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National Institute for Health and Care Excellence (NICE)

Workplace health – older employees: Economic model report

Final Report

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Executive Summary

1. INTRODUCTION

NICE has been asked by the Department of Health (DH) to develop a public health guideline on policies and approaches to promote and protect the health of older employees (those aged 50 and over). The guideline is aimed at employers and employees, human resources professionals, trade unions, professional bodies and health professionals.

2. OBJECTIVES

Three key questions were outlined in the final scope, all of which are relevant to the economic modelling:

Question 1: What are the most effective and cost-effective methods of protecting and promoting the health and wellbeing of older workers at both an individual and organisational level? What supports, or prevents, implementation of these methods?

Question 2: What are the most effective and cost-effective methods of supporting workers who wish to continue in employment up to and beyond the state pension age? What supports, or prevents, implementation of these methods?

Question 3: What are the most effective and cost-effective ways of helping older workers plan and prepare for retirement? What supports, or prevents, implementation of these methods?

3. METHODS

An economic model was developed to address the research questions. The model was developed as an interactive tool (a ‘cost calculator’) to be made available to those at which the guidance is aimed who are considering implementing workplace interventions. The model allows the user to input values and generate results specific to their workforce.

Due to the lack of relevant data identified, the model results were presented as a four-way sensitivity analysis. This allows the model user to identify the graph most relevant to their workforce and to the relevant age-group. The graphs allow the user to establish the point at which an intervention would become cost-saving.

3. RESULTS

Results were presented as a four-way threshold analysis, illustrating in which scenario an intervention is likely to be cost-saving for an employer. The results showed that income from increased productivity is the input most sensitive to the effect of an intervention.

4. DISCUSSION

The results show that with the base case inputs, the key driver of cost savings is the increase in productivity. However, the base case input for the increase in productivity (0.1%) is an assumption. Therefore, this is an important data gap in the model.

The method of presenting model results using a ‘what-if?’ sensitivity analysis was deemed to be the most appropriate based on the data that were available. This approach has some limitations which include no definitive answer being given as to whether a specific intervention is cost saving. However, it does allow the analysis to be directly relevant to a larger group of stakeholders. The model is designed as a flexible interactive ’cost calculator’ so that it can be tailored to an employer’s workplace and to a specific intervention.

Acknowledgements

The authors would like to thank members of the PHAC for their valuable contributions in developing the economic model.

Abbreviations

ABBREVIATIONS

BT	BT Group plc
CCG	Clinical commissioning group
CIPD	Chartered Institute of Personnel and Development
CPI	Consumer Price Index
DH	Department of Health
HSE	Health and Safety Executive
ICER	Incremental cost effectiveness ratio
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
ONS	Office for National Statistics
PHAC	Public Health Advisory Committee
PSSRU	Personal Social Services Research Unit
PwC	PricewaterhouseCoopers
QALY	Quality-adjusted life year
QOL	Quality of life
RTA	Road traffic accident

GLOSSARY

Absenteeism	Absence from work.
Incremental cost-effectiveness ratio (ICER)	The difference in mean costs in the population of interest divided by the differences in the mean outcomes in the population of interest
Presenteeism	The practice of coming to work despite illness, injury or anxiety, often resulting in reduced productivity.
Productivity	A measure of the efficiency of a person.
Quality-adjusted life year	A measure of the state of health of a person or group in which the benefits, in terms of length of life, are adjusted to reflect the quality of life. One QALY is equal to 1 year of life in perfect health

Section 1: Background

As outlined in the final scope published on the National Institute for Health and Care Excellence (NICE) website[1], NICE has been asked by the Department of Health (DH) to develop a public health guideline on policies and approaches to promote and protect the health of older employees (those aged 50 and over). The guideline is aimed at employers and employees, human resources professionals, trade unions, professional bodies and health professionals.

Three key questions were outlined in the final scope, all of which are relevant to the economic modelling:

Question 1: What are the most effective and cost-effective methods of protecting and promoting the health and wellbeing of older workers at both an individual and organisational level? What supports, or prevents, implementation of these methods?

Question 2: What are the most effective and cost-effective methods of supporting workers who wish to continue in employment up to and beyond the state pension age? What supports, or prevents, implementation of these methods?

Question 3: What are the most effective and cost-effective ways of helping older workers plan and prepare for retirement? What supports, or prevents, implementation of these methods?

The NICE scope outlines the expected outcomes of the economic modelling to include 'quality-adjusted life years (QALYs) if appropriate, along with all other outcomes' (p. 8, NICE Final Scope). Using costs and QALYs to calculate incremental cost-effectiveness ratios (ICER) is the approach usually taken in economic evaluations for NICE, if the data allows for this type of analysis. This approach allows decision makers to decide if an intervention is an efficient allocation of National Health Service (NHS) resources. NICE currently uses an ICER threshold of £20,000 to £30,000, above which an intervention is not deemed to be an efficient use of NHS resources. However, using this approach was not considered appropriate for the current economic analysis.

[1] https://www.nice.org.uk/guidance/gid-phg59/documents/workplace-health-older-employees-final-scope2

Using QALYs as an outcome would not be relevant to employers. From the employers' point of view, although the quality of life (QOL) of their employees may be important, QOL alone does not have a monetary value in any sense that could be utilised by an employer. Increasing employees' QOL may increase productivity and thereby have some monetary benefits to the employer; this would be captured using cost alone, without QALYs. An ICER would not have any meaning in terms of cost-effectiveness as there is no commonly used threshold for an ICER in order for an intervention to be considered cost-effective within the workplace. In addition, there were no work-related quality of life data identified that were suitable with which to populate the model. It is difficult to attach a quality of life measure to interventions that may help older workers to stay in the workplace as perspectives on this differ (i.e. some people would prefer to stay in the workplace and, therefore, their quality of life would increase, others would prefer to retire, and their quality of life would decrease if more time was spent in the workforce rather than in retirement). Therefore, the approach that was taken was to assign costs to any outcomes that were included in the model. For example, a cost can be assigned to an employee taking a day of sick leave, as a sick day will cost an organisation money but the quality of life of an employee during that sick day has no effect on the business. Rather than calculating an ICER, the model shows whether or not an intervention is cost-incurring or cost-saving.

The following document outlines the draft economic model. The economic model aims to quantify the effect that workplace health interventions aimed at older employees might have on cost from various perspectives. The perspectives considered in the model are as follows:

- The employer;
- The health care system;
- Society.

The economic model also provides a 'cost calculator' intended to be made available to the various decision makers (some of which are outlined above) to determine if a workplace health intervention aimed at older employees is likely to be cost-effective in their organisation. The model is not only relevant directly to employees but also to other organisations interested in the costs or cost savings associated with implementing a workplace health intervention. For example, if a Clinical Commissioning Group (CCG) were considering investing in workplace health interventions this tool would allow them to approximate the benefits that may be gained within a business from their investment. The model will allow the user to input values and generate results specific to their workforce.

This document is structured as follows: Section 2 reports the methodology employed in developing the economic model including the inputs used in the model, Section 3 reports the model sensitivity analysis and a discussion of the model output is included in Section 4.

Section 2: Methodology

2.1 MODEL STRUCTURE

The basic model structure is outlined in Figure 2.1. The approach taken was to assign a per person cost of the workplace health intervention. This was then combined with five categories of possible cost savings from the intervention:

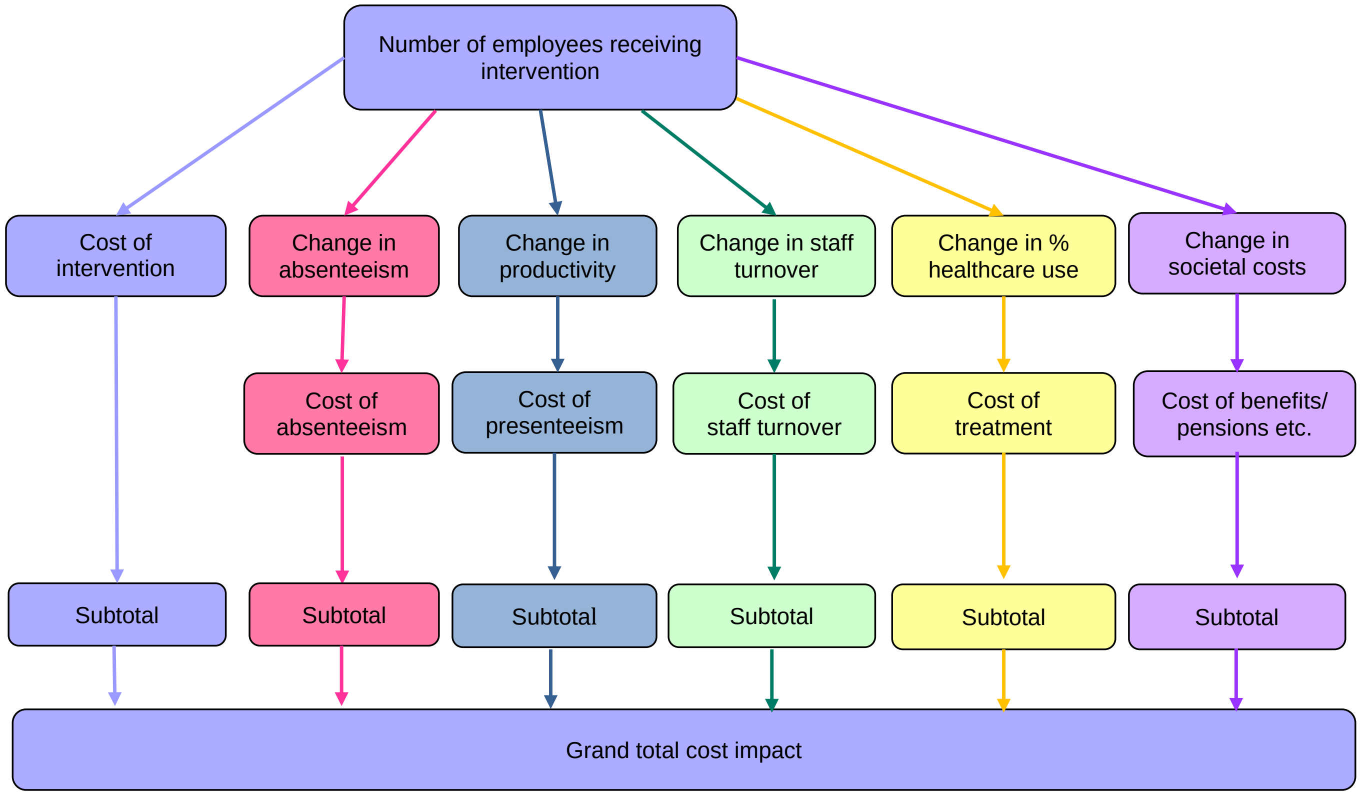
- Absenteeism;
- Productivity (including presenteeism);
- Staff turnover;
- Healthcare costs;
- Other societal costs.

Although there are countless areas of possible cost savings, the model was limited to five areas in order to make the results manageable and possible to interpret. Further, as there are so few data available, increasing the number of areas included would only increase the level of uncertainty in the model inputs. Categories such as 'healthcare costs' and 'other societal costs' can encompass many different costs and effects. The details of which costs are included in each of these areas are discussed in Section 2.2.

The same calculation approach was applied to each of the five categories. For example, the change in absenteeism was multiplied by the cost of absenteeism to give the cost difference before and after the intervention. The cost difference for all five areas was then summed to give an overall cost difference.

Due to the lack of data and many uncertainties in the input parameters of this model, the method outlined would give one single result which would be of limited usefulness alone as it would not apply to all possible variations in the model, such as type of organisation and type of intervention; therefore, these results were developed into a four-way sensitivity analysis. Four-way sensitivity analysis allows for four parameters to be varied at one time in order to observe the effect that this has on the model results. For further detail about how to interpret four-way sensitivity analysis is available in Appendix A. Details of the presentation of results are discussed in Section 2.3.

Figure 2.1: **Model structure**



2.2 INPUTS

As previously mentioned, there is a lack of quantitative evidence around the implementation of workplace health interventions that are targeted specifically at older employees. Further, in those workplace interventions that are targeted at the whole workforce, results by age bracket are rarely reported. There are many factors that can affect the costs and effectiveness of a workplace health intervention. These include the age of the employees, seniority of employees, the type of intervention, the type of organisation the intervention is carried out in and factors external to the workplace, such as the labour market, the current state of pension schemes, and personal financial and domestic situations. As defined in the NICE scope, there are a wide range of relevant interventions:

- Organisational policies and initiatives for older employees, for example: policies on promoting health and wellbeing, staff retention, development and progression, and the transition between work and retirement;
- Changes to the way work is organised and changes to the work environment to improve health and wellbeing and to support older employees. This includes: flexible working policies; incentives to stay in work; job design (including the nature of the work); adaptations to the equipment used or workspace to mitigate any functional decline related to ageing;
- Activities to counteract or challenge ageism in the workplace;
- Retirement planning and training (either as a recipient or trainer/mentor);
- Other initiatives in the workplace and wider business communities, and by organisations representing employees, to promote all of the above.

In addition, the systematic and targeted literature reviews did not identify any intervention studies in older employees that had the quantitative data necessary to populate the model. As such, rather than determining a single base case input for use in the economic model, a range of plausible values was identified. Wide inputs ranges were used in the model to try and cover most probable scenarios. The information used to determine these ranges is outlined in the following sections. Age-specific data are included where possible, though this was not always available. The inputs included in this iteration of the model and report can be refined at a later stage if better data sources are identified. However, the best available inputs that have been identified to date are included and this can be used as a starting point for discussion. Similar work has been carried out for NICE (PHG57 - Workplace policy and management practices to improve the health and wellbeing of employees) in which literature searches were carried out to identify model inputs. Where no age-specific data were found, sources from this work were used

All inputs in the model are annual. The model assumes that the effects of an intervention last one year. If the effects of the intervention lasted less than one year then this model may overestimate the benefits. If the effects of the intervention lasted longer than one year this model may not capture all of the benefits associated with the intervention. The ranges that are used in the model are the mean ranges at organisational rather, rather than at individual level. Figure 2.2 summarises the base case inputs and ranges used in the model. It also shows how the model set-up is laid out to allow the model user to select which of the five

Comment [YHEC1]: YHEC note: Reference to this work will be added when the full report is published on the NICE website (27th May)

YHEC note (01/06/15) – Unable to find the Levy model report on the NICE website. Will this be published soon?

categories to include in the analysis (using tick boxes). The model user can input their own values in any of the green input cells and the model results will automatically update.

Figure 2.2: Inputs used in model

Number of employees	30

	Baseline	Minimum	Maximum
Cost of intervention per person	£200	£0	£2,000

Absenteeism ☑	Baseline	Minimum	Maximum
Number of days lost per person	7.084	2	25
Cost of absenteeism per day	£120	£50	£500
Reduction in absenteeism	10%	0%	100%

Productivity ☑	Baseline	Minimum	Maximum
Percentage of staff affected	100%	50%	75%
Value of employee	£28,230	£6,000	£150,000
Increase in productivity	0.1%	0%	50%

Staff turnover ☑	Baseline	Minimum	Maximum
Annual rate of staff turnover	12%	0%	50%
Cost per case of staff turnover	£14,282	£2,000	£30,000
Reduction in staff turnover	18%	0%	50%

Health care costs ☐	Baseline	Minimum	Maximum
Percentage of staff affected	22%	14%	43%
Cost per person affected	£841	£50	£5,000
Reduction in healthcare use	50%	30%	73%

Other societal costs ☐	Baseline	Minimum	Maximum
Percentage of staff affected	5%	0%	50%
Cost per person affected	£5,000	£0	£20,000
Reduction in societal costs	10%	0%	90%

*The details of the references for each of these inputs are discussed elsewhere

**Green cells indicate those that have sources and orange cells indicate where assumptions have been made. Please note that all ranges are marked as assumptions because wide ranges were used to capture all possible scenarios.

***The number of employees is illustrative. This number would change with each individual organisation. The total cost difference will change but the direction of results will remain the same.

2.2.1 Cost of intervention

The specific cost of an intervention is difficult to determine owing to the huge range of interventions that are available. As discussed by the Public Health Advisory Committee (PHAC) and identified in the literature reviews, workplace health interventions can range from pre-retirement planning to educating managers to reduce age discrimination. The costs involved in implementing an intervention can vary widely, from completing a simple paper fact sheet, to providing one-on-one training with a specialist. Further, if the intervention is aimed at training senior staff, it is difficult to determine the cost per employee who might benefit from the intervention (as is required in the model inputs).

The definition of the cost of the intervention in the model is flexible in order to allow all scenarios to be assessed. It can include only the price of the intervention or it can include the price of the intervention plus the cost for employees to take part in the intervention. The time involved for employees to take part would be equivalent to the cost of absenteeism. The Mental Health Foundation charge £200 for a one day mental health awareness event (1) while Restore provide training for people experiencing mental health problems before professional help is obtained for £200 per attendee (2). There is no reason to expect that for these interventions the costs would increase for older employees. Therefore, £200 was used in the base case. However, no costs were identified for interventions specifically aimed at older employees e.g. retirement planning, or for those interventions that run over a longer period which may be more costly. Conversely, some interventions can be very inexpensive. Therefore, a range of £0 to £2,000 was used for the cost of an intervention per person.

The effectiveness of the intervention was assumed to last one year. The inputs outlined in Section 2.2.2 to Section 2.2.6 all apply over one year.

2.2.2 Absenteeism

Absenteeism is defined as the number of days away from work due to sickness. National data also reports that sickness absence is higher in those aged 50 over years. The number of days lost per person working full-time per year for those aged 50 to 65 years is approximately 7 days (3).

The Sainsbury Centre for Mental Health (4) provide their estimate of the cost of sickness absence which is adjusted for specialised skills in teams (in which the output of each member affects the productivity of the team), earnings (sickness absence tends to vary inversely with earnings) and employee compensation, resulting in a cost of sickness absence of £120 per day. It is not clear by how much this figure would change for older employees. It is possible that older workers are more likely to be in senior management roles which would affect the adjustment made for earnings, or, older employees with health issues may have more difficulty working full time hours and are less productive which may affect the adjustment based on team working. A range of £50 to £500 per day of absenteeism was applied.

A meta-review found a 25% change in sick leave following workplace health interventions (5). Aldana *et al.* (2005) (6) carried out a literature review and concluded that most studies looking at health promotion programs showed a reduction in short term absenteeism rates of approximately 3% to 15%. BT found that their sickness absence rates decreased by approximately 4% following implementation of a workplace health programme which drives a culture of 'self-help' with support for managers (7). Further, PricewaterhouseCoopers (PwC) report that in 45 out of 55 UK case studies, wellness interventions resulted in a reduction in days lost through sickness. Unsurprisingly, the reductions in lost days varied hugely from 10% to 97% (8) due to the variations in type of intervention and type of workplace. A 10% reduction was applied in the base case and a range of 0% to 100%. Table 2.1 summarises these inputs.

Table 2.1: Change in absenteeism following an intervention

Author (reference)	Intervention	Reduction in absenteeism
Aldana et al (2005) (6)	Meta-review of workplace interventions	25% reduction in sick leave
BT (7)	Implementation of workplace culture that drives 'self-help' with support of managers	Absence rates decreased by 4%
PwC (8)	Reviewed 55 wellness intervention case studies	Reduction in lost days varied from 10% to 97%

2.2.3 Productivity

Productivity is a measure of the efficiency of an employee. In the model, this has been included as the value that a staff member adds to an organisation. Productivity can be affected by many different things such as an employee's satisfaction in the workplace, the impact of other market forces and innovation. Although productivity is affected by other factors included in the model, such as turnover and absenteeism, the definition of productivity here, is productivity *over and above* that which is already accounted for by absenteeism and staff turnover.

The ONS (9) report the median full time gross weekly earnings for those aged 50 to 65 (£542.90) which gives annual earnings of £28,230. To account for salary 'on-costs' (the cost of paying the employee this salary to the business, additional costs includes pensions, national insurance payments and overheads), this figure has been increased by 40%, giving a value of £39,522. However, the value of an employee to an organisation is likely to be more than their salary (including 'on-costs'). Therefore, it may be necessary to increase the average earnings to give an approximation of the actual value of the staff member to the organisation. The range in the model is from £6,000 to £150,000.

The estimate for the value of the member of staff is based on the premise that staff do not presently work at 100% efficiency. Therefore, an increase in productivity is possible. An increase in productivity can be increased by any method, including, but not limited to, a decrease in presenteeism. The increase in productivity is that which is over and above factors already included in the model (such as staff turnover and absenteeism). The increase in productivity was set at 0.1%. Although BT reports an increase in productivity of 21% for flexible workers, this is based only on one organisation (10) and it was not possible to disentangle how much of the increase in productivity is over and above a decrease in staff turnover and absenteeism. The range was set at 0% to 50%.

2.2.4 Staff turnover

Staff (or employee) turnover is defined as the proportion of employees who leave a workplace over a set period of time (usually on an annual basis). There are several costs related to staff turnover, including legal fees, the cost of recruiting a new employee (costs of advertising and staff time), lost production while recruiting, training for a new employee, assisting employees to develop the level of skill needed for a new job role and the impact on others' productivity. The costs associated with one person leaving are significant. Sainsbury Centre for Mental Health (2007) (4) report the national average cost of one person leaving is £11,625. This figure was expressed in 2015 prices using the consumer price index (CPI) from ONS resulting in a cost per case of £14,281, which was used as the base case. No age-specific data were identified. As previously mentioned, this value could increase or decrease subject to the link with older age and seniority or with decreased productivity and increased absenteeism.

The base case annual rate of staff turnover was set at 11.9% based on an estimate of staff turnover from the Chartered Institute of Personnel and Development (CIPD) (11). Although older employees may be more likely to retire, those people that do want to stay in the workforce may be less likely to change employer. The rate and cost of staff turnover is an input that is likely to vary hugely depending on the type of employment (such as by skilled and unskilled workers). In order to capture all possible permutations, a wide range was set at 0% to 50%.

PwC (8) reported that firms introducing wellness programs resulted in a reduction in staff turnover ranging from 10% to 25%.The base case was set at 18% and a wide range was set from 0% to 50%.

2.2.5 Health care costs

This input is relevant if the perspective taken is from the health care perspective or from a societal perspective. Health care system costs may not be of any financial interest to a UK based business. This category will not be included in the base case results as the base case is undertaken from the perspective of the employer. However, scenario analysis including this category will be carried out in order to determine what effect it has on the model's results.

The inputs used in the scenario analysis are described below. The health care costs per person affected can vary hugely as these costs could relate to any type of work-related illness. Some of the most common work-related illnesses include musculoskeletal disorders, breathing or lung problems, infectious disease and stress, depression or anxiety (12). Back pain and stress were used to cost the treatment. Lamb *et al.* (2004) (13) reported the total health care costs per person for low-back pain over one year, this was expressed in 2013/2014 prices using the Hospital and Community Health Services Index from PSSRU's Unit Costs of Health and Social Care 2014 to a cost of £280.93. Mukuria *et al.* (2013) (14) reported the cost of treating mental illness, including primary, secondary and social care. The cost over one year was calculated to be £1,401. The cost per person affected was the mid-point of these two estimates. There is a wide range of possible healthcare costs because of the variation in types of work-related illness and because some work-related illnesses are sector specific. Therefore, the range was £50 to £5,000, although it is recognised that the range could in fact be much larger for a small proportion of the population who have serious and/or long-term work-related illnesses.

No sources were identified that reported the reduction in healthcare use due to an intervention. However, PwC (8) reported the reduction in accidents and injuries as a result of workplace wellness initiatives which was used as a proxy for this input. The reduction in accidents and injuries ranges from 30% to 73% with an average of 50%. Again, the range is wide due to a variety of workplace settings and interventions.

The Fourth European Working Conditions Survey found that in 2005, 22% of European employees reported suffering from stress, lower back ache, muscular pain and fatigue (15). The survey reported that 14% to 43% of people suffer from stress or backache dependent upon type of employment (16), Figure 5.12). In terms of the age-distribution of stress, the Health and Safety Executive (HSE) reports that the 45-54 age-group had the highest incidence rate for stress, depression or anxiety caused or made worse by work, with this falling to the lowest incidence of all age groups for those aged over 55 (17). The low incidence in those aged over 55 may be explained by a self-selection effect, in which only relatively health employees will still be working. However, the effect may be in the opposite direction for low-back back.

2.2.6 Other societal costs

Dependent upon what is included in 'other societal costs' it may or may not be relevant to the model users' perspective. Therefore, this input is not included in the base case analysis. This input can be used to add in any additional costs that have not been captured in the other four categories of possible cost-savings. For example, as reported by the HSE, of the total costs of workplace injury, only around 20% of this cost falls to the employer, 57% falls to the individual and 23% falls to the government (18).

As mentioned previously, there are many external factors that can be included in the model. One such example is road traffic accidents (RTA). Many people are killed on the road in the UK, most of whom are not drivers themselves. Some of these RTAs will occur during the course of work and some while commuting to and from the workplace. However, as data are not available for older workers, or any information about how a workplace intervention could reduce the number of RTAs, this input has not specifically been included.

Due to a lack of data, the inputs in societal costs are based mainly on assumptions. The assumptions are shown in Figure 2.2. These costs could be adjusted to include savings from reducing the number of RTAs or from many other external factors. Wide ranges have been included to illustrate the effect of different societal factors being included. Other societal costs can also include state benefits for those that are unemployed.

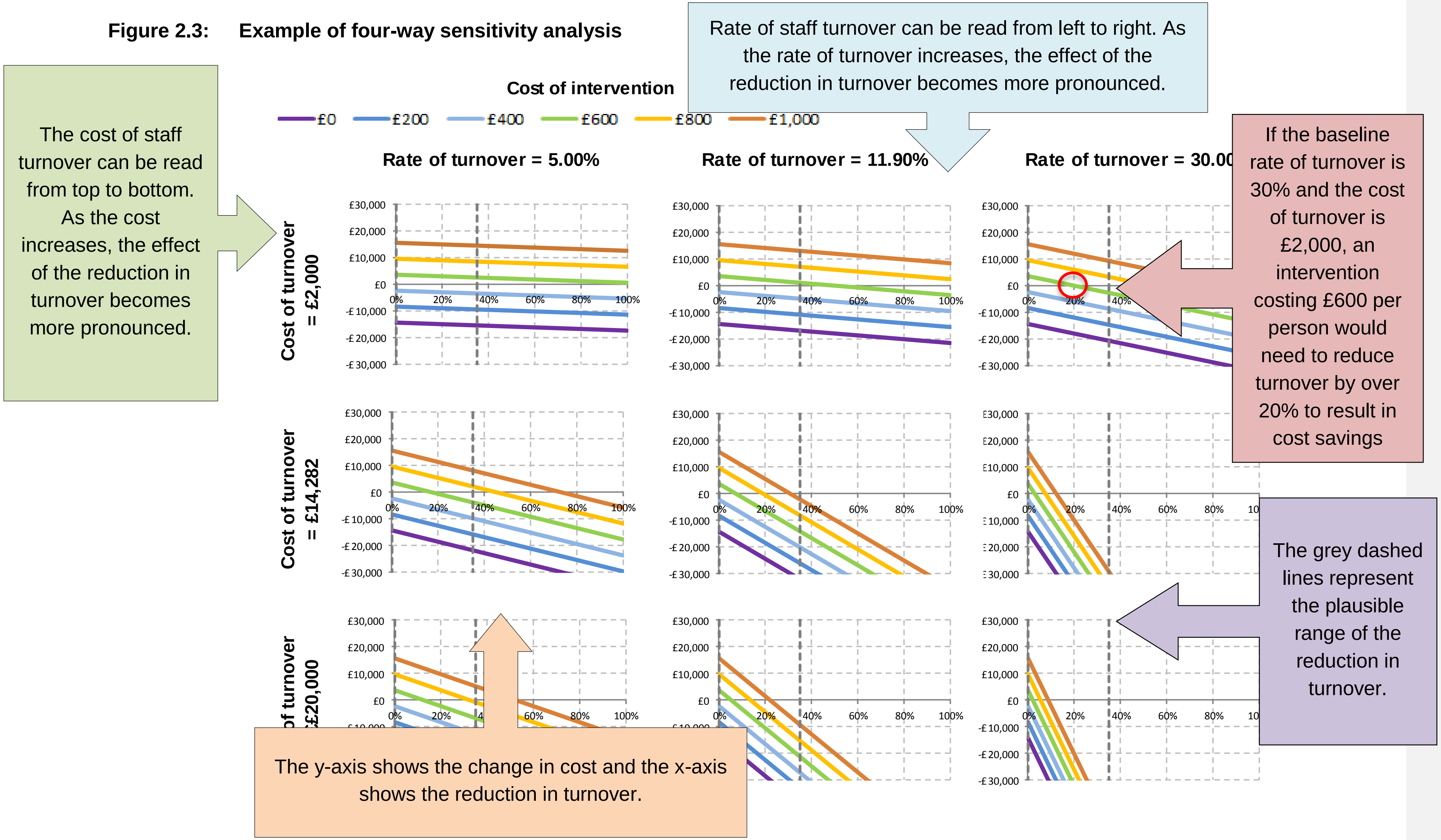
2.3 PRESENTATION OF RESULTS

Due to the scarcity of data with which to populate the model and the uncertainties in the current inputs, the results will be presented mainly as a sensitivity analysis. When the data with which to populate a model is poor or scare, it is often more useful for the model user to have a range of inputs displayed, rather than a single result which is calculated from the base case inputs. The results then cover many different permutations of scenarios and settings, such as a business with unskilled workers and a high turnover, or a business with skilled workers and low turnover, or any other combinations.

The model is intended to be an interactive 'cost calculator' to be made available to those at which the guidance is aimed (employers and employees, human resources professionals, trade unions, professional bodies and health professionals) who are considering implementing workplace interventions. The model is built using Microsoft Excel and is designed in a user-friendly format whereby the user can access a full range of input sheets and run various scenarios by choosing from the options provided in the set-up and results sheet. The model will allow the user to input values and generate results specific to their workforce.

Presenting the results as a four-way sensitivity analysis allows the model user to identify the most relevant graph for their workforce and to the relevant age-group. The graphs allow the user to establish the point at which an intervention becomes cost-saving. Figure 2.3 gives an overview of how to interpret the four-way sensitivity analysis while more detailed information is given in Appendix A.

Figure 2.3: Example of four-way sensitivity analysis



Section 3: Sensitivity analysis

The results for each category of potential cost savings are reported below in the form of four-way sensitivity analyses (see Appendix A for guidance on how to interpret these figures, see Appendix B in which illustrative case studies are outlined in order to aid interpretation).

3.1 BASECASE RESULTS

Table 3.1 below shows the results for the base case model. The following values are used in the base case model (these are described in detail in Section 2.2):

- Intervention cost - £200;
- Number of employees in model – 30;
- Absenteeism – days lost = 7, cost per day = £120, reduction = 10%;
- Productivity – staff affected =100%, value of staff member = £28,230, increase = 0.1%;
- Staff turnover – annual rate = 12%, cost per case = £14,282, reduction = 18%.

The table does not show a value for societal costs and healthcare costs because, as explained earlier, these have been excluded from the main analysis because the model is from the perspective of the employer.

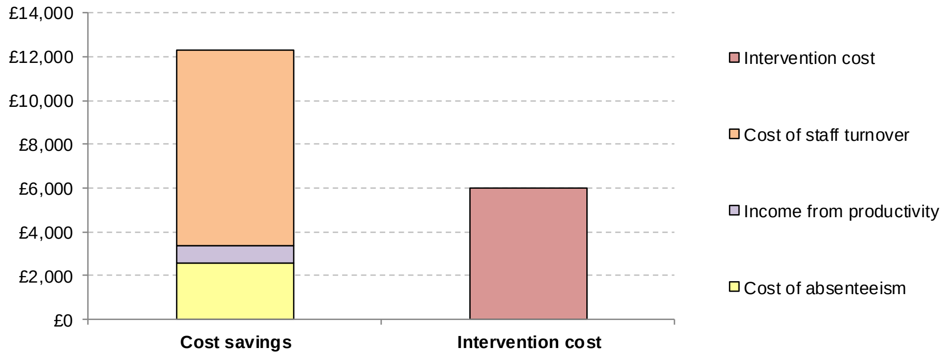
Table 3.1: Base case results

	Before	After	Cost savings
Cost of absenteeism	£25,502	£22,952	£2,550
Income from productivity	£1,185,660	£1,186,846	£1,186
Cost of staff turnover	£50,986	£42,064	£8,923
Healthcare costs	£0	£0	£0
Societal costs	£0	£0	£0
Intervention cost	£0	£6,000	-£6,000
Total	**£1,262,149**	**£1,257,862**	**£6,659**

The results in Table 3.1 show that, with the current base case inputs, an intervention would be cost-saving. However, due to the uncertainty in the base case inputs and the lack of data, presenting the results in this way is of limited usefulness. Therefore, these results have been used to develop a threshold analysis. A threshold analysis may be more helpful as it allows an employer to pin point where their organisation and employees would be on the diagram and identify the likelihood of an intervention being cost-saving and to see where the uncertainty lies.

Figure 3.1 shows a cost chart of Table 3.1. This illustrates the cost savings associated with each category (left hand bar) offset against the cost of the intervention (right hand bar).. Based on the inputs in the base case, this allows the key drivers of the cost savings to be identified.

Figure 3.1: Cost chart – base case results



*Please note the costs in the cost saving bar are in the same order as in the legend

Figures 3.2 to 3.4 show the four-way sensitivity analysis for each of the three categories included in the base case model. In each figure, the inputs relating to that category are varied by the ranges shown in Figure 2.2. For example, for absenteeism, the following is varied: baseline absenteeism, cost of absenteeism, the cost of the intervention and the reduction in absenteeism post-intervention. The axes are the same in each set of graphs in order to enable comparison between the sets of graphs. Detailed explanations of how to read these diagrams is available in Figure 2.3 and Appendix A. Appendix B outlines illustrative case studies in order to aid interpretation of the analysis.

Figure 3.2: Four-way threshold analysis - Absenteeism

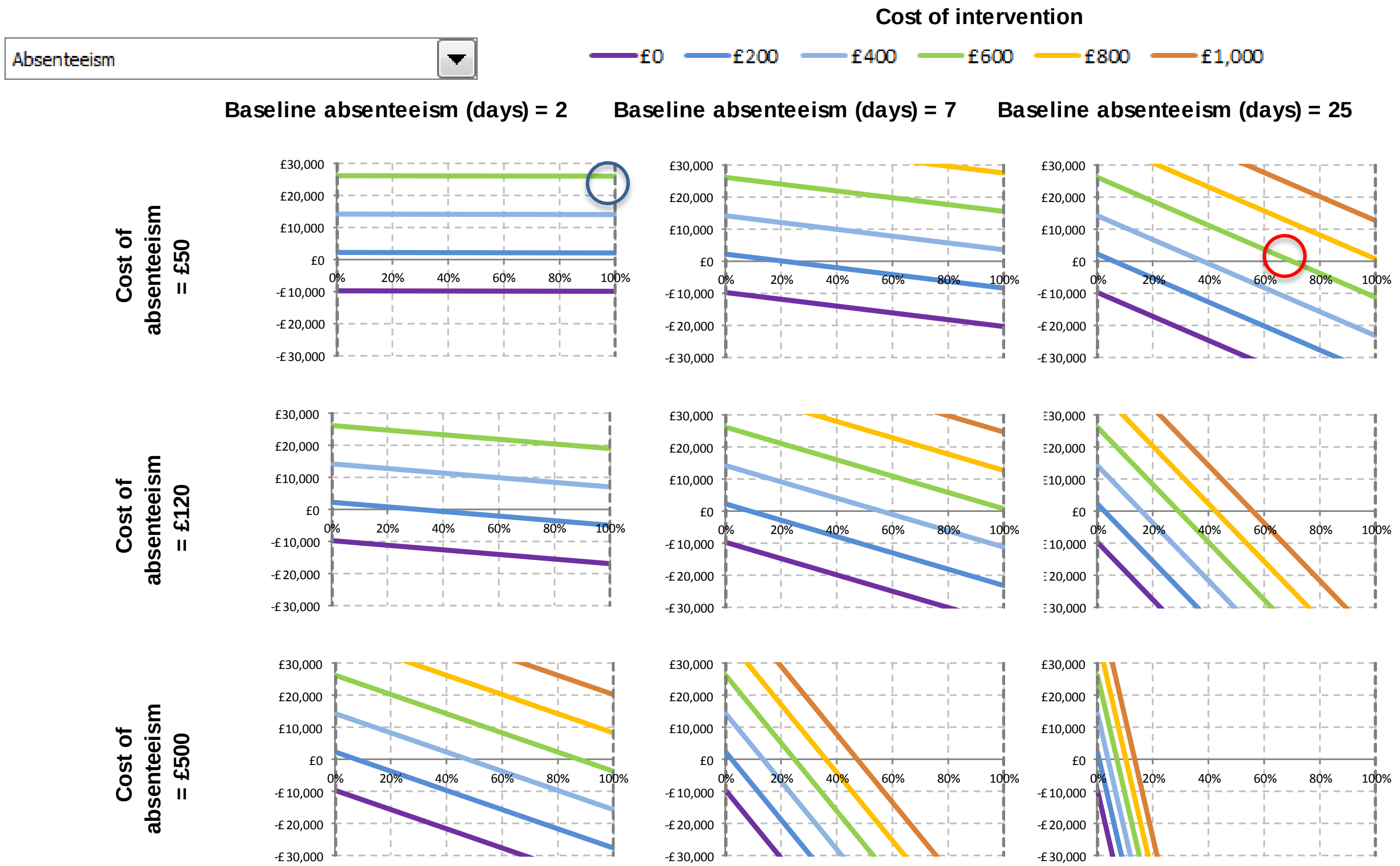
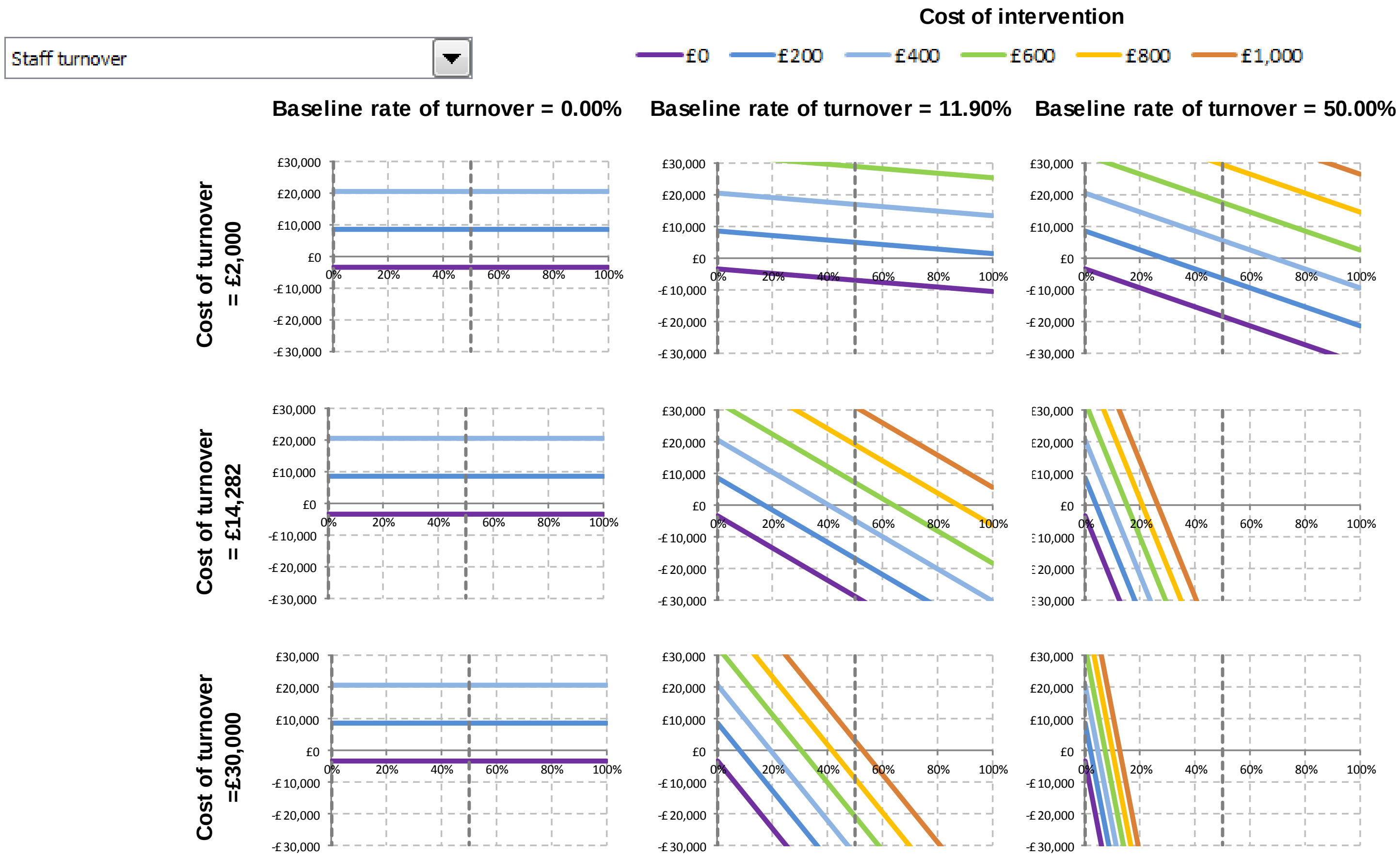


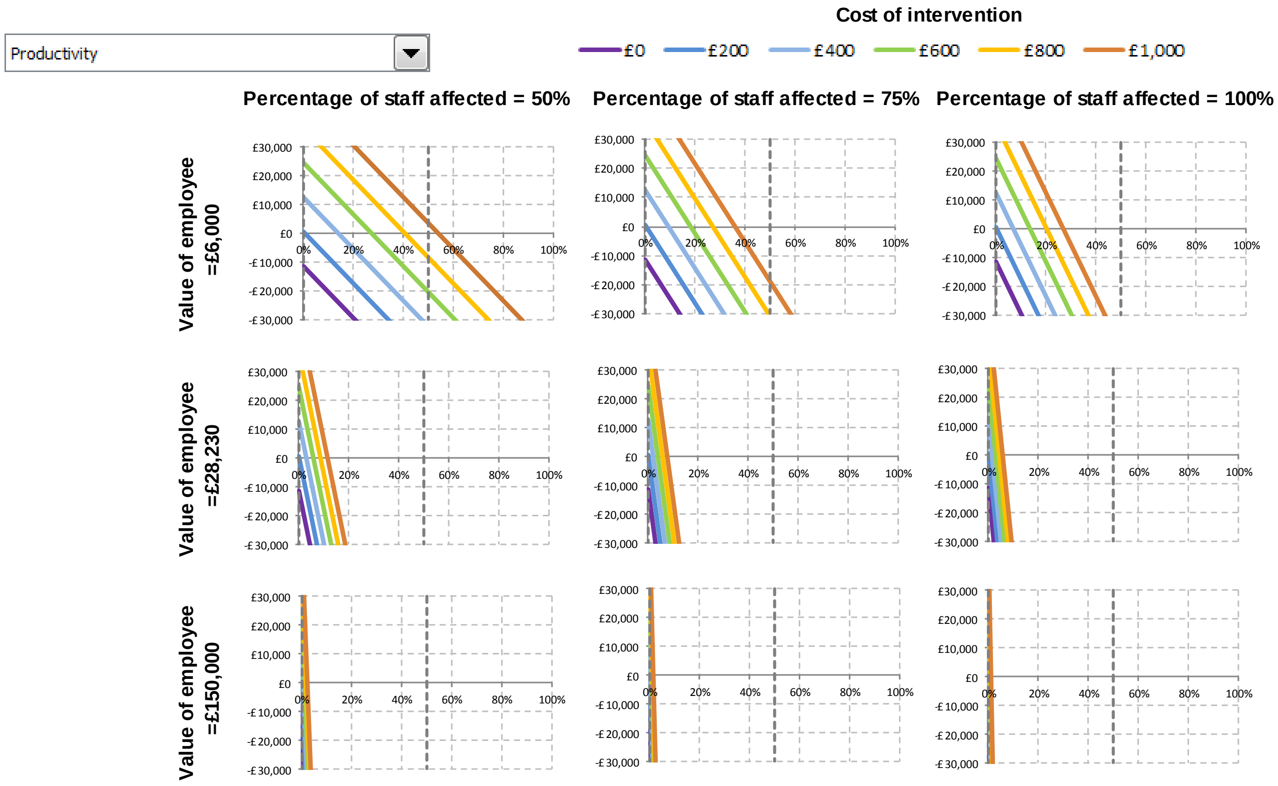
Figure 3.2 illustrates that as the baseline absenteeism increases, the effectiveness of the intervention has more weight. It shows that the higher the baseline rate of absenteeism, the more capacity to benefit there is. When the extreme example of a baseline number of 25 sick days is taken, even an intervention priced at £600 per person could save costs if it reduced absenteeism by 75% (red circle on Figure 3.2). Conversely, if the baseline absenteeism is only 2 days, an intervention that priced at £600 will never be cost saving, even if it is very effective (blue circle on Figure 3.2). This type of threshold analysis could help a stakeholder make the decision as to whether to implement an intervention to reduce absenteeism. If the workforce (or a population group of a workforce, such as older workers) already has a low rate of absenteeism (2 days) the stakeholder can be reasonably certain that an intervention priced at £600 (blue circle on Figure 3.2) is unlikely to result in cost-savings. The graph also shows that even if an intervention was 100% effective, it will not have much effect on the total costs. A similar pattern applies with the cost of absenteeism, as the costs increase, there is more capacity to benefit and the benefit that can be achieved is more pronounced. Figure 3.2 shows the effect when only absenteeism is varied. All other factors are held constant as described in the base case. This graph would, therefore, look different if other factors change.

Figure 3.3: Four-way threshold analysis – Staff turnover



The pattern of results in Figure 3.3 is similar to that in Figure 3.2. As the baseline rate of staff turnover increases and as the cost of replacing staff increases the results become more pronounced, with the effectiveness of the intervention having a much more marked effect on the total costs. The results in Figure 3.3 are more pronounced than in Figure 3.2. As outlined in Section 2.2.4, the plausible range of results was set from 0% to 45% which is represented on the diagram by the grey dotted vertical lines.

Figure 3.4: Four-way threshold analysis – Productivity



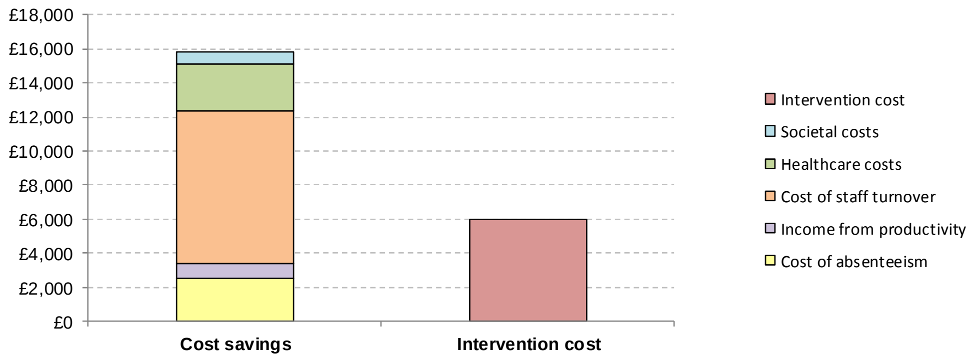
The results in Figure 3.4 follow the same pattern as the results in Figures 3.2 and 3.3. However, the effect of the intervention is much more pronounced, showing that productivity is a key driver of the model's results. This effect is confirmed by Figure 3.1 which shows that productivity is the category that potentially has the most influence on the total costs. The reason that this is much more pronounced is that productivity affects all staff within the model cohort. With an intervention to increase productivity all staff have the opportunity to improve and consequently there is potentially a large capacity to benefit by implementing the intervention. Due to the pronounced result in this set of graphs, a version showing only the plausible range of the results on the x-axis is shown in Appendix C.

As there is such a wide range of interventions and organisations, it is not particularly useful to use one base case model. However, these diagrams allow stakeholder to look at the information that is relevant to their organisation and to the population group they are targeting (in this case, older employees) in order for the results to be applicable and useful. If the extreme ranges captured in these diagrams is not wide enough, the model user can input their own values. These graphs not only allow the stakeholder to see if an intervention is likely to result in cost savings in their organisation but also to choose between interventions. When faced with a choice of workplace health interventions to implement it can allow the stakeholder to see the type of intervention that is most likely to result in cost savings.

3.2 SCENARIO ANALYSIS

Figure 3.6 and 3.7 show the result if healthcare costs and societal costs are included. The diagrams show, that the pattern of results is similar to that of absenteeism, staff turnover and productivity although the results are less pronounced. Figure 3.5 shows the cost chart when health care and societal costs are included. This shows that the key driver of cost savings in the base case scenario appears to be the cost of staff turnover.

Figure 3.5: Cost chart –scenario analysis



*Please note the costs in the cost saving bar are in the same order as in the legend

Figure 3.6: Scenario analysis – Healthcare

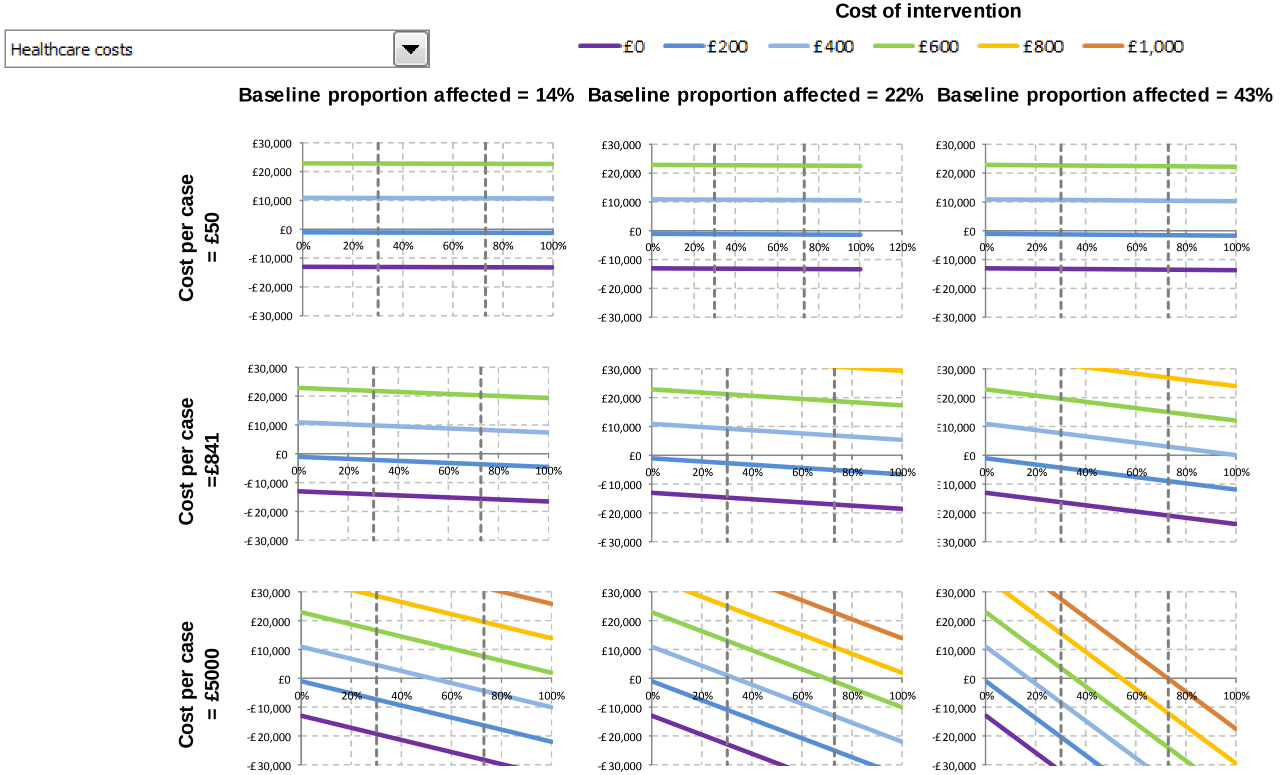
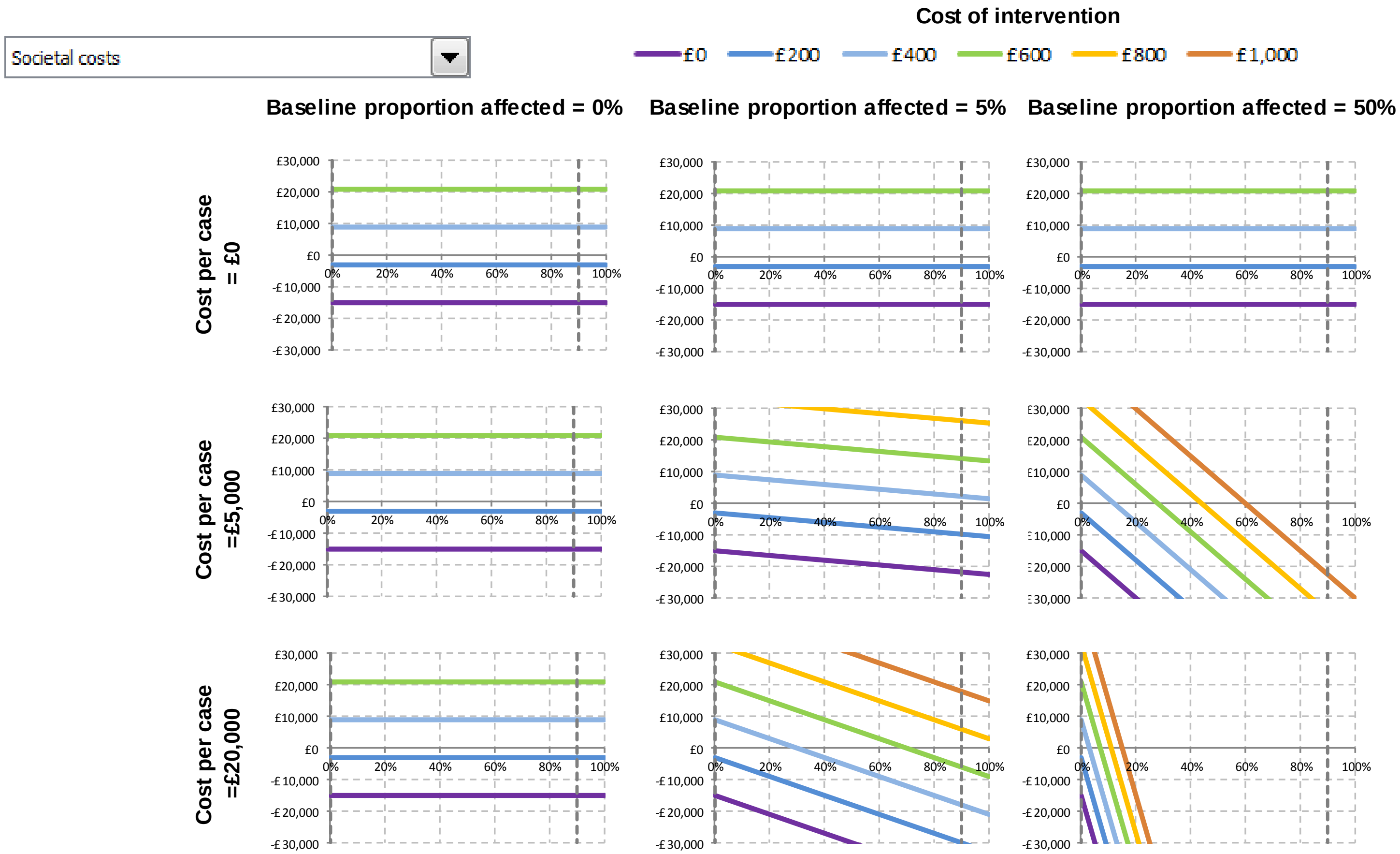


Figure 3.7: Scenario analysis – Societal



Section 4: Discussion

The results show that with the base case inputs, the key driver of the cost difference is the increase in productivity. Cost savings are most sensitive to a change in the level of productivity. The results are most pronounced when productivity is varied as it only needs to increase by a small amount to create a large cost saving because it affects all (or a large proportion, in the sensitivity analysis) staff. The increase in productivity is a key driver of the model. However, the base case input for the increase in productivity (0.1%) is an assumption. Therefore, this is an important data gap in the model.

In each set of graphs, the direction of results follows the same pattern. For example, for an organisation with high baseline absenteeism and a high cost of absenteeism, an intervention that is effective would result in cost-savings (Figure 3.2). Similarly, an organisation with low baseline absenteeism and a low cost of absenteeism can see that there is little capacity to benefit, and no matter how effective the intervention, it will scarcely affect the cost difference. Figure 3.3 shows the same pattern of results for staff turnover. An organisation with high baseline turnover and high costs of turnover can benefit from an intervention to reduce staff turnover. An organisation with a low baseline rate of turnover and a low cost of turnover is unlikely to see much benefit from a workplace intervention to reduce staff turnover. All other organisation settings (such as, those with a high baseline rate of turnover and a low cost of turnover) are somewhere in between and can be read off the figures as appropriate to the organisation.

The method of presenting model results using a 'what-if?' sensitivity analysis was deemed to be the most appropriate based on the data that were available. This approach has some limitations which include no definitive answer being given as to whether a specific intervention is cost saving. The inputs used in the model have many limitations including that they do not apply to all type of organisation and many do not apply to older employees. However, taking the 'what-if?' approach allows us to deal with the uncertainty in the inputs and for the model results to be more flexible.

The literature review and the PHAC did not identify specific interventions that could be modelled due to a scarcity of quantitative evidence in this area. The cost data and effectiveness data included are not ideal in many of the model inputs. However, the inputs in the model are intended as a starting point for discussion and to give a general overview of the direction of results. If better data become available, these inputs can be refined.

Carrying out the analysis as a sensitivity analysis allows the model results to be relevant to a larger group of stakeholders. The model is designed as an interactive 'cost calculator' which is intended to be used flexibly so that it can be tailored to an employer's workplace and to a specific intervention.

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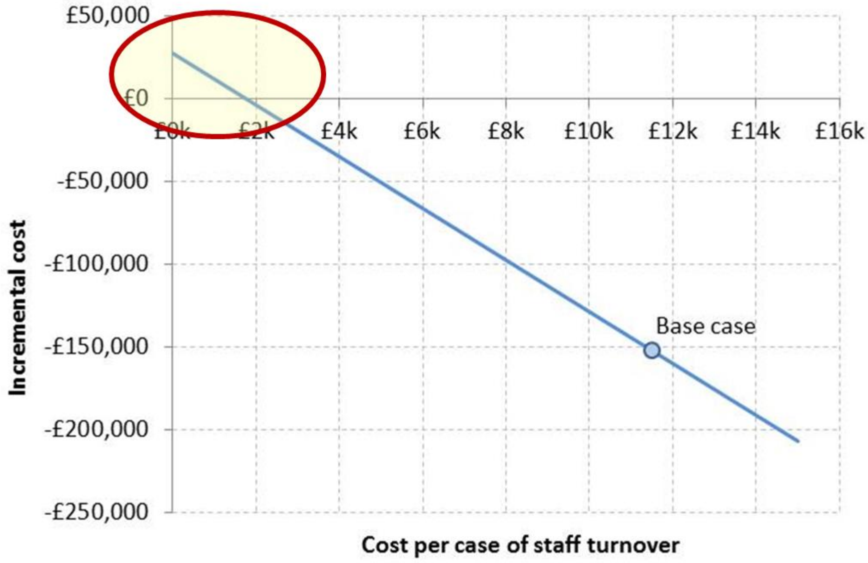
APPENDIX A

Interpreting four-way sensitivity analysis

Step 1

Graph 1 shows a one-way sensitivity analysis in which the change in the cost of staff turnover is varied in order to see what affect this has on the results.

Graph 1: One-way sensitivity analysis

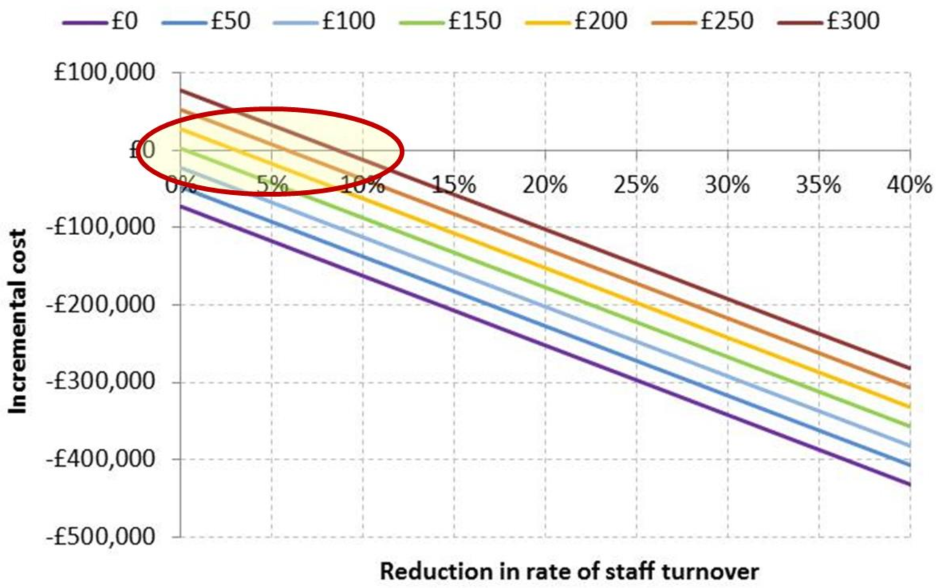


The graph allows the model user to see that when the cost of staff turnover is over £2,000 per person the incremental cost of the intervention decreases. However, when the cost is under £2,000 the intervention would be cost-incurring. If the model user knows that the cost to them of staff turnover is near £2,000 they may not have certainty in the results, if however, the cost to staff turnover is £8,000 the model user can be fairly certain that the intervention will be cost-saving even if their estimate of the cost of staff turnover is not completely accurate.

Step 2

As it is likely that there will be more than one uncertain parameter in the model, it is useful to visualise what would happen if more than one input was changed at one time, as illustrated in Graph 2.

Graph 2: Two-way sensitivity analysis

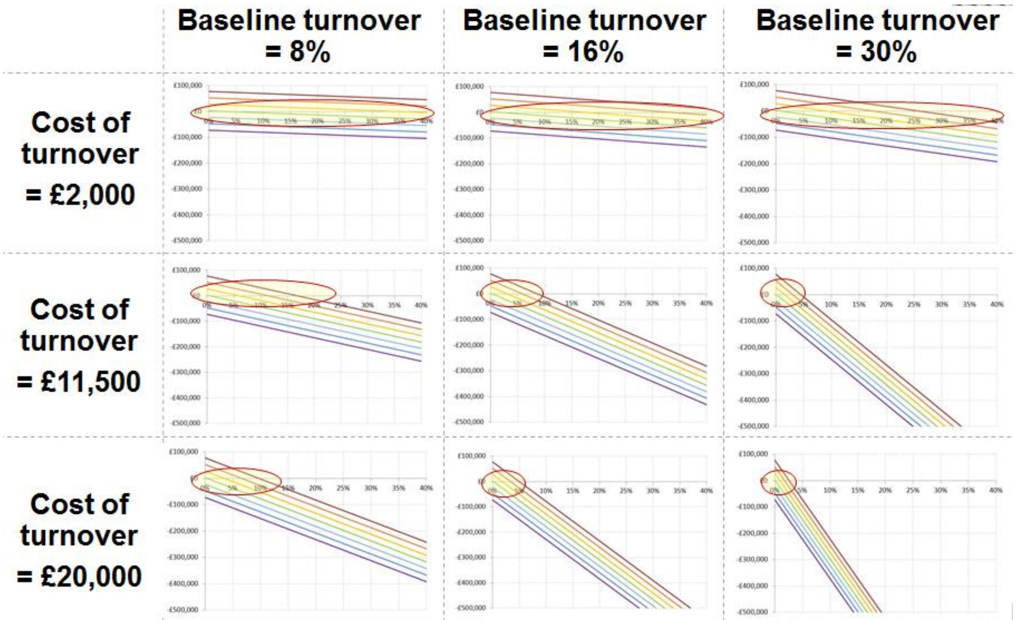


The coloured lines on the graph represent different intervention costs. This allows the model user to see that as the intervention cost decreases, the more cost savings can be made for an intervention of the same effectiveness. In addition, the model user can see that the higher the intervention cost, the higher the effectiveness needs to be for the intervention to result in a cost-saving (as shown in the red circle).

Step 3

Graph 3 shows a four-way sensitivity analysis. This includes the baseline rate of staff turnover, the intervention cost, the cost of turnover and the reduction in the rate of staff turnover. However, the four-way analysis can be carried out for different combinations of inputs.

Graph 3: Four-way sensitivity analysis



The costs and turnover rates (and other inputs) will vary by type of business which means is it difficult to model an ‘average’ business. The four-way diagram helps overcome this problem as it can be used by different types of businesses in different settings.

An example of how to interpret the four-way sensitivity analysis is outlined here. For a business with a low rate of baseline turnover but a high cost of turnover would use the graph in the bottom left of the diagram. It also shows those businesses that have a low cost of turnover that it is much more uncertain whether the intervention will be cost-saving or cost-incurring as the difference between intervention cost and effectiveness would only need to change by a small amount to change the direction of the results. This would allow the decision maker to quantify their level of confidence.

APPENDIX B

Case studies

Case Studies

The following case studies are hypothetical examples given to aid interpretation of the diagrams in this report. The following examples are given in relation to absenteeism, but the same analysis can be applied to the other four factors included in the analysis.

Company A

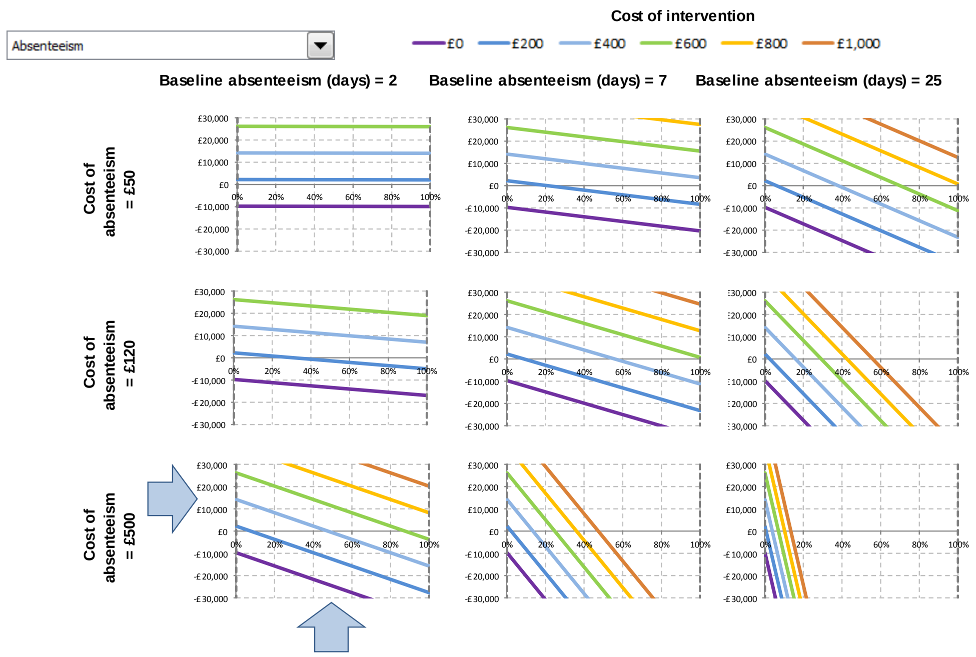
Although the national average number of days absenteeism is around 7 days per person, Company A has a lower than average rate of absenteeism. Company A's absenteeism is 2 days per person per year.

Company A also has a higher than average cost of absenteeism. The average cost of one day of absenteeism is £500.

Although the rate of absenteeism is low, the cost of absenteeism is high so Company A is considering implementing an intervention that costs £400 per employee in order to reduce absenteeism.

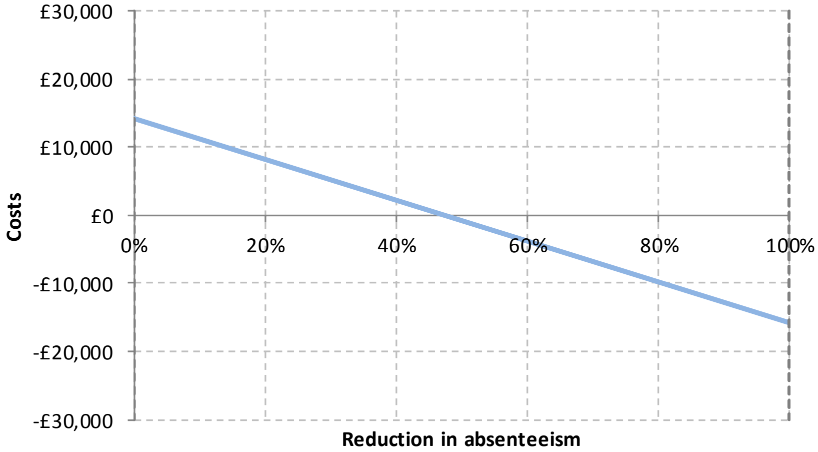
Company A is shown on the four-way sensitivity diagram below. The pale blue line represents the £400 intervention that Company A are considering implementing.

Figure 1: Company A on the four-way sensitivity diagram



Company A can now look at the relevant graph shown in Figure 1 and the relevant intervention cost line. This graph is shown in Figure 2.

Figure 2: Analysis relevant to Company A



Company A can use this graph to decide if it is worthwhile implementing the intervention (from a financial perspective). The graph shows that in order to achieve a cost saving the intervention would have to halve absenteeism. Company A can decide whether they think the intervention is likely to achieve this reduction and, therefore, whether the intervention will be cost saving for their company.

If the other inputs within the model were varied, the results of this graph would change. Therefore, it is important that Company A review all inputs that are included in the model before making decisions using this analysis.

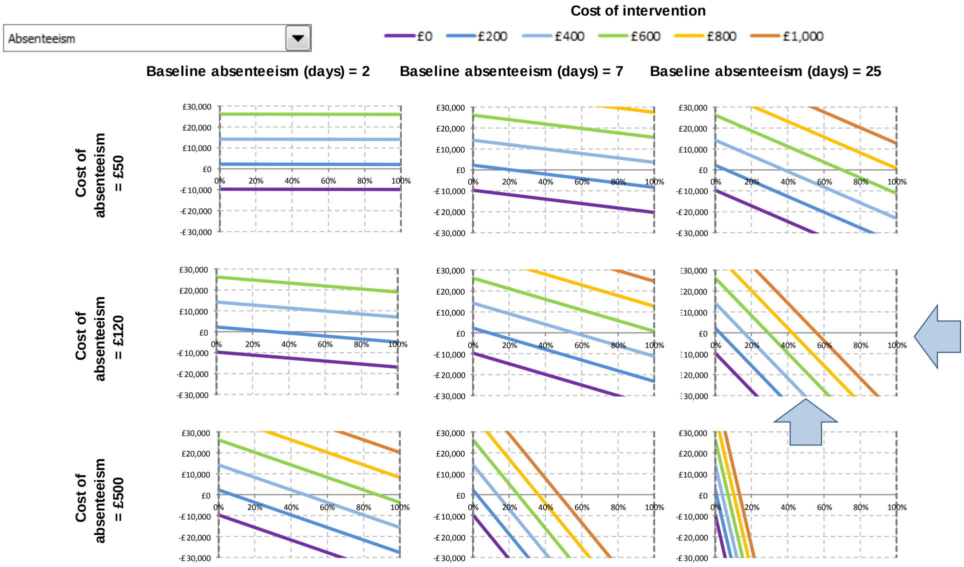
Company B

Company B has a staff turnover which is much higher than the national average. The average number of days absenteeism per person in Company B is 25 days per year. The cost of absenteeism in Company B is equal to the national average cost, which is around £120 per day.

Because the absenteeism is so high in Company B, they are considering implementing a workplace health intervention to reduce this number. The intervention would cost £400 per day per person.

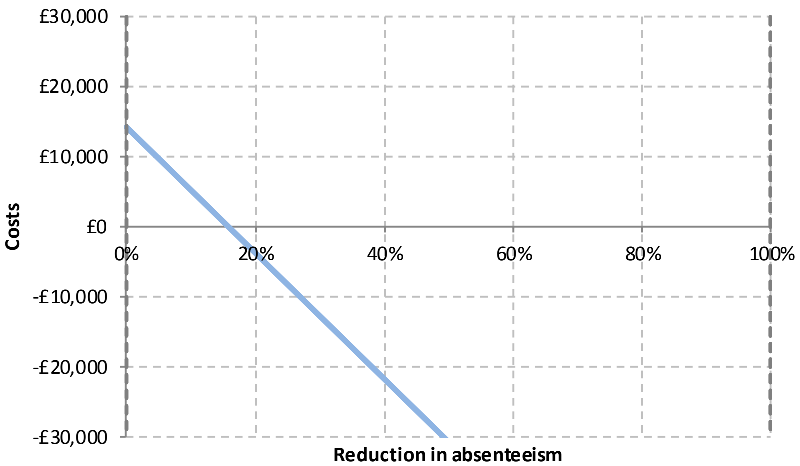
Company B is shown on the four-way sensitivity diagram below (Figure 3). The pale blue line represents the £400 intervention that Company B is considering implementing.

Figure 3: Company A on the four-way sensitivity diagram



Company B can identify the relevant graph shown in Figure 3 and the relevant intervention cost line on the graph (the pale blue line, representing an intervention cost of £400 per employee). This graph is shown in Figure 4.

Figure 4: Analysis relevant to Company A



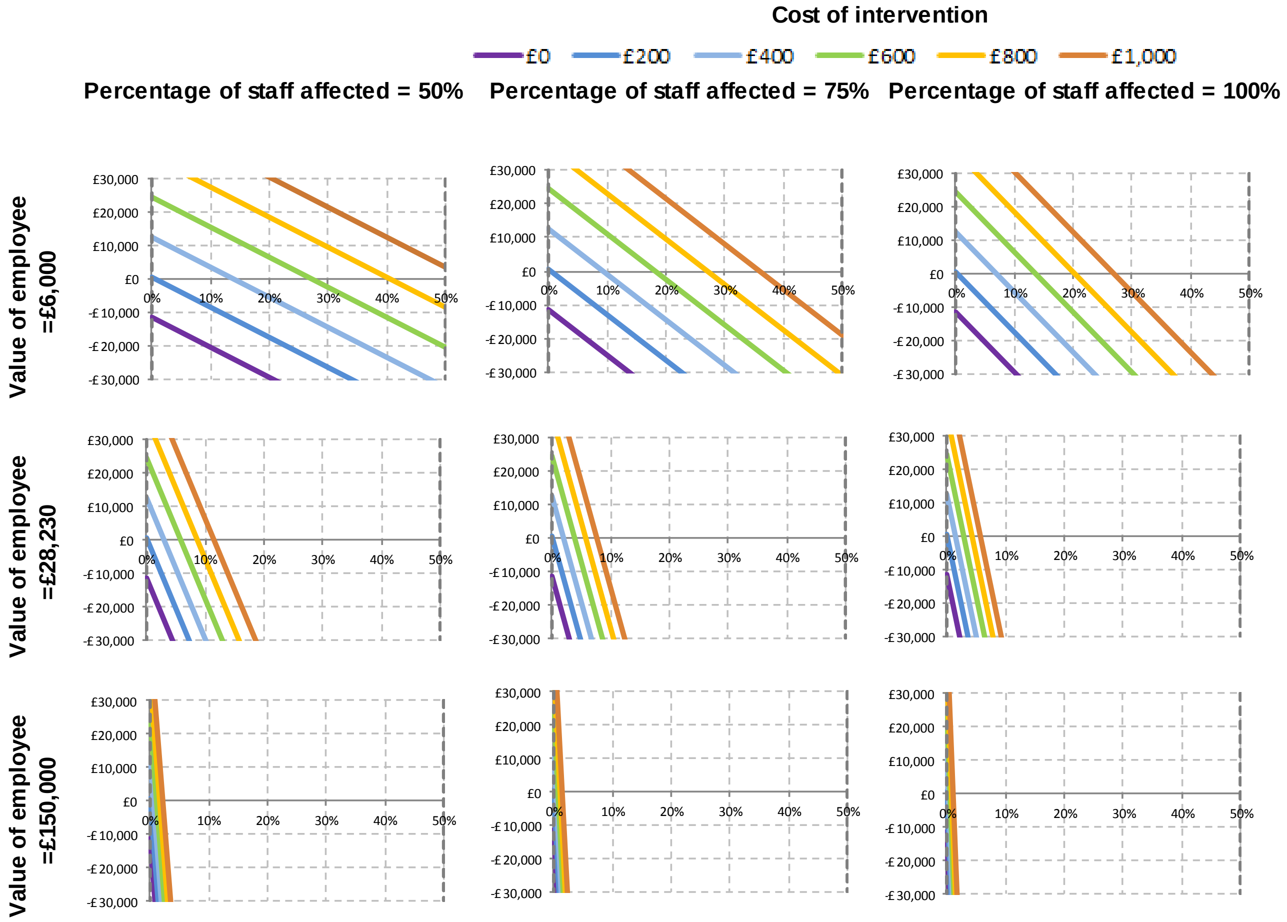
Company B can use Figure 4 to determine if the intervention will result in a cost saving. Company B has a high baseline rate of staff turnover and, therefore, Company B would need to achieve less of a reduction in absenteeism of around 18% which is less than the reduction needed by Company A to achieve a cost saving.

If the other inputs within the model were varied, the results of this graph would change. Therefore, it is important that Company A review all inputs that are included in the model before making decisions using this analysis.

APPENDIX C

Four-way threshold analysis – Productivity

Four-way threshold analysis – Productivity: Plausible ranges on x-axis



Four-way threshold analysis – Productivity: 0% to 10% increase in productivity on x-axis