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Cost-effectiveness of interventions to return employees to work following long-term sickness absence due to musculoskeletal disorders

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ABSTRACT

Background Sickness absence costs the UK economy around £20 billion per year. This study aims to assess the cost-effectiveness of interventions to return employees with musculoskeletal disorders to work, one of the major causes of long-term sickness absence, using a mathematical model.

Methods A Markov model was developed to assess the cost-effectiveness of three interventions: a workplace intervention; a physical activity and education intervention and a physical activity, education and workplace visit intervention. Extensive sensitivity analyses were undertaken to assess the impact of uncertainties upon the model results.

Results All interventions assessed are estimated to have a cost per quality-adjusted life year gained below £3000 compared with usual care within the UK from a National Health Service (NHS) or societal perspective. Moreover, any intervention which returns at least an additional 3% of employees to work and costs less than an additional £3000 per employee, is likely to be considered economically attractive compared with usual care, relative to other interventions routinely funded by the NHS.

Conclusions This is the first economic evaluation in this area which extrapolates data beyond trial follow-up and synthesizes evidence from numerous sources. This sort of modelling approach should be considered for informing other public health policy decisions.

Keywords cost-effectiveness, models, musculoskeletal disorders

Introduction

Sickness absence in the UK accounts for 3–4% of average working time.[1] An estimated £20 billion are spent on sickness absence in the UK in terms of both direct and indirect costs [2] and longer absences comprise up to 75% of these costs.[3] Much of this is due to the cost of incapacity benefit (IB) [replaced for new customers by Employment and Support Allowance (ESA) in 2008]. There is a wealth of evidence to suggest that the longer a person has been receiving IB the less likely they are to return to work.[4] There is therefore a need for policy-makers and employers to understand the effectiveness and cost-effectiveness of interventions to prevent people from moving onto IB/ESA, which can occur after 6 months of sickness absence.

Musculoskeletal disorders are one of the main causes of long-term sickness absence, accounting for 34 and 17% of long-term sick leave amongst manual and non-manual workers, respectively.[1] This study aims to assess the cost-effectiveness of interventions to return employees to work following long-term sick leave (defined as between 1 week and 6 months) due to musculoskeletal disorders from a National Health Service (NHS) and Personal Social Service

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(PSS) perspective, a societal perspective and an employer perspective. This is the first economic evaluation in this area, which extrapolates data beyond trial follow-up and synthesizes evidence from numerous sources.

Methods

Model scope

A Markov model was developed to follow a cohort of employed men and women who had been on sick leave for between 1 week and 6 months with musculoskeletal disorders over a lifetime. The model assesses the cost-effectiveness of interventions aiming to return employees with musculoskeletal disorders to work due to limited availability of effectiveness evidence for other forms of sickness absence. The effectiveness of the interventions was based upon a systematic literature review, reported elsewhere.[5–7] The effectiveness studies included employees with a mixture of musculoskeletal disorders, with the majority suffering from low back pain. Details of the musculoskeletal disorders, such as the severity of illness, were generally poorly defined within the studies.

The interventions assessed within the model were the following:

- Workplace intervention (a workplace assessment and work modifications based on participative ergonomics involving all relevant stakeholders);
- physical activity and education intervention (any form of physical activity and education around how to deal with pain and body mechanics);
- physical activity, education and workplace visit (as above with a visit by the employee and the physical therapist to the workplace to inform rehabilitation and enable the employer to become actively involved in the rehabilitation process; it does not include a workplace assessment and work modifications as for the workplace intervention).

Limited descriptions of these interventions were provided within the original effectiveness studies. These interventions were compared within the model against usual care for musculoskeletal disorders within the UK. Usual care was assumed to generally involve GP visits and prescriptions for analgesics. The time frame for long-term sickness absence was defined as greater than a week, although no standard definition of 'long-term sickness absence' is available.

Outcomes assessed within the health economic model were the cost per quality-adjusted life year (QALY) gained and the cost per day on sick leave avoided. The cost per QALY gained was calculated from an NHS and PSS perspective and a societal perspective. It was thought to be important to consider the costs and benefits incurred to the employer as a result of the interventions for implementation purposes. It was assumed that employers' primary concerns would be with sickness absence costs; hence only a cost per day on sick leave avoided was calculated from this perspective.

Model structure

Figure 1 shows the health states within the model; the arrows show the possible transitions between health states. There is a probability each 6 months of transitioning between health states.

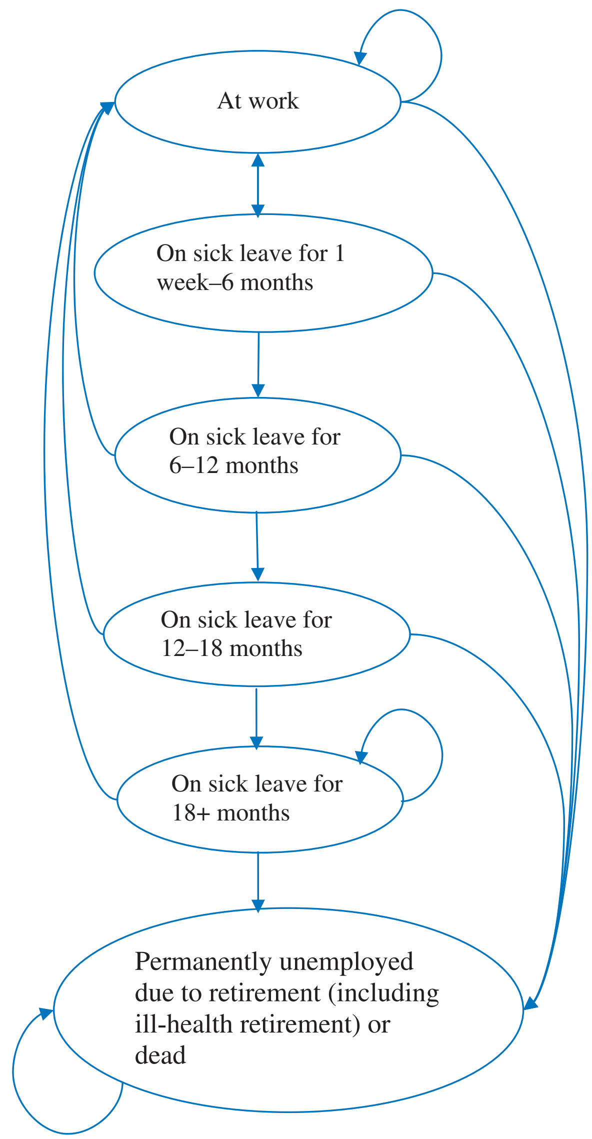

Fig. 1 Model schematic.

The probability of returning to work within the first 6 months with usual care for musculoskeletal disorders was based on a meta-analysis of the studies identified by the effectiveness systematic literature review.[8–16] The probability of returning to work in each successive 6 month period was based upon national statistics.[4] A half-cycle correction was applied within the model to account for those people who would return to work mid-way through each 6-monthly cycle. The probability of subsequent episodes of long-term sickness absence due to musculoskeletal disorders following a return to work was assumed to be twice as great as for a member of the general population based on a study of low back pain, which provided the best available evidence for this parameter.[17] This probability was assumed to be the same independent of whether the employee had been given the intervention or usual care previously, i.e. any benefits resulting from the intervention were incurred only during the administration of the intervention. This was a conservative assumption, which means that the effectiveness estimates of the interventions are unlikely to be overestimated.

The average age of an employee initially progressing to long-term sickness absence due to musculoskeletal disorders was assumed to be 41 based on the evidence identified by the effectiveness literature review.[5–7] The retirement age was assumed to be 66 based on projections by the Department for Work and Pensions for people who are currently 41.[18] After the employee reaches pension age, there was assumed to be no substantial difference in the costs or benefits incurred by the people who received the intervention and those that received usual care. In addition, the probability of dying was assumed to be no different for people on long-term sick leave due to musculoskeletal disorders to people who are at work, because having musculoskeletal disorders is unlikely to affect survival of the employees.

Intervention effectiveness

The increased likelihood of return to work (i.e. the relative risk of return to work) within the first 6 months of sickness absence was obtained from a systematic literature review, described elsewhere,[5–7] of all relevant randomized controlled trials for each of the interventions assessed within the model. This was estimated to be 1.12 for a workplace intervention based on a study by Steenstra *et al.*[15] and for a physical activity and education intervention it was estimated to be 1.06 based on a meta-analysis of three studies identified by the review.[10,12,13] The relative risk of return to work for a physical activity, education and workplace visit intervention was estimated to be 1.43 based on a meta-analysis of four studies identified by the review.[8,9,11,14] If the intervention was not effective within the first 6 months, the employee was assumed to be subsequently no more likely to return to work than if they were receiving usual care for musculoskeletal disorders. These parameters are shown within Table 1.

Utilities

A health utility is used to describe employee quality of life for each 6 month cycle, where 0 is equivalent to death and 1 is equivalent to full health. The QALY is derived by summing the health utility for each 6 monthly cycle from the initial sick leave episode until retirement. The health utilities were derived using a study by Peasgood *et al.*[19] This study used data from the British Household Panel Survey, a longitudinal annual survey of a nationally representative sample of Great Britain. As part of this survey, SF-36 data were collected, one of the most widely used measures of general health, which were converted into SF-6D utility scores using a standard algorithm [20] for people who are at work and people who are on sick leave. These estimates were limited to people within the survey that had both been at work and on sick leave within the previous 10 years so that the utility estimates were based on people that are likely to move between being at work and being on sick leave. The underlying illness is not directly used within the utility estimates due to data limitations, although a reasonable correlation is assumed between illness and work status. These utilities are shown within Table 1.

Costs

Costs incurred from each perspective are shown within Table 2. Currently within the UK, if an employee is on sick leave from work for more than 3 days they are eligible to receive Statutory Sick Pay (SSP) from their employer. If the employee continues to be on sick leave for 6 months, they may then receive ESA (previously IB) which is paid for via national insurance contributions. Many employers also provide occupational sick pay (OSP) to their employee. Within the UK, the amount of OSP provided to employees is highly variable, ranging from no payment, to up to 6 months of full pay followed by 6 months of half pay. During sick leave within the model, the employees were assumed to receive full pay for 15 weeks and half pay for 16.4 weeks based on the national average.[1] The impact of this assumption upon the model results is tested within a sensitivity analysis. Sensitivity analysis involves testing the impact of alternative plausible assumptions and parameters upon the model results. If alternative assumptions do not impact substantially upon the model results then the

Table 1 Model parameters

Parameter	*Mean value*	*Source*
Probability of being on long-term sick leave and going back to work (0–6 months)	64.8%	Weighted average of the effectiveness studies
Probability of being on long-term sick leave and going back to work (6–12 months)	2.3%	Department for Work and Pensions[4]
Probability of being on long-term sick leave and going back to work (12–18 months)	5.3%	
Probability of being on long-term sick leave and going back to work (every 6 months after 18 months on sick leave)	0.7%	
Probability of being at work and experiencing sickness absence (>4 days) given already experienced long-term sickness	2.3%	CIPD[1]
Relative risk of RTW within first 6 months given Workplace Intervention	1.12	Anema *et al.*[16], Steenstra *et al.*[15]
Relative risk of RTW within first 6 months given physical activity and education intervention	1.06	Meta-analysis of Jensen *et al.*[13], Molde *et al.*[12] and Sinclair *et al.*[10]
Relative risk of RTW within first 6 months given physical activity and education and workplace visit	1.43	Meta-analysis of Burke *et al.*[9], Haldorsen *et al.*[11], Lindstrom *et al.*[8] and Skouen and Kvale[14]
Utility of employee age		Derived from Peasgood *et al.*[19]
<35, at work	0.83	
35–45, at work	0.8	
45–55, at work	0.76	
>55, at work	0.76	
<35, sick leave	0.66	
35–45, sick leave	0.59	
45–55, sick leave	0.61	
>55, sick leave	0.61	
Cost of usual care for musculoskeletal disorder[a]	£216	
4.5 visits to GP	£140	Curtis[27]
4.5 prescription	£50	Curtis[27]
3 packs of analgesics or equivalent pain relief (64%)	£5	BNF[28]
4 half-hour sessions of physiotherapy (7%)	£5	Curtis[27]
2.5 sessions of osteopathy (5%)	£5	Curtis[27]
2.5 sessions of chiropractic treatment (2%)	£2	Curtis[27]
Hospital outpatient visit (10%)	£12	Curtis[27]
Cost of usual care and workplace intervention	£743	
Usual care	£216	See above
Workplace intervention	£527	Steenstra *et al.*[15] (2006)
Cost of usual care and physical activity and education	£999	
Usual care	£216	See above
Physiotherapy/physical activity	£163	Curtis[27]
CBT-type treatment	£620	Curtis[27] [b]
Cost of usual care, physical activity, education and workplace visit	£1045	
Cost of usual care, physical activity and education	£999	See above
Cost of workplace visit	£46	DWP[21]
Gross weekly salary	£457	DWP[21]
Friction period	10 weeks	CIPD[22]
Cost of OSP to employer during first 6 months of illness	£9369	DWP[21] and CIPD[1]
Cost of OSP to employer during 6–12 months of illness	£1234	DWP[21] and CIPD[1]
Cost of employers' national insurance contribution for first 6 months of OSP	£1199	HMRC website[29]

Table 1 Continued

Parameter	*Mean value*	*Source*
Cost of employers' national insurance contribution for 6–12 months of OSP	£158	HMRC website[29]
Cost of hiring replacement worker (includes advertising costs, agency or search fees)	£4333	CIPD[22]

[a]Proportions taken from Maniadakis *et al.*[24] and personal communication with Dr S. Eldabe and Prof. G. Waddell (2008).
[b]Based on the cost of CBT for mental health disorders.

Table 2 Costs incurred from different perspectives

State in the model	*Perspective*		
	NHS and PSS	*Societal*	*Employer*
At work	£0	£0	£0
1 week to 6 months sick leave	Cost of usual care or intervention incurred by NHS	NHS and PSS costs + employer costs—salary of replacement worker after friction period—OSP—employer's national insurance contribution	Cost of intervention incurred by employer + cost of replacement worker + production loss over friction period + salary of replacement worker after friction period + OSP + employer's national insurance contribution
6–12 months sick leave	Cost of usual care	Cost of usual care	OSP + employer's national insurance contribution
12 months + sick leave	Cost of usual care	Cost of usual care	£0

uncertainty around them is not important; however if the results alter substantially then further research may be useful in order to reduce the uncertainty within that model input. This sensitivity analysis considers (i) employees who receive only SSP for 6 months and (ii) employees earning double the national average wage who receive 6 months of full pay followed by 6 months of half pay.

Production loss within the model was estimated by assuming that production is equivalent to an employee's wage and is based upon the national average wage.[21] Within sensitivity analyses, this wage estimate was varied by 50 and 200% to test the impact of this assumption upon the model results. It was assumed that loss of salary was not already incorporated into the valuation of utilities. The model also assumed that there are a sufficient number of unemployed people within the UK in order to replace each worker who goes onto sick leave due to musculoskeletal disorders after some 'friction period', which allows for the advertising and recruitment of another worker. The cost of the advertising and recruitment were included within this analysis. It was assumed that the friction period is 10 weeks based on the national average replacement period.[22] Wages and productivity of a replacement worker were assumed to be the same as those given to the worker they replaced. This is likely to be a conservative estimate of costs[23] and hence the cost-effectiveness of the intervention is more likely to be overestimated than underestimated. Within a sensitivity analysis, the assumption that it is possible to replace a sick employee was tested using the human capital approach to costing production loss. This approach assumes that it is not possible to replace the worker who is on sick leave due to musculoskeletal disorders, and hence production loss continues until that person reaches state pension age.

The costs of usual care for musculoskeletal disorders in the UK, shown in Table 2, were based on the studies identified by the systematic literature review, personal communication with UK clinicians (Dr. S. Eldabe, Consultant in Anaesthesia and Pain Management, 2008; Prof. G. Waddell, Orthopaedic Surgeon, 2008) and a paper by Maniadakis *et al.*[24] estimating 'the burden of back pain within the UK'.

The cost of usual care was varied within a sensitivity analysis to assess the impact of variations in the provision of usual care within the UK.

All model parameters are shown in Table 1.

Sensitivity analyses

Extensive one-way sensitivity analyses were undertaken to assess the impact of uncertain parameters and key model assumptions upon the model results. Parameters and assumptions varied within these analyses and the results of the analyses are shown in the Supplementary data. Due to the uncertainties around the costs and effectiveness of the interventions, the results are presented marginally compared with usual care, rather than incrementally. Also an analysis was undertaken varying the relative risk of return to work within the first 6 months for an intervention from 1.05 to 1.4 and varying the additional cost of an intervention in comparison to usual care from £0 to £5000. These ranges were chosen as they were thought to represent the widest plausible ranges for any effective intervention.

Results

The incremental cost-effectiveness ratios from an NHS and PSS perspective and societal perspective were very similar (although the absolute costs differed). This is because the majority of the cost differences between giving the intervention and usual care relate to the ongoing costs of usual care to the NHS for those people who have not returned to work, rather than the assumed one-off societal costs of a replacement worker and reduced productivity. The physical activity and education intervention was estimated to result in a cost per QALY gained of around £2800 in comparison to usual care from both perspectives. This is a relatively low cost per QALY gained in comparison to other interventions routinely assessed by NICE.[25] The remaining two interventions assessed within the model were estimated to be more effective and less costly than usual care. These results are shown in Fig. 2a, where the origin denotes usual care and the x-axis and y-axis denote the difference between usual care and the interventions in terms of effectiveness and costs, respectively.

From the employer perspective, the model suggests that the interventions which do not require large cost input from the employer (physical activity and education intervention; physical activity, education and workplace visit) are likely to be cost saving to the employer. Most of the costs for these interventions are incurred by the NHS. The workplace intervention is estimated to cost the employer a net 34 pence per day on sick leave avoided after taking into account productivity loss and costs such as OSP and the cost of the intervention. These results are shown in Fig. 2b. Based upon current evidence, the physical activity, education and workplace visit is estimated to be the most effective and cost saving from all perspectives assessed.

Sensitivity analyses

From the NHS and societal perspectives, only two assumptions increased the cost per QALY gained above £5500. Firstly, if quality of life associated with being at work is only slightly greater than being on sick leave (i.e. difference in health utility is 0.02), the cost per QALY gained for the physical activity and education intervention increases to around £23 000. The two remaining interventions continue to dominate usual care, i.e. they are more effective and less costly than usual care. Secondly, if the employee is aged 55 rather than 41 when moving onto long-term sick leave, then the cost per QALY gained increases to around £9000 for the physical activity and education intervention. Again the remaining two interventions dominate usual care.

The results of the sensitivity analysis from the employer perspective suggest that doubling the probability of recurring sickness absence will increase the net cost per day on sick leave avoided to over £1 per employee for the workplace intervention compared with usual care and that the remaining two interventions assessed will no longer produce a net cost saving. All other assumptions tested within the sensitivity analysis improve the cost-effectiveness of the interventions by decreasing the cost per day on sick leave avoided or increasing the net saving as a result of the intervention.

Varying the costs of the interventions and the relative risk of return to work suggests that if the intervention costs less than an additional £3000 and returns at least an additional 3% of people to work (32/1000) in comparison to usual care then it is likely to result in a cost per QALY gained below £20 000 as shown in Fig. 3. It should, however, be noted that this analysis did not take other uncertainties within the model into account.

Discussion

Main finding of this study

The analysis suggests that interventions resulting in small improvements of return to work are likely to be considered to be cost-effective in comparison to other interventions routinely funded by the NHS due to the large ongoing costs associated with being on sick leave.

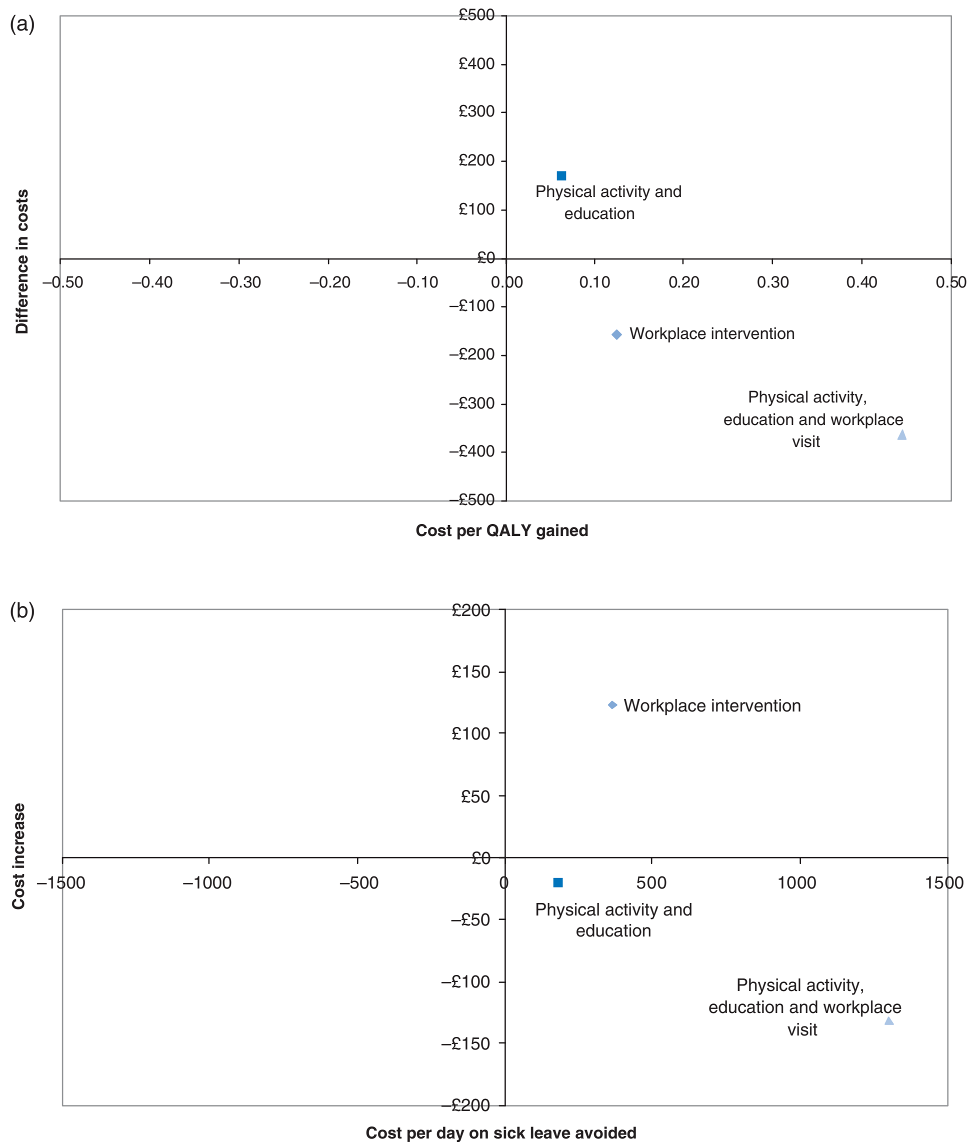

Fig. 2 (**a**) NHS and societal perspective model results. (**b**) Employer perspective model results.

What is already known on this topic

Economic analyses undertaken alongside randomized controlled trials have suggested that these interventions may be economically attractive.

What this study adds

This is the first full economic evaluation worldwide of interventions to return employees to work which extrapolates data beyond trial follow-up and synthesizes evidence from numerous sources. It also suggests where additional evidence may be useful.

Limitations of this study

The results of any mathematical model should be interpreted in the light of the available evidence. The evidence identified around the effectiveness of returning employees to work following long-term sickness absence was generally of poor quality and from non-UK countries; hence the estimates of intervention effectiveness are highly uncertain. In addition, the lack of long-term follow-up data meant that assumptions around return to work after the first 12 months were required. For example, the workplace intervention may have a preventive effect on subsequent injuries and on the overall output of the workplace which it was not possible to capture within the model. The movement between being at work and being on sick leave is likely to be more complex in practice and further research in the form of clinical trials is required within the UK to assess the effectiveness over the long term of specific interventions to return employees to work following long-term sickness absence. This mathematical model could then be used to

Fig. 3 Results of exploratory analysis (NHS and societal perspective).

more reliably compare each intervention to assess which specific intervention(s) are cost-effective within the UK setting. Further qualitative research would also be beneficial around the reason for the workplace visit being so effective.

Relationships between variables within the model were largely simplified due to lack of data and resource constraints. For example, the relationship between sickness benefits paid to the employee and rate of return to work is highly complex. It is possible that limited OSP may result in an earlier return to work. However, these employees may be more likely to return to work in an unsatisfactory state of health which could reduce productivity. Inter-related factors such as level of salary, working hours and whether there is any flexibility in terms of phased return to work may also affect return to work. Further evidence is required around these factors in order to reduce the structural uncertainties within the model. It was not feasible to incorporate these structural uncertainties adequately within a probabilistic sensitivity analysis (PSA) within the constraints of the project. Therefore, a PSA was not undertaken in order to avoid providing misleading estimates of model uncertainty, based only on the uncertainty in the parameter inputs. Importantly, a large amount of structural uncertainty is inherent to modelling any public health interventions and further research should aim to develop methodologies for addressing this. Conservative assumptions were made around the long-term outcomes associated with the interventions, meaning that the estimates of cost-effectiveness are more likely to be overestimated than underestimated.

There have been debates about the way in which production loss should be incorporated into economic models and whether utilities already incorporate some of the impacts of loss of salary.[26] However, the cost of production loss has a minimal impact upon the model results. Importantly, this analysis was undertaken during a time of essentially full employment in the UK. The recent economic downturn may result in these interventions becoming less economically attractive.

Conclusions

The results of the analysis suggest that interventions resulting in small improvements of return to work are likely to be considered to be cost-effective in comparison to other interventions routinely recommended by NICE. This is due to the ongoing costs associated with being on sick leave compared with the relatively low cost of the interventions. This is the first economic evaluation in this area, which extrapolates data beyond trial follow-up and synthesizes evidence from numerous sources. This sort of modelling approach was useful in informing policy-makers' understanding of the long-term costs and outcomes of these interventions and should be considered for informing other public health policy decisions.

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

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References

1 Chartered Institute of Personnel and Development. Absence management annual survey report 2010. http://www.cipd.co.uk/hr-resources/survey-reports/absence-management-2010.aspx (December 2010, date last accessed).

2 Leaker D. OfNS. Sickness absence from work in the UK. Report No. 2 (11), 2008.

3 Henderson M, Glozier N, Elliot KH. Long term sickness absence. *BMJ* 2005;**330**:802.

4 Department for Work and Pensions. Incapacity benefit and severe disablement allowance quarterly summary statistics, 2005. http://research.dwp.gov.uk/asd/index.php?page=ib_sda (December 2010, date last accessed).

5 Hillage J, Rick J, Pilgrim H *et al. Review of the Effectiveness and Cost Effectiveness of Interventions, Strategies, Programmes and Policies to Reduce the Number of Employees Who Move From Short Term to Long Term Sickness Absence and to Help Employees on Long Term Sickness Absence Return to Work*. NICE, 2008. http://guidance.nice.org.uk/PH19 (December 2010, date last accessed).

6 Rick J, Carroll C, Hillage J *et al. Review of the Effectiveness and Cost Effectiveness of Interventions, Strategies, Programmes and Policies to Reduce the Number of Employees Who Take Long Term Sickness Absence on a Recurring Basis.* NICE, 2008. http://guidance.nice.org.uk/PH19 (December 2010, date last accessed).

7 Hayday S, Rick J, Carroll C *et al. Review of the Effectiveness and Cost Effectiveness of Interventions, Strategies, Programmes and Policies to Help Recipients of Incapacity Benefits Return to Employment (paid and unpaid).* NICE, 2008. http://guidance.nice.org.uk/PH19 (December 2010, date last accessed).

8 Lindstrom I, Ohlund C, Eek C *et al.* The effect of graded activity on patients with subacute low back pain: a randomized prospective clinical study with an operant-conditioning behavioral approach. *Phys Ther* 1992;**72(4)**:279–90.

9 Burke S, Harmsconstas C, Aden P. Return to work/work retention outcomes of a functional restoration program—a multicenter, prospective-study with a comparison group. *Spine* 1994;**19(17)**: 1880–5.

10 Sinclair SJ, Hogg-Johnson SH, Mondloch MV *et al.* The effectiveness of an early active intervention program for workers with soft-tissue injuries. The Early Claimant Cohort Study. *Spine (Phila Pa 1976)* 1997;**22(24)**:2919–31.

11 Haldorsen EM, Grasdal AL, Skouen JS *et al.* Is there a right treatment for a particular patient group? Comparison of ordinary treatment, light multidisciplinary treatment, and extensive multidisciplinary treatment for long-term sick-listed employees with musculoskeletal pain. *Pain* 2002;**95(1–2)**:49–63.

12 Molde HE, Grasdal A, Eriksen HR. Does early intervention with a light mobilization program reduce long-term sick leave for low back pain: a 3-year follow-up study. *Spine (Phila Pa 1976)* 2003;**28(20)**: 2309–15.

13 Jensen IB, Bergstrom G, Ljungquist T *et al.* A 3-year follow-up of a multidisciplinary rehabilitation programme for back and neck pain. *Pain* 2005;**115(3)**:273–83.

14 Skouen JS, Kvale A. Different outcomes in subgroups of patients with long-term musculoskeletal pain. *Norsk Epidemiol* 2006;**16(2)**: 127–35.

15 Steenstra IA, Anema JR, van Tulder MW *et al.* Economic evaluation of a multi-stage return to work program for workers on sick-leave due to low back pain. *J Occup Rehabil* 2006;**16(4)**:557–78.

16 Anema JR, Steenstra IA, Bongers PM *et al.* Multidisciplinary rehabilitation for subacute low back pain: graded activity or workplace intervention or both? A randomized controlled trial. *Spine (Phila Pa 1976)* 2007;**32(3)**:291–8.

17 Hestbaek L, Leboeuf-Yde C, Manniche C. Low back pain: what is the long-term course? A review of studies of general patient populations. *Eur Spine J* 2003;**12(2)**:149–65.

18 Department for Work and Pensions. The pension service, 2007. http://www.direct.gov.uk/en/Pensionsandretirementplanning/StatePension/DG_4017919 (June 2011, date last accessed).

19 Peasgood T, Roberts J, Tsuchiya A. Incapacity benefit: a health or labour market phenomenon? [SERP Number: 2006011]. Sheffield Economic Research Paper Series 2006, 2006.

20 Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ* 2002;**21(2)**: 271–92.

21 Department for Work and Pensions. Annual survey of hours and earnings, 2007.

22 Chartered Institute of Personnel and Development. Recruitment, retention and turnover annual survey report 2007. http://www.cipd.co.uk/ (February 2008, date last accessed).

23 Hayday S, Bevan S. Costing sickness absence in the UK, 2001. Report 382, Institute for Employment Studies.

24 Maniadakis N, Gray A. The economic burden of back pain in the UK. *Pain* 2000;**84(1)**:95–103.

25 *Guide to the Methods of Technology Appraisal, 2008*. NICE, 2008. http://www.nice.org.uk/media/B52/A7/TAMethodsGuideUpdatedJune2008.pdf (December 2010, date last accessed).

26 Pritchard C, Sculpher M. *Productivity Costs: Principles and Practice in Economic Evaluation*. London, Office of Health Economics, 2000.

27 Curtis L. *Unit Costs of Health and Social Care*. University of Kent: Personal Social Services Research Unit, 2007.

28 Joint Formulary Committee. British National Formulary 55 London: British Medical Association and Royal Pharmaceutical Society, 2008. http://bnf.org/bnf/index.htm (February 2008, date last accessed).

29 HM Revenue & Customs. http://www.hmrc.gov.uk/index.htm (February 2008, date last accessed).