730	2,047
Central case boundaries	4,640	3,093	2,320
DFD boundaries contracted by 10%	8,171	5,447	4,085

Note: i = 1 means the numerator in the ICER is the total incremental cost of the intervention. i = 3 means the numerator in the ICER is the total incremental cost of the intervention *less* the incremental productivity gains from reduced absenteeism *less* the incremental productivity gains from reduced presenteeism. Low: assumed effectiveness of intervention = 5 % reduction in baseline absence rate + 2 % improvement in baseline on-the-job productivity. High: assumed effectiveness of intervention = 45 % reduction in baseline absence rate + 22 % improvement in baseline on-the-job productivity. Also, the denominator in the ICER is the total QALY gained over the first year of the intervention, and not just over the follow-up period.

3.5. WTP for Depression-free Days

Unutzer et al (2003) estimated the willingness to pay (WTP) for depression care among a sample of 615 depressed adults who participated in a randomized controlled trial of a disease management program for depression in primary care. The contingent-valuation method (CVM) was used, employing a simple payment-card format. Participants were asked at baseline interviews and six-month follow-up interviews how much they would be willing to pay per month for a six-month treatment that would eliminate their symptoms of depression. Specifically, patients were asked the following question: "*Assume for a moment that you had no health insurance, but that there was a treatment that would completely eliminate the symptoms of depression. How much money would*

you be willing to pay each month for a six-month treatment?" The payment card presented to respondents contained continuous response choices from US$ 0 to US$ 400 (1998 prices), as well as more than US$ 400 per month. The mean amount that all participants were willing to pay at baseline was US$ 270 (SD: ± 187) per month for the six-month depression treatment programme; equivalent to about 9 percent of the participants' household income. Over six months, the mean monthly willingness to pay decreased for all participants along with their severity of depressive symptoms; from US$ 270 (SD: ± 187) per month to US$ 214 (SD: ± 174) per month. The type of treatment (intervention or care as usual) was not a significant predictor of willingness to pay at six months. According to the authors, the estimated willingness to pay is comparable to that reported for the treatment of other chronic medical disorders - specifically, asthma (Blumenschein and Johannesson, 1998) and psoriasis (Lundberg et al, 1999).

Interestingly, Unutzer et al used the method developed by Lave et al (1998) and Simon et al (2001) to estimate the amount participants were willing to pay for a depression-free day. They estimated that a decrease from the participants' mean SCL-90 depression score at baseline -1.26 - to complete remission of depression symptoms - an SCL-90 score of about 0.5 - would result in a gain of about 91 depression-free days over the six months follow-up period. The resulting mean willing to pay for a depression-free day was estimated at about US$ 18 (1998 prices).

The study has a number of limitations – including the fact that it did not explicitly inquire about participant's "maximum" willingness to pay. Despite the limitations, the estimated value for depression-free days is used to provide an indicative benefit to workers of the interventions considered above. Before the above value is used, however, it must first be transferred from its original valuation context to the context of the present study.

Unit value transfer is recommended as the simplest and most transparent way of transfer between countries. This transfer method has generally also been found to be just as reliable as the more complex procedures of value function transfers and meta-analysis. This is mainly due to the low explanatory power of WTP functions of stated preference studies, such as that used by Unutzer et al (2003), and the fact that methodological choice, rather than the characteristics of the location and affected population, has a large explanatory power in meta-analyses. For unit transfers between countries, the differences in currency, income and cost of living between countries is normally taken into account by using exchange rates adjusted for Purchase Power Parity. Using the average annual PPP exchange rate for 1998, and allowing for growth in real per capita income between 1998 and 2007, US$ 18 per additional DFD is roughly equivalent to £16 per additional DFD (2007 prices).

Table 29 illustrates the net-benefit of Intervention 1 and Intervention 2 from a social perspective; showing the difference between the cohort's total WTP for the intervention-induced gain in DFDs and the cost to the employer of providing the intervention. The net-benefit is positive with respect to both interventions. Moreover, the net-benefits in column 4 are underestimates, since the value to the employer of intervention-induced reductions in absenteeism and presenteeism are not included. The results also relate only to a period of 1-year. Furthermore, the net-benefits are underestimated to the extent that NHS resources are saved due to reductions in work-related stress, depression and anxiety in the cohort (although it has not been possible to quantify any such savings in this report).

Table 29: Net-benefit of Intervention 1 and Intervention 2 from (limited) social perspective for a cohort of 1,000 workers

Intervention	Cost of Intervention	Total WTP for DFD Gain (first year)	Net (Social) Benefit (first year)
	(£ per cohort)	(£ per cohort)	(£ per cohort)
1: Bergdahl et al (2005)	365,848	482,560	116,712
2: Jones and Johnston (2000)	141,850	560,714	418,864

3.6. Key Findings

- The total QALY gain for a cohort of 1,000 workers subject to the modelled interventions ranges from 24.3 QALYs (0.0243 per worker) to 40.6 QALYs (0.0406 per worker). These values are at the lower end of QALY estimates generated for other public health interventions, such as those for workplace interventions to promote physical activity (0.05 to 0.12) and environmental interventions to promote physical activity (0.125).
- The effectiveness evidence from which the estimated QALY gains are derived as applicable to the UK.
- The lower estimated average QALY gain per worker (0.0243) is derived from estimates of depression-free days, which were

themselves derived from one of two depression-scales (i.e. the BDI and the SCL-90). The upper estimated average QALY gain per worker (0.0406) is derived directly from the SF-12 Health Survey.

- The estimated QALY gains are likely to be conservative. First, they may not capture related heath effects (e.g. CVD, MSD, more severe depression, etc.) that may develop in the absence of the intervention. Second, they accrue from a period of 1-year only; to the extent that the full effect of the interventions is maintained after 1-year, the average QALY gain per worker will be underestimated.
- The effectiveness evidence did not allow for the consideration of sub-groups.
- The total cost of the modelled interventions ranges from £141 per participant to £366 per participant. These costs are incurred by the employer. The costs are basically all recurring, with nearly 95% of the total costs incurred every time the intervention is run. Hence, there is little scope for employers to reduce total costs by spreading any non-recurring costs over a number of intervention runs.
- Based on a number of assumptions that define our central case, ICERs range from about £3,470 per QALY gained to £15,030 per QALY gained. These values do not include any benefits accruing to employers due to reductions in absenteeism and presenteeism.
- When the benefits of intervention-induced reductions in absenteeism and presenteeism are included in the cost component of the ICER, the ratios can be as low as £2,138 to £12,810 per QALY gained. These ICERs are based on the most optimistic assumptions regarding the effectiveness of the interventions on baseline absenteeism and presenteeism.
- The benefits of intervention-induced reductions in absenteeism and presenteeism incorporated into the ICERs listed above are essentially based on all workers participating in the interventions, even those not currently claiming to suffer from work-related stress, depression or anxiety. If the interventions are restricted to only those workers suffering from work-related stress, depression or anxiety, the intervention-induced reductions in absenteeism and presenteeism

increase significantly. Indeed, for a cohort of sufferers, the ICERs are all negative, with the interventions generating health gains as well as reducing employer costs. The net-benefits to employers range from approximately +£40 per inflicted worker per year to as much as +£4,050 per inflicted worker per year. These results support the business case for work-site interventions to promote the mental wellbeing of employees.

- Of the 3 interventions modelled, only one provides effectiveness evidence to facilitate the calculations of QALYs gained and absence costs avoided. Effectiveness evidence relating to intervention-induced reductions in absenteeism and presenteeism was therefore sourced from other studies in the literature. In using this evidence it is assumed that the modelled interventions will generate similar reductions in absenteeism and presenteeism to those from which the effectiveness evidence was derived. Uncertainty is accommodated to some extent by working with a very wide range of effectiveness values.
- Using a WTP value from an American stated preference survey, it was possible to provide a conservative estimate of the net-benefit of the interventions from a social perspective; showing the difference between total WTP for the intervention-induced gain in depression-free days and the cost to the employer of providing the intervention. The net-benefit is positive indicating that the interventions increase total welfare in society (+£115 to +£420 per participating worker).

4. DISCUSSION AND CONCLUSIONS

4.1. Main Findings

The main findings of the economic analysis are summarised in the following evidence statements:

Evidence Statement 1

Sickness absence due to work-related stress, depression or anxiety costs employers about £2,875 per affected employee per year. This amounts to about £42 per year for each person employed in the UK.

"Associate professional & technical occupations" have the highest absence costs per employee; the "public administration and defence" sector has the highest absence costs per employee.

Evidence Statement 2

Consistent with evidence from other studies, the cost of presenteeism is higher than the cost of absenteeism. For each employee suffering from work-related stress, depression or anxiety, the employer costs of reduced on-the-job performance are between £2,345 and £9,375 per affected employee per year. This amounts to between £27 to £109 per year for each person employed in the UK.

"Professional occupations" have the highest presenteeism costs per employee; the "public administration and defence" sector has the highest presenteeism costs per employee.

Evidence Statement 3

Work-site interventions to promote the mental wellbeing of employees can reduce absence costs by between £145 and £1,295 per affected employee per year, and reduce presenteeism costs by between £350 and £3,865 per affected employee per year. However, there is considerable uncertainty surrounding the estimated reductions in presenteeism costs.

Such interventions can therefore save employers between £495 and £5,160 per affected employee per year.

Evidence Statement 4

The cost to the employer of 3-specific interventions to promote the mental wellbeing of employees ranges from about £140 per participant to £365 per participant. Roughly 95% of these costs are incurred every time the intervention programme is run. Hence, there is little scope for employers to reduce total costs by spreading any non-recurring cost element over a number of programme runs.

Evidence Statement 5

The net-benefit to employers of implementing interventions to promote the mental wellbeing of employees can therefore range from negative £220 (£145 *less* £365) to positive £1,155 (£1,295 *less* £140) per affected employee participating in the programme, incorporating solely the intervention-induced reductions in absence costs.

Including the intervention-induced reductions in presenteeism as well, the net-benefit to employers can therefore range from positive £130 (£495 *less* £365) to positive £5,020 (£5,160 *less* £140) per affected employee participating in the programme.

These results support the business case for work-site interventions to promote the mental wellbeing of employees.

Evidence Statement 6

The average QALY gain per employee participating in the 3 modelled interventions ranges from 0.0243 to 0.0406. These values are at the lower end of QALY estimates generated for other public health interventions, such as those for workplace interventions to promote physical activity (0.05 to 0.12) and environmental interventions to promote physical activity (0.125).

However, the estimated QALY gains are likely to be conservative – e.g. they are unlikely to capture related heath effects (e.g. CVD, MSD, more severe depression, etc.) that may develop in the absence of the intervention, and they relate only to a period of 1-year.

There is considerable uncertainty surrounding the lower bound estimate of average QALY gain, as it is derived from estimates of depression-free days, which were themselves derived from SCL-90.

The effectiveness evidence did not allow for the estimation of QALY gains by sub-groups.

Evidence Statement 7

Based on a number of assumptions that define our central case and evidence from the effectiveness review, ICERs range from about £3,470 per QALY gained to £15,030 per QALY gained. However, these

values do not include any benefits accruing to employers due to reductions in absenteeism and presenteeism.

When the benefits of intervention-induced reductions in absenteeism and presenteeism are included in the cost component of the ICER, the ratios become negative – i.e. relative to the baseline of 'do nothing' all 3 modelled interventions are dominant, resulting in reduced costs and increased health benefits.

Effectiveness evidence relating to intervention-induced reductions in absenteeism and presenteeism is sourced from studies other than those of the 3 modelled interventions. In using this evidence it is thus assumed that the modelled interventions will generate similar reductions in absenteeism and presenteeism to those from which the effectiveness evidence was derived. Uncertainty is accommodated to some extent by working with a very wide range of effectiveness values.

Evidence Statement 8

The net (social) benefit of interventions to promote the mental wellbeing of employees ranges from positive £115 to positive £420 per participating employee. This indicates that such interventions increase total social welfare.

These are conservative estimates, since (i) the value to the employer of intervention-induced reductions in absenteeism and presenteeism are not included and (ii) any savings in NHS resources due to reductions in work-related stress, depression and anxiety are also not included.

There is nonetheless considerable uncertainty surrounding the estimates, since they are based on a single WTP value from an American stated preference survey.

The preceding economic review concluded that there is no research published since 1990 reporting evidence on the cost-effectiveness, cost-utility or cost-benefit of worksite interventions that directly promote the mental wellbeing of employees in the workplace. It is therefore not possible to contrast the above results with the findings of other studies.

4.2. Limitations and Further Analysis

There are a number of limitations inherent to the modelling approach used. Most of these derive from lack of consistent and robust effectiveness evidence on which to base the economic evaluation. This necessitated the adoption of a pragmatic approach to the modelling, which in turn required the adoption of a number of assumptions, which inevitably increases the uncertainty surrounding the results.

For a start, to generate incremental cost-effectiveness ratios (ICERs) in terms of QALYs

gained it was necessary to restrict the effectiveness evidence to a limited set of studies where health outcomes are measured on a scale that could be transformed into QALYs gained. With respect to 2 of 3 interventions modelled, this meant that the QALY gains used in the analysis were not directly measured, but rather indirectly derived from other studies simply on the basis of days with and days without depression. Not only should there should be a more graduated spectrum of values between these two extremes, but to use this approach it is necessary to establish threshold survey scores that define each endpoint. These thresholds are not consistently defined in the literature, although the sensitivity of the results is tested with respect to a range of threshold values. Nonetheless, the estimated ICERs based on QALY gains derived indirectly from depression-free days should be seen as more tentative than the ICER based on QALY gains derived directly from the SF-36. Future studies should either measure utility directly, or should use an instrument from which QALYs can be more readily derived.

The modelling sought to estimate the net cost (or net-benefit) to the employer of interventions to promote the mental wellbeing of employees in the workplace. This requires effectiveness evidence with respect to absence levels and on-the-job productivity, in addition to evidence on utility gains. Ideally, this evidence should be sourced from studies of the modelled interventions. However, of the 3 interventions modelled in this report, only one provided effectiveness evidence to facilitate the calculations of QALYs gained and absence costs avoided. Effectiveness evidence relating to intervention-induced reductions in absenteeism and presenteeism was therefore sourced from other studies in the literature, with different interventions to those modelled herein. In using this evidence it is assumed that the 3 modelled interventions will generate similar reductions in absenteeism and presenteeism to those from which the effectiveness evidence was derived, despite the fact that the interventions are different. Attempts are made to account for uncertainty by working with a wide range of effectiveness values for absenteeism and presenteeism; it is assumed that the modelled interventions will generate reductions in absenteeism and presenteeism somewhere within the estimated range.

It should also be noted that the modelled intervention-induced reductions in absenteeism and more reliable than the reductions in presenteeism. The assumed reductions in absence levels are derived from specific interventions sourced from the effectiveness review. However, the assumed reductions in on-the-job productivity, do not relate to specific interventions. Rather, they represent mean self-reported improvements in productivity while at work as a result of the complete removal of one health-risk factor (e.g. workplace stress). To the extent that the modelled interventions do not completely eliminate work-related stress, depression or anxiety as a risk factor, the estimated reductions in

presenteeism will be overestimated.

The follow-up period for the 3 modelled interventions varies from 5 weeks to 19 weeks. The effectiveness evidence sheds no light on what happens after the last follow-up – i.e. are the observed health gains at follow-up maintained, do they continue to increase beyond follow-up, or do they reduce over time. To avoid the need to adopt heroic assumptions, the analysis of utility gains, and reductions in both absenteeism and presenteeism is therefore undertaken for a 1-year period only. Furthermore, it is assumed that once the full incremental effect of the intervention is realised, it is maintained for until year end. It is therefore likely that the estimated effects (i.e. benefits employees and employers) of the modelled interventions will be underestimated, unless they were to decline very rapidly after follow-up.

The estimated ICERs incorporated the net financial benefit to the employer associated with reduced absenteeism and presenteeism. From the employer perspective, additional benefits may accrue from reductions in labour turnover (and associated costs) and compensation / insurance payments. A recent CIPD survey, for example, put the median cost of labour turnover in its sample at £7,750 per replaced employee (CIPD, 2006). The cost of labour turnover is therefore potentially significant; however, no effectiveness evidence was available to incorporate such costs the economic modelling.

Cost savings may also be expected from an NHS perspective, to the extent that employees affected by work-related stress, depression and anxiety currently utilise NHS resources, or other related-health effects may develop with time (e.g. MSD, CVD or more severe depression). Again, no effectiveness evidence was available to incorporate potential NHS cost savings into the economic modelling. Like the cost of labour turnover, these cost savings could nonetheless be significant. For example, Thomas and Morrison (2003) estimated the total cost of depression among adults in England in 2000 at over £9 billion. Of this amount, about £370 million represented direct treatment costs borne by the NHS. These costs comprise: in-patient (7.7% of £370 million), day and outpatient care (6.1%), general practitioner consultations (2.2%) and medication (84.0%). A more recent study by CEP (2006) put the cost of treating depression and chronic anxiety at about 2% of NHS expenditure.

Future analysis could be undertaken where these other costs - NHS costs and labour turnover costs - are included.

4.3. Conclusions

The results of the economic modelling support the business case for implementing work-site interventions to promote the mental wellbeing of employees.

Due to the lack of consistent and robust effectiveness evidence on which to base the economic evaluation, a pragmatic approach to the modelling is adopted. However, this necessitates the adoption of a number of assumptions, which inevitably increases the uncertainty surrounding the results. Consequently, the evidence statements listed above should only be viewed as indicative, and the underlying uncertainty should be taken into account when developing guidelines to promote the mental wellbeing of employees in the workplace.

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Appendix A – Scope of Effectiveness and Cost-effectiveness Review

Areas Covered

The guidance will consider policies and initiatives that promote mental wellbeing in the workplace. Policies and initiatives can be classified as:

- Primary - i.e. seeking to reduce causes of work-related stress at source;
- Secondary – i.e. modifying the effect of existing causal factors; and
- Tertiary – i.e. assisting individuals in coping better with stressful demands or rehabilitation of those suffering from stress.

Policies and initiatives to be considered may include, depending on the evidence:

- The implementation of mental wellbeing, anti-bullying, anti-discrimination and family-friendly policies.
- Interventions which engage employees in decision-making (including consultation on working conditions that impact on mental wellbeing).
- Interventions which tackle organisational sources of work-related stress (e.g. job demand, support, control, role, relationships, change, .
- Support for employees who experience stress, anxiety and depression as a result of external pressures and situations.
- Flexible working.

Policies and initiatives that are not to be considered include:

- Rehabilitation or re-employment schemes that are part of a return-to-work programme.
- Disease-specific interventions for chronic and serious mental health disorders that are not work-related.
- Workplace interventions that do not aim to reduce stress, anxiety or depression.

Population Groups Covered

The relevant population groups covered by the review are:

- Working adults (16 years of age and over) who:

(i) may be in full or part-time, paid or unpaid work (and on permanent or temporary contracts); and

(ii) who experience work-related stress, anxiety or depression (including, those who may also have a serious mental health disorder, such as schizophrenia, personality disorder, bipolar or manic depression).

- Employers.

Population groups not covered by the review are:

- Adults who are unemployed or who do not work.
- Working adults who experience serious mental health disorders (e.g. schizophrenia, personality disorder, bipolar or manic depression), but do not experience stress, anxiety or depression at work.
- Working adults suffering from mental health conditions, which require pharmacological and / or psychosocial treatment.

Outcomes

This review focuses on cost-effectiveness evidence relating to the areas covered by the proposed guidance (as outlined in Section **Error! Reference source not found.**).

For the organisation (**employer**) outcomes may include:

- implementation of a mental health policy;
- changes in methods and levels of employee consultation and participation;
- uptake of support services;
- organisational measures of productivity; and
- employee retention (levels of staff turnover) and levels of absenteeism.

For the individual (**employee**) outcomes may include:

- levels of mental wellbeing (reported stress, anxiety and depression); and
- job satisfaction (employee morale).

Research Questions

The following questions are to be addressed by the review:

- How can work and working conditions be used to promote mental wellbeing; which interventions are most effective and cost-effective?
- What specific characteristics of work and working conditions promote mental wellbeing effectively and cost-effectively?
- How can organisations support employees who are coping with stress, anxiety and depression caused by external factors (e.g. bereavement, family breakdown or debt)?
- How can healthy working conditions be created for different occupational groups and in different organisational contexts?
- What help do employers need to review and adapt working practices and conditions to promote the mental wellbeing of employees?
- What are the barriers and facilitators to the implementation of interventions to promote mental wellbeing in the workplace – for both employers and employees?
- Do interventions that promote health equalities also have an impact on mental wellbeing and productivity?
- How can the promotion of mental wellbeing at work improve both working conditions and productivity?
- What are the costs and economic benefits to employers: what is the business case for promoting employees' mental wellbeing?

Appendix B – Basic Data for Estimation of Absenteeism and Presenteeism Costs

Table 30: Estimated days (full-day equivalent) off work in 2004-05 and associated average days lost per worker due to self-reported stress, depression or anxiety caused or made worse by the current or most recent job, by occupational major group

Occupation	Major Group	Sample cases	Illness ascribed to their current / most recent job					
			Days lost (full-day equivalents) (thousands)			Average days (full-day equivalents) lost per worker		
			central	95% C.I.		central	95% C.I.	
				lower	upper		lower	upper
Managers and senior officials	1	85	2,016	1,263	2,769	0.50	0.31	0.68
Professional occupations	2	91	1,309	880	1,738	0.43	0.29	0.57
Associate professional & technical occupations	3	92	2,345	1,549	3,141	0.70	0.47	0.94
Administrative and secretarial occupations	4	74	1,530	1,024	2,035	0.59	0.39	0.78
Skilled trades occupations	5	16	*	*	*	*	*	*
Personal service occupations	6	27	645	298	991	0.43	0.20	0.65
Sales and customer service occupations	7	32	653	312	993	0.47	0.23	0.72
Process, plant and machine operatives	8	20	491	171	811	0.25	0.09	0.42
Elementary occupations	9	28	1,068	519	1,617	0.49	0.24	0.73
All occupations		465	10,597	9,033	12,161	0.46	0.39	0.53

Source: (http://www.hse.gov.uk/statistics/swi/tables/0405/strocc6.htm)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 31: Estimated days (full-day equivalent) off work in 2004-05 and associated average days lost per worker due to self-reported stress, depression or anxiety caused or made worse by current or most recent job, by industry section

Industry	Section	Sample cases	Illness ascribed to their current / most recent job					
			Days lost (full-day equivalents) (thousands)			Average days (full-day equivalents) lost per worker		
			central	95% C.I.		central	95% C.I.	
				lower	upper		lower	upper
Agriculture, hunting, forestry and fishing	A & B	2	*	*	*	*	*	*
Extractive and utility supply	C & E	3	*	*	*	*	*	*
Manufacturing	D	44	1,039	569	1,509	0.31	0.17	0.45
Construction	F	15	*	*	*	*	*	*
Wholesale and retail trade	G	43	859	411	1,307	0.27	0.13	0.40
Hotels and restaurants	H	8	*	*	*	*	*	*
Transport, storage and communication	I	22	477	146	809	0.27	0.08	0.46
Financial intermediation	J	33	659	337	987	0.66	0.34	0.98
Real estate, renting and business activities	K	51	1,042	543	1,542	0.38	0.20	0.56
Public administration and defence	L	66	1,750	1,081	2,419	1.10	0.66	1.50
Education	M	68	908	533	1,283	0.49	0.29	0.70
Health and social work	N	91	2,060	1,443	2,676	0.80	0.56	1.00
Other community, social and personal services	O	10	*	*	*	*	*	*
All sectors		465	10,597	9,033	12,161	0.46	0.39	0.53

Source: (http://www.hse.gov.uk/statistics/swi/tables/0405/strind.6.htm)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 32: Hourly pay by occupational group - gross (£ per hour) - all employees - United Kingdom 2007

			Hourly Pay - Gross (£ per hour) - All employees - United Kingdom 2007									
Major Group	Median	Mean	Percentile									
			10	20	25	30	40	60	70	75	80	90
1	16.67	20.56	8.25	10.42	11.51	12.54	14.51	19.16	22.46	24.59	27.24	36.78
2	18.43	19.99	11.23	13.48	14.47	15.31	16.84	20.07	22.10	23.32	24.87	30.27
3	12.93	14.14	7.91	9.53	10.15	10.73	11.87	14.09	15.44	16.21	17.14	20.07
4	8.58	9.49	6.15	6.87	7.16	7.43	7.95	9.28	10.12	10.69	11.39	13.52
5	9.82	10.46	6.00	7.04	7.59	8.07	8.99	10.73	11.73	12.35	13.03	15.10
6	7.28	7.93	5.40	5.93	6.14	6.35	6.79	7.82	8.46	8.90	9.36	10.86
7	6.06	7.06	5.05	5.21	5.34	5.48	5.75	6.50	7.11	7.48	7.89	9.38
8	8.50	9.26	5.85	6.58	6.90	7.24	7.86	9.25	10.15	10.74	11.41	13.37
9	6.19	7.28	5.05	5.20	5.35	5.50	5.82	6.73	7.46	7.89	8.36	9.78
	9.91	12.97	5.58	6.49	6.99	7.50	8.57	11.62	13.84	15.25	16.87	22.15

Source: ASHE (2007)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 33: Hourly pay by industrial section - gross (£ per hour) - all employees - United Kingdom 2007

Section	Hourly Pay - Gross (£ per hour) - All employees - United Kingdom 2007											
	Median	Mean	Percentile									
			10	20	25	30	40	60	70	75	80	90
A & B	7.69	8.97	5.74	6.21	6.49	6.68	7.11	8.39	9.23	9.74	10.4	13.42
C & E	13.75	15.71	7.77	9.1	10.13	10.94	12.35	15.4	17.49	18.63	20.64	25.72
D	10.99	13.10	6.45	7.58	8.11	8.64	9.73	12.34	14.15	15.34	16.80	21.90
F	11.25	13.15	6.77	8.10	8.63	9.19	10.13	12.61	14.10	15.17	16.54	21.11
G	7.42	10.53	5.41	5.79	5.95	6.14	6.68	8.42	9.87	10.80	12.11	17.08
H	6.00	7.87	4.95	*	5.35	5.40	5.62	6.42	7.01	7.56	8.26	11.03
I	10.42	12.76	6.84	7.96	8.32	8.69	9.46	11.71	13.53	14.74	16.17	20.84
J	14.02	20.23	7.67	8.81	9.41	10.06	11.68	17.07	20.97	23.57	27.06	38.81
K	11.50	15.57	6.00	7.03	7.67	8.30	9.78	13.69	16.61	18.45	20.69	28.47
L	12.18	13.81	7.53	8.60	9.07	9.59	10.98	13.68	15.55	16.62	17.75	21.02
M	11.78	14.37	6.20	7.21	7.79	8.33	9.80	14.38	17.17	18.61	20.28	24.54
N	10.35	13.08	6.22	7.04	7.46	7.92	8.99	12.19	14.11	15.13	16.26	19.94
O	8.95	12.28	5.45	6.02	6.41	6.85	7.81	10.26	12.21	13.46	14.96	20.19
	10.22	13.37	5.83	6.70	7.23	7.75	8.88	11.98	14.24	15.69	17.39	22.96

Source: ASHE (2007)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 34: Total labour costs by occupational group - gross (£ per hour) - all employees - United Kingdom 2007

			Total Labour Costs - Gross (£ per hour) - All employees - United Kingdom 2007									
Major Group	Median	Mean	Percentile									
			10	20	25	30	40	60	70	75	80	90
1	20.50	25.28	10.15	12.81	14.15	15.42	17.84	23.56	27.62	30.24	33.50	45.23
2	22.66	24.58	13.81	16.58	17.79	18.83	20.71	24.68	27.18	28.68	30.58	37.23
3	15.90	17.39	9.73	11.72	12.48	13.20	14.60	17.33	18.99	19.93	21.08	24.68
4	10.55	11.67	7.56	8.45	8.81	9.14	9.78	11.41	12.45	13.15	14.01	16.63
5	12.08	12.86	7.38	8.66	9.33	9.92	11.06	13.20	14.43	15.19	16.02	18.57
6	8.95	9.75	6.64	7.29	7.55	7.81	8.35	9.62	10.40	10.95	11.51	13.36
7	7.45	8.68	6.21	6.41	6.57	6.74	7.07	7.99	8.74	9.20	9.70	11.54
8	10.45	11.39	7.19	8.09	8.49	8.90	9.67	11.38	12.48	13.21	14.03	16.44
9	7.61	8.95	6.21	6.39	6.58	6.76	7.16	8.28	9.17	9.70	10.28	12.03
	12.19	15.95	6.86	7.98	8.60	9.22	10.54	14.29	17.02	18.75	20.75	27.24

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 35: Total labour costs by industrial section - gross (£ per hour) - all employees - United Kingdom 2007

Section	Median	Mean	Total Labour Costs - Gross (£ per hour) - All employees - United Kingdom 2007									
			Percentile									
			10	20	25	30	40	60	70	75	80	90
A & B	9.46	11.03	7.06	7.64	7.98	8.21	8.74	10.32	11.35	11.98	12.79	16.50
C & E	16.91	19.32	9.56	11.19	12.46	13.45	15.19	18.94	21.51	22.91	25.38	31.63
D	13.52	16.11	7.93	9.32	9.97	10.63	11.97	15.18	17.40	18.86	20.66	26.93
F	13.83	16.17	8.33	9.96	10.61	11.30	12.46	15.51	17.34	18.66	20.34	25.96
G	9.12	12.95	6.65	7.12	7.32	7.55	8.21	10.35	12.14	13.28	14.89	21.00
H	7.38	9.68	6.09	*	6.58	6.64	6.91	7.90	8.62	9.30	10.16	13.56
I	12.81	15.69	8.41	9.79	10.23	10.69	11.63	14.40	16.64	18.13	19.89	25.63
J	17.24	24.88	9.43	10.83	11.57	12.37	14.36	20.99	25.79	28.99	33.28	47.73
K	14.14	19.15	7.38	8.65	9.43	10.21	12.03	16.84	20.43	22.69	25.44	35.01
L	14.98	16.98	9.26	10.58	11.15	11.79	13.50	16.82	19.12	20.44	21.83	25.85
M	14.49	17.67	7.62	8.87	9.58	10.24	12.05	17.68	21.12	22.89	24.94	30.18
N	12.73	16.09	7.65	8.66	9.17	9.74	11.06	14.99	17.35	18.61	20.00	24.52
O	11.01	15.10	6.70	7.40	7.88	8.42	9.60	12.62	15.02	16.55	18.40	24.83
	12.57	16.44	7.17	8.24	8.89	9.53	10.92	14.73	17.51	19.30	21.39	28.24

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 36: Paid hours worked by occupational group (hours per week) - all employees - United Kingdom 2007

			Paid hours worked (hours per week) - All employees - United Kingdom 2007									
Major Group	**Median**	**Mean**	**Percentile**									
			10	20	25	30	40	60	70	75	80	90
1	37.5	37.5	34.0	35.0	35.0	36.2	37.0	37.5	39.9	40.0	40.0	42.5
2	35.0	32.6	34.5	36.0	36.8	37.0	37.5	40.0	40.0	41.0	41.0	45.5
3	37.1	34.8	20.4	31.2	35.0	35.0	36.8	37.5	38.0	39.5	40.0	42.2
4	35.4	31.8	16.6	22.4	25.2	30.0	35.0	36.9	37.0	37.5	37.5	40.0
5	40.0	41.0	34.5	37.0	37.5	37.9	39.0	41.0	43.1	44.8	46.0	51.0
6	30.4	29.2	12.0	18.0	20.0	22.4	27.0	35.0	37.0	37.5	38.0	41.8
7	27.7	27.1	10.2	15.1	16.8	18.8	22.5	34.0	36.8	37.5	38.2	40.3
8	40.2	42.4	34.0	37.0	37.5	38.7	40.0	43.0	45.8	47.6	49.0	55.0
9	35.0	30.3	8.5	14.0	16.3	20.0	27.0	37.5	*	40.0	42.0	47.5
	37.0	33.9	16.0	25.0	29.9	32.5	35.0	37.5	39.0	40.0	40.0	44.6

Source: ASHE (2007)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 37: Paid hours worked by industrial section (hours per week) - all employees - United Kingdom 2007

Section	Median	Mean	Paid hours worked (hours per week) - All employees - United Kingdom 2007									
			Percentile									
			10	20	25	30	40	60	70	75	80	90
A & B	40.0	38.1	17.1	28.0	35.0	37.0	39.0	40.0	42.5	44.2	46.3	52.5
C & E	37.0	38.5	36.9	36.9	37.0	37.0	*	37.2	38.8	39.9	41.0	45.6
D	38.9	39.3	33.8	36.4	37.0	37.4	37.5	40.0	40.6	42.0	43.8	48.1
F	40.0	40.7	32.0	37.3	37.5	38.0	39.8	40.6	43.0	45.0	46.0	51.8
G	37.4	32.7	14.1	20.0	23.5	27.6	35.0	38.2	39.9	40.0	40.5	44.8
H	33.2	30.0	10.0	15.9	18.0	20.5	27.1	37.4	39.9	40.0	40.0	45.2
I	40.0	40.0	30.0	36.0	36.8	37.4	38.0	40.0	41.9	43.5	45.6	51.0
J	35.0	34.0	24.1	34.9	35.0	*	*	35.0	35.1	35.5	37.0	39.0
K	37.3	34.6	16.6	29.9	34.5	35.0	36.2	37.5	37.8	39.8	40.0	43.7
L	37.0	35.9	22.5	34.9	35.0	36.1	37.0	37.0	40.0	40.0	41.0	42.7
M	32.5	28.2	10.0	18.2	20.9	24.2	28.0	35.0	36.1	37.0	37.0	37.3
N	36.0	32.2	15.0	21.0	23.6	26.5	32.0	37.0	37.5	37.5	37.6	40.3
O	36.1	31.8	10.0	19.0	22.8	28.0	35.0	37.5	39.3	40.0	40.0	44.0
	37.0	33.9	16.0	25.0	29.9	32.5	35.0	37.5	39.0	40.0	40.0	44.6

Source: ASHE (2007)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 38: Total labour costs by occupational group - gross (£ per day) - all employees - United Kingdom 2007

			Gross wage (£ per day) - All employees - United Kingdom 2007									
Major Group	Median	Mean	Percentile									
			10	20	25	30	40	60	70	75	80	90
1	153.75	189.63	68.99	89.70	99.08	111.65	132.05	176.72	220.41	241.92	267.99	384.47
2	158.65	160.28	95.29	119.36	130.97	139.33	155.32	197.45	217.42	235.16	250.79	338.75
3	117.99	121.03	39.69	73.13	87.38	92.37	107.44	129.96	144.31	157.48	168.63	208.31
4	74.70	74.22	25.11	37.85	44.38	54.82	68.44	84.22	92.10	98.60	105.05	133.01
5	96.61	105.48	50.91	64.07	70.01	75.23	86.23	108.20	124.35	136.08	147.42	189.41
6	54.43	56.95	15.94	26.25	30.20	34.98	45.09	67.32	76.99	82.09	87.48	111.65
7	41.29	47.06	12.67	19.35	22.07	25.34	31.82	54.36	64.35	68.99	74.13	92.97
8	84.04	96.57	48.92	59.88	63.64	68.91	77.33	97.83	114.34	125.74	137.51	180.86
9	53.29	54.25	10.56	17.91	21.45	27.06	38.65	62.07	*	77.62	86.36	114.26
	90.18	108.14	21.96	39.91	51.40	59.95	73.77	107.18	132.76	150.03	165.97	242.98

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 39: Total labour costs by industrial section - gross (£ per day) - all employees - United Kingdom 2007

Section	Median	Mean	Gross wage (£ per day) - All employees - United Kingdom 2007									
			Percentile									
			10	20	25	30	40	60	70	75	80	90
A & B	75.66	84.06	24.14	42.77	55.87	60.79	68.20	82.54	96.48	105.89	118.43	173.29
C & E	125.13	148.76	70.52	82.59	92.19	99.56	*	140.90	166.91	182.83	208.14	288.46
D	105.15	126.63	53.62	67.86	73.80	79.48	89.74	121.40	141.30	158.46	180.98	259.09
F	110.68	131.64	53.28	74.31	79.60	85.89	99.16	125.92	149.12	167.90	187.13	268.95
G	68.25	84.69	18.76	28.48	34.39	41.68	57.50	79.11	96.86	106.25	120.63	188.20
H	48.99	58.07	12.17	*	23.69	27.23	37.46	59.06	68.79	74.38	81.26	122.62
I	102.51	125.54	50.47	70.48	75.31	79.94	88.42	115.21	139.43	157.70	181.36	261.41
J	120.69	169.17	45.46	75.62	81.01	*	*	146.95	181.03	205.80	246.26	372.28
K	105.50	132.50	24.50	51.70	65.08	71.45	87.08	126.27	154.43	180.61	203.55	306.00
L	110.84	121.94	41.67	73.82	78.08	85.15	99.92	124.49	152.98	163.51	178.99	220.76
M	94.16	99.67	15.25	32.27	40.04	49.58	67.49	123.79	152.45	169.36	184.56	225.13
N	91.64	103.59	22.95	36.36	43.30	51.62	70.76	110.93	130.14	139.55	150.37	197.65
O	79.47	96.05	13.40	28.13	35.95	47.17	67.23	94.63	118.02	132.42	147.18	218.50
	93.01	111.48	22.94	41.20	53.17	61.95	76.44	110.50	136.59	154.36	171.09	251.86

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 40: Estimated prevalence and rates (%) of self-reported stress, depression or anxiety caused or made worse by current or most recent job, by occupational major and sub-major group, for people working in 2004-05

Major Group	Sample cases	Illness ascribed to their current / most recent job					
		Estimated prevalence (thousands)			Rate per 100 employed in the last 12 months		
		central	95% C.I.		central	95% C.I.	
			lower	upper		lower	upper
1	129	68	56	80	1.60	1.30	1.90
2	146	75	63	88	2.10	1.80	2.50
3	127	66	55	78	1.70	1.40	2.00
4	95	48	39	58	1.30	1.10	1.60
5	28	15	9	20	0.45	0.27	0.63
6	32	17	11	23	0.76	0.49	1.00
7	41	22	15	29	0.91	0.63	1.20
8	25	13	8	18	0.61	0.37	0.85
9	38	20	14	27	0.58	0.39	0.77
All occupations	661	345	318	372	1.20	1.10	1.30

Source: (http://www.hse.gov.uk/statistics/swi/tables/0405/strocc2.htm)

Notes: * indicates that sample numbers too small to provide reliable estimates

Table 41: Estimated prevalence and rates (%) of self-reported stress, depression or anxiety caused or made worse by current or most recent job, by industrial section, for people working in 2004-05

Section	Sample cases	Illness ascribed to their current / most recent job					
		Estimated prevalence (thousands)			Rate per 100 employed in the last 12 months		
		central	95% C.I.		central	95% C.I.	
			lower	upper		lower	upper
A & B	4	*	*	*	*	*	*
C & E	4	*	*	*	*	*	*
D	60	31	23	39	0.80	0.60	1.00
F	24	13	7	18	0.56	0.32	0.80
G	59	32	24	40	0.70	0.52	0.88
H	14	*	*	*	*	*	*
I	32	17	11	23	0.85	0.55	1.20
J	45	24	17	32	2.00	1.40	2.50
K	82	43	33	53	1.30	1.00	1.60
L	83	44	34	53	2.20	1.80	2.70
M	103	53	43	63	2.00	1.60	2.40
N	126	63	52	74	1.80	1.50	2.10
O	25	14	8	20	0.86	0.52	1.20
All sectors	661	345	318	372	1.20	1.10	1.30

Source: (http://www.hse.gov.uk/statistics/swi/tables/0405/strind.2.htm)

Notes: * indicates that sample numbers too small to provide reliable estimates

Appendix C – Cost of Interventions

Table 42: Cost of Intervention 1: Bergdahl et al (2005)

Intervention Component	Resources Required	Unit Cost £per hour	Cost £per participant	Source of Unit Cost
Group session per week for seven weeks (2 hour duration). Four groups of 6-7, with 27 participants in total	2 psychologists per group per session	38.00	157.63	Curtis and Netten (2006) PSSRU
As above	Employees time, valued at median wage rate for "all sectors" adjusted for non-labour costs	13.27	185.82	ASHE (2007)
Handouts for each session	Not specific, but assumed to 10 pages per handout	0.08 (£per page)	22.40	Cost of photocopying / printing at University of Bath Library
Venue	Assumed use of vacant in-house room with zero incremental cost.	-	-	-
Total Cost			**£365.85**	

N.B. Participation in Affect School - group intervention program. One 2-hour session per week for seven weeks, led by 2 psychologists. Each group included 6-7 of the 27 participants (so assume 4 groups?) Handouts provided for each session. Each session has 30 minutes didactic presentation of topics, then participants asked to remember and present a specific stress-related situation.

Table 43: Cost of Intervention 2: Jones and Johnston (2000)

Intervention Component	Resources Required	Unit Cost £per hour	Cost £per participant	Source of Unit Cost
6 group session (2-hour duration) with each group of sessions run 3 times to accommodate 40 participants in total.	1 facilitator, assumed to be a psychologist	38.00	34.20	Curtis and Netten (2006) PSSRU
As above	Students time, valued at median wage rate for "hotels and restaurants"	6.00	72.00	ASHE (2007)
Incentive	Maximum payment of travel expenses	20.00 (£per participant)	20.00	Jones et al (2000)
Incentive	One-off prize	50.00 (single cost)	1.25	Jones et all (2000)
Handouts for each session	Not specific, but assumed to be 10 pages per handout	0.08 (£per page)	14.40	Cost of photocopying / printing at University of Bath Library
Venue	Assumed use of vacant in-house room with zero incremental cost.	-	-	-
Total Cost			**£141.85**	

N.B. Six 2-hour sessions held at School of Nursing and Midwifery in NE Scotland. Travel expenses up to £20 per participant offered plus £50 prize draw. Three runs of programme used to ensure attendance by all participants

Table 44: Cost of Intervention 3: Butterworth et al (2006)

Intervention Component	Resources Required	Unit Cost £per hour	Cost £per participant	Source of Unit Cost
Health coaching with minimum of 1 initial session + 2 follow-up contacts, average number of sessions attended = 2.7. Each session = 30 minutes	Counsellor, assumed to be equivalent to a "health visitor"	84.00	113.40	Curtis and Netten (2006) PSSRU
As above	Employees time, valued at median wage rate for "all sectors" adjusted for non-labour costs	13.27	17.92	ASHE (2007)
Independent verification	Not specific, but assumed to 15 minutes per participant	38.00	9.50	Curtis and Netten (2006) PSSRU
Venue	Assumed use of vacant in-house room with zero incremental cost.	-	-	-
Total Cost			**£140.82**	

N.B. 3-month coaching with minimum of 1 initial session and 2 follow-up contacts. Participants determined the number of sessions they needed - average number of sessions attended = 2.7 (SE 0.16). Coaching carried out by health care professionals trained in motivational interviewing and evaluated for proficiency by an independent coder. Each session was 30 minutes. Control group received no intervention

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