



York Health Economics Consortium

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# NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

## Preventing Suicide in Community and Custodial Settings

### Model Plan

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# Section 1: Introduction

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## 1.1 BACKGROUND

The National Institute for Health and Care Excellence (NICE) is developing a guideline on suicide prevention. As stated in the NICE Final Scope<sup>1</sup>, the guideline will cover:

- Adults, young people and children including:
  - High-risk groups;
  - Those in custodial settings;
  - Those in contact with the criminal justice system;
  - Those released from prison and in contact with a community rehabilitation company or the probation service;
  - Those who are serving a community sentence.

The guideline will cover community settings, such as schools, community health and primary care settings and workplaces. In addition, the guideline also covers a number of custodial settings and immigration removal centres and short-term holding facilities. The guideline does not cover military training centres or secondary care settings that are covered by other NICE guidance. The guidance covers a wide range of interventions including, but not limited to, helping staff and members of the public respond to signs of distress, interventions to support people who are bereaved by suicide, interventions to reduce access to the means of suicide and working with local media. Areas that have been covered by previous NICE guidelines are excluded, as are staffing levels in custodial settings, interventions to promote mental well-being and national level interventions.

The following model plan outlines the objectives of the guideline and the suggested economic analyses that can be undertaken in order to answer these questions and help the Public Health Advisory Committee (PHAC) to make recommendations.

## 1.2 OBJECTIVES

The key questions from the NICE scope are listed below. Questions 8 and 9 cannot be answered by the economic analyses but are included for completeness. Question 5 and 6 may involve populations (family and relatives) and pathways (custodial settings), for which the generalised approach described below may not be applicable. Applicability of the YHEC model in answering these questions will in part depend on the precise focus of the question and the evidence retrieved.

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<sup>1</sup> NICE. Final Scope. Preventing suicide in community and custodial settings. Available from: <https://www.nice.org.uk/guidance/indevelopment/gid-phg95/documents>

Key questions from the NICE scope:

1. How effective and cost effective are local multi-agency teams at preventing suicide? Who needs to be involved?
2. How effective and cost effective are local plans for suicide prevention? What components are needed for plans to be effective?
3. What are the most effective and cost effective approaches for responding to 'suicide clusters' (situations in which an unusual number of suicides occur, whether in terms of time, place or both)?
4. What information, advice, education or training is effective and cost effective at increasing the ability of staff and members of the public to recognise and respond to someone who may be contemplating suicide? What core components would make information, advice, education and training more likely to be effective, and how does effectiveness vary for different components and different audiences?
5. What are the most effective and cost effective interventions that provide information and arrange local support for people in community or custodial settings, or who are transferring between settings?
6. Are approaches that provide people affected by suicide with information about grief and bereavement and bereavement support services (postventions) effective and cost effective at encouraging those people to seek help?
7. Are interventions to change or reduce access to the means of suicide (such as providing safety fences, more lighting, CCTV or suicide patrols), effective and cost effective at preventing suicide?
8. How effective are local media, other awareness campaigns, including social media interventions and face-to-face approaches in: – reducing the stigma around expressing suicidal thoughts and emotional distress – encouraging people who experience distress and crisis to seek help?
9. What are the most effective ways for local print, internet and digital media to report suicide and suicidal behaviour without increasing the likelihood of copycat attempts?

## Section 2: Modelling Approach

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### 2.1 APPRAISAL OF THE PHE ECONOMIC ANALYSIS

Public Health England (PHE) is in the process of developing a return on investment (ROI) tool evaluating suicide prevention. The ROI tool has been provided to YHEC to determine whether it would be possible to adapt the tool for use of this analysis.

The PHE tool evaluates the cost-effectiveness of training for gatekeepers (GPs) combined with an increase in the routine use of psychosocial assessment in A&E. The model assumes that GPs who are trained are more likely to refer patients to psychological therapies in secondary care, and that these secondary care therapies reduce the rate of hospital presenting self-harm. When someone presents in A&E for self-harm, there is a risk of a repeated event, and of a completed suicide. The psychosocial assessment reduces the risk of the repeated self-harm event or suicide. Evaluation of the interventions within secondary care are out of scope for the current project. However, the effectiveness of such therapy could influence the downstream outcomes, and therefore cost effectiveness, of different case finding methods. The model has a ten-year time horizon and the model population is working age adults. The model reports total costs for suicide broken down by productivity losses, police investigations, funerals, and intangible costs, as well as the healthcare system costs. The model reports net costs and life years saved.

A technical review was undertaken to confirm the internal validity and applicability of the PHE model. Focus of the review was based on whether assumptions and content were transparent and appropriate for the needs of the PHAC. Whilst many of the calculations were examined, given the timeframe and concerns over applicability of the PHE model to inform the Suicide Prevention NICE guideline, systematic checking using checklists was not undertaken. Following the review, a teleconference was undertaken with the developers of the PHE model to clarify the assumptions made within the PHE model and provide general feedback.

The review of the PHE tool established that there are several areas within the model that need to be updated or added in order for the model to meet the needs of the PHAC. These are outlined below:

- With some minor changes, the PHE model may be appropriate to model 'interventions to help staff and members of the public recognise and respond to signs of distress and crisis that may indicate someone is contemplating suicide', however is specific only to GP training. Further adaptation would be required to explore similar interventions with different costs and effectiveness;
- The PHE model considers two specific interventions (one of which is out of scope), and structural changes and new inputs would be required to make a flexible model capable of running various scenarios for the range of interventions outlined within the scope;
- The model includes components which are outside the scope of the guideline, such as intangible costs, and would need to be removed;

- The model may need to include a longer time horizon in order to meet the NICE reference case;
- Although the PHE model includes a weighting for life years, the use of the weighting is not transparent and further work would be required to ensure quality of life is incorporated (to meet the NICE reference case); Additional outcomes requested by the Committee will need to be incorporated (such as cost per QALY, cost per suicide averted and ROI).

As such, we recommend the development of a *de novo* economic model, based on the inputs and assumptions used in the PHE tool. This bespoke model would be designed to incorporate the additional components described above that would be required for the Committee.

## **2.2 YHEC ANALYSIS**

An outline of a *de novo* model is provided in this section.

### **2.2.1 Model format**

The model will be built using Microsoft Excel and will be designed in a flexible, 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 an initial set-up sheet.

The model will be built to allow all major inputs to be easily changed by the model user, including the intervention, cost and utility inputs and time horizon.

### **2.2.2 Model aims**

The aims of the model are to:

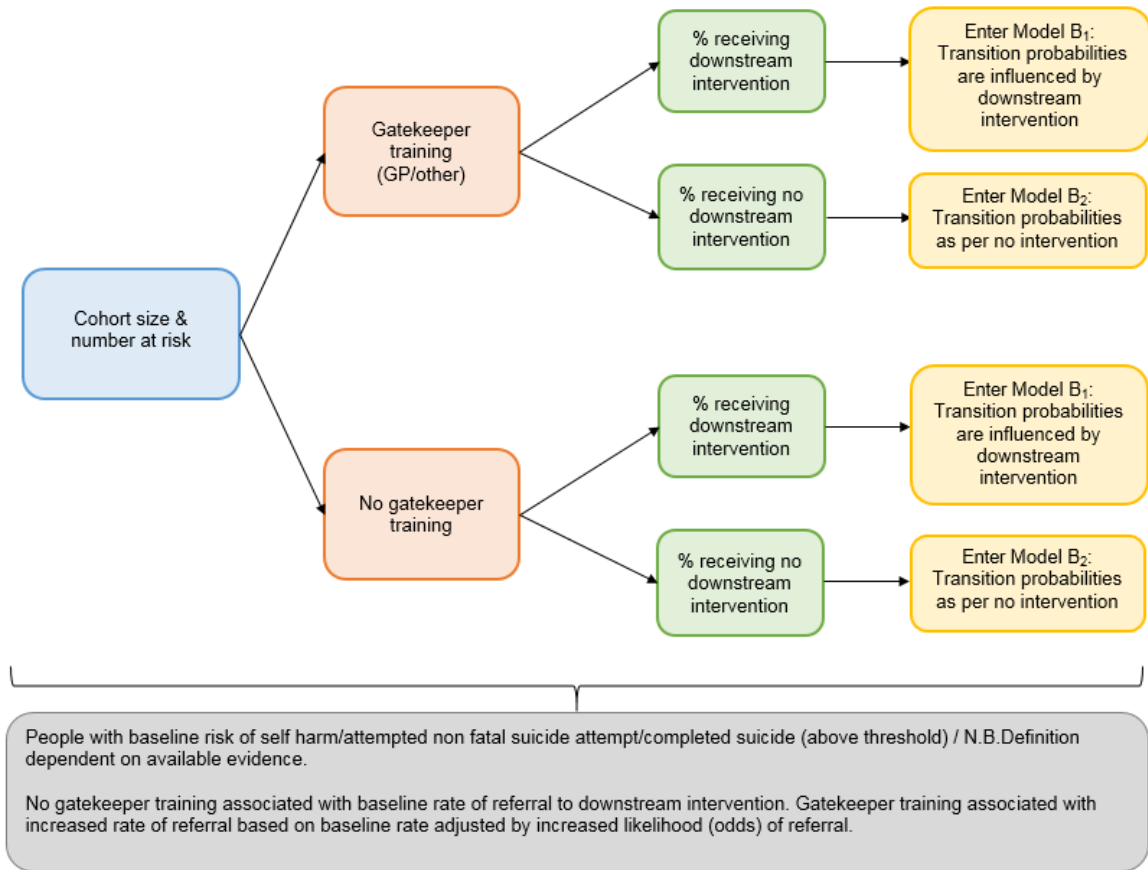
- Assist the Committee and the audience of the guideline in their decision making;
- Provide a framework to combine different data sources;
- Calculate and compare expected outcomes of different interventions or scenarios;
- Explore the impact of uncertainty in data or assumptions.

### **2.2.3 Model structure**

The complexity of the structure will be commensurate with the availability and robustness of data. The model will be designed to be used as a tool to test ranges and assumptions rather than a complex economic model to get a precise estimate of cost effectiveness for a specific intervention.

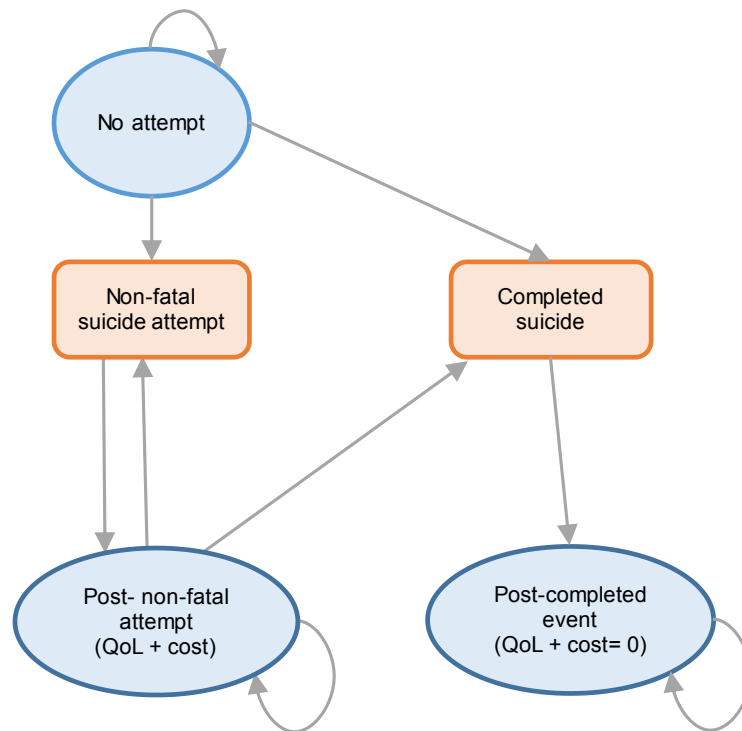
The structure of the model is expected to take a hybrid approach, whereby a decision tree is used to identify patients at risk (Model A in Figure 1, differentiating between interventions for case finding, gate keepers, etc.), and a state transition model is used to evaluate the impact on downstream events (Model B in Figure 2, reduction in completed suicides, non-fatal suicide attempts due to increased access to downstream therapies).

**Figure 1: Model A – Identification and Referral**





**Figure 2: Model B – Long-Term Impact on Downstream Events**



State costs:

- Productivity costs (% of unemployed in each state, days missed of work)
- Monitoring costs (NHS)

Event costs

Post non fatal attempt event:

- GP visit;
- Hospital admission;
- Weightings for each resource to be applied.
- *Include placeholder for % having more than one event*

Event costs

Post completed event:

- Hospital (dead on arrival, hospital admission);
- Police;
- Coroner;
- Postvention;
- Other.

Transition Probabilities:

- Intervention (Model B<sup>1</sup>) = Transition probability of each event adjusted by effectiveness of intervention (e.g. relative risk reduction)
- No intervention (Model B<sup>2</sup>) = Baseline probability of each event as per no intervention
- Assumed that risk of future events not time dependent from present states due to the memoryless probability of the Markov model.
- All cause mortality not shown but still included.

We will seek the advice of the committee for user friendly language in the final tool and model illustration.

Where possible, the treatment pathway once someone is referred for further help by a GP or following self-harm will be informed by the NICE guidelines in self-harm and depression<sup>2,3</sup>. It is our understanding from discussion with the PHE team that the majority of at-risk patients being referred to supportive care would access the IAPT service, and this has the strongest evidence for the impact on reducing risk of self-harm and suicide attempts. Alternative treatment can also be incorporated, however, these may be associated with a different impact of effectiveness which would also need to be reflected in the analysis. Given that case finding is only cost-effective if a cost-effective therapy is available, it may be sensible to fix the effectiveness of downstream therapy in line with best practice for analyses looking at case finding interventions. It was agreed by the Committee in PHAC3 that self-harm will not be evaluated as a separate health state but may be included as part of the pathway to suicide risk.

The PHE tool assumes that the effectiveness of an intervention is maintained over the ten year time horizon (no decay rate). A range of assumptions around the potential decay rate of a non case finding intervention over time will be incorporated into the model and the different impact on the results explored. The decay rate will be applied from the time people enter the Markov model. We are not explicitly modelling further treatment in the post event health states, but implicitly this would be captured by the cost and differential transition probabilities associated with the post event health state. Options include applying the same effectiveness in each year (no decay rate), a percentage reduction in effectiveness each year (whereby the effectiveness of the intervention declines over a defined period of time, and then is assumed to not be effective) associating a cost to sustain effectiveness (i.e. a placeholder to insert a cost for a user defined booster intervention), and a user-input for effectiveness for each separate year (to allow custom scenarios to be explored).

The model will be designed to incorporate a number of perspectives, including:

- NHS and PSS (cost of GPs, secondary care psychological interventions, ongoing management of patients at risk, immediate treatment of a suicide attempt);
- Police and coroner;
- Societal (productivity loss due to completed suicides and inability to work due to poor health). It was agreed in PHAC3 that productivity costs will be explored in a scenario analysis and not included within the model basecase.

At PHAC3 it was agreed that the model basecase will be the wider perspective that includes local authority costs. Although NHS perspective is usual in the basecase, this is likely to be

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<sup>2</sup> NICE clinical guidelines for self-harm in over 8s: short-term management and prevention of recurrence. Available from: <https://www.nice.org.uk/guidance/cg133>

<sup>3</sup> NICE clinical guidelines for self-harm in over 8s: Available from: <https://www.nice.org.uk/guidance/cg16>

least relevant for certain interventions, (e.g. intervention costs that fall to the Department of Transport) and so broader costs that involve local authorities will need to be considered.

#### **2.2.4 Overview of modelling approach**

As previously agreed with the Committee at PHAC 0 and PHAC 1, the *de novo* model will take a generalised approach. The generalised approach to modelling is useful when there is a lot of variability between interventions. For example, if we consider modelling the cost-effectiveness of safety fences in high-risk locations there are too many changing factors between interventions to give one overall cost-effectiveness estimate. The effectiveness and cost of the intervention would be affected by many factors including the physical location in which the fence needed to be built, the number of alternative high risk locations nearby, whether the fence is in a rural or city location and how busy the area is and the level of intention. A generalised approach generates a range of cost-effectiveness outputs for different scenarios, such as 'if an intervention costs 'x', it would need to decrease suicide attempts by 'y' to be cost-effective'. The generalised approach requires ranges rather than specific values to populate model input parameters, it allows multiple scenarios to be modelled and interpreted easily, it can be used for threshold analysis and the uncertainty is more transparent in the model.

If the clinical effectiveness review (expected to be made available in time for PHAC 3 in May 2017) does provide detailed data for some specific interventions these can be modelled as 'case studies' within the generalised model. This protocol focuses on interventions delivered in the community setting, using the example of GP training as an example.

#### **Adaptation to custodial setting**

At PHAC 1, it was highlighted that the custodial setting utilises different care pathway that is more similar to a secondary care model of care (in contrast to the primary care pathway that has been established in the PHE tool). We will refer to the NICE clinical guidelines on physical and mental health in prisons to inform the pathway<sup>4 5</sup>.

It may be possible to utilise the community model to provide a scenario that reflects the custodial setting with specific inputs. However, it is possible that a separate model may be required given a more clinical model of care and a potential reliance on cost effective care within the community after the custodial sentence. We would seek guidance from the Committee on this topic. It is expected that the pathways, quality of life, future productivity and baseline risk of suicide attempts would differ in the custodial setting to that in the community, and equality would need to be a strong consideration within decision making. Given this, the potential paucity in data and tenuous assumptions informing a more specific model, the committee may not feel an economic model would be robust or useful to evaluate interventions in a custodial setting. A separate model for the custodial pathway should be considered a separate project and beyond the scope of the current unit size.

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<sup>4</sup> NICE Guidance – Physical health of people in prison. Available from: <https://www.nice.org.uk/guidance/ng57>

<sup>5</sup> NICE Guidance – Mental health of adults in contact with the criminal justice system (in development). Available from: <https://www.nice.org.uk/guidance/indevelopment/gid-cgwave0726>

### 2.2.5 Model parameters

Key parameter inputs will be extracted from the PHE model and from a targeted literature search. If the clinical reviews and these data sources are not informative, assumptions will need to be made with committee validation. Inputs are expected to include:

- Baseline risks:
    - Population size;
    - Population characteristics (certain populations have increased baseline risks of suicide and interventions may be found more cost effective when implemented in a certain setting (e.g. younger populations have a higher baseline risk therefore interventions based in schools may be found more cost effective). The impact of a population characteristics such as baseline risks will be explored through sensitivity/scenario analysis rather than through subgroup analysis given we do not anticipate different effect sizes to be reported for different subgroups for the same intervention.
    - Number at risk;
    - Non-fatal suicide attempt;
    - Completed suicide;
    - Information informing the correlation between baseline NFSA and completed suicide rates (data permitting).
  - Quality of life:
    - Population mortality (age- and gender-specific mortality, to estimate average life expectancy, mortality over the time horizon of the analysis and to estimate potential QALY loss from completed suicides);
    - Quality of life (age- and gender-specific to adjust for the population at risk and aging over the time horizon of the analysis);
    - Disutility associated with events (non-fatal suicide attempt);
    - Health state-related quality of life (post-non-fatal suicide attempt). Following discussions had at PHAC3, the inclusion of QoL will be explored in a sensitivity analysis
    - Disutility to family and friends (to be explored in explanatory analysis)
  - Costs of intervention, for example:
    - Upfront (set-up cost) of the intervention;
    - Ongoing (annual) running cost of the intervention;
    - Cost of case finding interventions (e.g. gatekeeper training, GP training, providing information to the public);
    - Prevention interventions (e.g. safety net on bridge, MDT, information schemes);
    - Providing postventions to people affected by suicide (implementing grief and bereavement support services);
    - Implementing multi-agency teams;
    - Development of local plans for suicide prevention, inclusive of all components which are necessary to achieve the composite effect applied;
    - Providing support and information to at-risk people in custodial settings;
    - Providing support and information to at-risk people in the community setting.
-

- Effectiveness of interventions in scope:
  - For directly reducing risk of future suicide attempts;
  - For improved access to downstream interventions which have an associated risk reduction of future suicide attempts;
  - Probability of detecting at-risk patients;
- Effectiveness of downstream interventions at reducing risk of future suicide attempts;
- Decay rates of effectiveness of interventions;
- Costs and resource use of downstream therapies and events, for example:
  - Secondary care psychological therapies;
  - Booster interventions;
  - Non-fatal suicide attempts (e.g. GP visits, hospitalisation, ambulance costs, ongoing monitoring, A&E cost, psychosocial evaluation, proportion of events with these associated costs);
  - Completed suicides (ambulance, A&E, death on arrival, hospitalisation, proportion of events with these associated costs).
- Cost to other sectors associated with completed attempts:
  - Police costs;
  - Coroner costs;
  - Productivity costs (days off work due to non-fatal attempts, unemployment). This will be explored in a scenario analysis and not included within the model basecase.
- Additional costs or quality of life reductions associated with events or health states for family members.

## **2.2.6 Results**

### **2.2.6.1 Model outputs**

Results can be reported from various time horizons and cost perspectives. All uncertain parameters will be varied in univariate sensitivity analysis in order to identify the greatest causes of uncertainty in the model.

It is anticipated that the model will include the following model outcomes:

- Cost per QALY;
- Cost per life year;
- Cost per completed suicide averted;
- Cost per attempted suicide averted
- Return-on-investment;
- Disaggregated costs (by perspective);
- Four-way sensitivity analysis and scenario analysis.

A cost-benefit analysis may be required for transport industry-funded interventions. In this instance, the value of a statistical life (VSL) may be incorporated into the analysis.

Of the outcomes listed above, one should be prioritised for the sensitivity analysis. We would welcome feedback from the Committee on which would be most useful for decision making.

### 2.2.6.2 Scenarios

The model will be designed so that it is able to provide estimates of cost-effectiveness for a number of different scenarios. Since the model will be designed to be flexible, with all inputs able to be changed by the user and contain a range of options reflecting a number of different assumptions, it will be possible to use the model to provide results for custom scenarios. We would welcome guidance from the Committee on which scenarios would be useful for us to explore and present for their decision making, as well as illustrate how the model can be used for different decision problems. We suggest that up to three scenarios are devised and prioritised by the committee. The committee may wish to base their decision on the availability of data from the systematic reviews.

Examples of the types of scenarios the model could be used to explore are listed below, however we would need clear instruction from the committee to the precise inputs they would wish to test and the outcomes they wish to measure.

- Understanding the expected investment return on building a safety net for a bridge versus displaying posters: We assume a baseline suicide rate of 1% within the local community, 50% of which were completed at the bridge location. The safety net would cost £10,000 to install with 100% effectiveness in prevention for 5 years until replacement, versus, posters which would cost £1000 per year and have a 80% effectiveness at reducing completed suicides at that location.
- Evaluating the cost of case averted and return on investment of setting up GP training (£30,000) versus university department teacher training (£50,000) as part of an improved gate keeper scheme: We assume each intervention would have equal effectiveness, however the baseline suicide rate within the GP practice was 1% compared to 0.5% in the department. However, the total population sizes covered by the intervention are different (i.e. 30,000 patients versus 10,000 students). For people identified, downstream treatment has an 80% success rate in preventing an attempted suicide.
- Evaluation of the number of lives saved within a prison setting (if the generalised model is deemed appropriate) of an intervention that has an upfront cost versus an intervention with a yearly cost: We assume a baseline suicide rate of 10% and the prison mental health team have a 95% sensitivity of initial case finding of people at risk. One intervention has an intervention cost of £20,000 and a treatment success rate of 80% in preventing a completed suicide, with a decay rate of 20% per year, whilst the other intervention has a cost of £1,000 per person identified at risk per year, and a 70% success rate of preventing a completed suicide, with no decay rate.
- Evaluation of a postvention delivered to families suffering from grief and bereavement: comparing outcomes from implementing a postvention within a school compared with via a GP surgery. Treating at-risk patients would be evaluated from

Model B (Figure 1). In this case, patients would not have an elevated risk of suicide, but have associated probabilities of “improvement” or “deterioration” whereby they can move to another health state with a higher or lower QoL, or have “no improvement or deterioration” and stay in the baseline health state with a QoL reflective of those who are bereaved.

### 2.2.6.3 Sensitivity analysis

YHEC has developed a method of displaying four-way sensitivity analysis (Figure 3). This is particularly suited to a model such as this, with many uncertain parameters. The analysis allows the model user to visualise the impact of varying four different parameters within the model. The effect of one parameter can be read horizontally across, another vertically, another is varied on the x-axis and a final parameter is varied with the coloured curves on each graph.

When taking a generalised approach, a range of values and scenarios are tested rather than trying to establish a precise base case estimate. In order to make the results easy to interpret it is recommended that only **four or five key parameters** are chosen that can be varied at one time. It is usual to include the parameters that have more certainty as base case inputs and vary those parameters that are either uncertain or that would clearly differ based on the specific intervention (e.g. cost of CCTV or patrol at a high bridge, railway station or cliff).

The parameters outlined below could be narrowed down to prioritise those to include in the four-way analysis approach:

- Cost of the intervention;
- Effectiveness of intervention (what percentage of suicide attempts does it avert?);
- Baseline risk of events (completed suicides, non-fatal attempts);
- Time horizon;
- Different costing perspectives;
- Effectiveness of downstream therapies;
- The number of repeat events (either reflected explicitly or by testing a change in cycle length);
- Decay rate of intervention effectiveness and booster interventions.

**Figure 3: Four-way sensitivity analysis presentation**

