

Supporting investment in public health:

**Review of methods for assessing cost
effectiveness, cost impact and return on
investment**

Proof of concept report

March 2011

Project team

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Abbreviations

CBA	Cost benefit analysis
CCA	Cost–consequence analysis
CEA	Cost-effectiveness analysis
CPHE	Centre for Public Health Excellence
CUA	Cost–utility analysis
ICER	Incremental cost-effectiveness ratio
LYG	Life year gained
MCD	Multi-criteria decision analysis
NPV	Net present value
NICE	National Institute for Health and Clinical Excellence
PCT	Primary care trust
PDG	Programme Development Group
PHIAC	Public Health Interventions Advisory Committee
PSS	Personal social services
QALY	Quality-adjusted life year
QIPP	Quality, innovation, productivity and prevention
ROI	Return on investment
VfM	Value for money

List of terms and definitions

Commissioning

Commissioning is the process of ensuring that services meet the needs of the population. It includes the assessment of the needs of the population, the selection of providers and the confirmation that any services are safe, effective, population centred and of high quality.

Cost benefit analysis

A form of economic evaluation that weighs the total expected costs against the total expected benefits by valuing both in monetary terms.

Cost-consequence analysis

A form of economic evaluation comparing alternative interventions or programs in which the components of incremental costs and consequences are computed and listed, without aggregating these results (for example into a cost-effectiveness ratio).

Cost-effectiveness analysis

A form of economic analysis that compares the relative costs and outcomes (effects) of two or more courses of action. The effects of the intervention are summarised in one indicator and not converted into monetary terms.

Cost impact

Cost impact is the assessment of the net costs (or savings) arising from implementing guidance recommendations for the purpose of informing budget setting. Cost impact considers the impact on healthcare budgets for both one-off costs and recurring costs within a defined time period and for a defined population.

Cost-utility analysis

A form of economic analysis used to guide procurement decisions. The effects of interventions are assessed in a single quality of life or 'utility' index.

Health expectancy

Is the number of years a person can expect to live in 'full health' if current mortality and morbidity rates continue.

Incremental cost-effectiveness ratio

The difference in the expected cost of two interventions, divided by the difference in the expected effect produced by the two interventions.

Intervention

Involves a single action (or set of actions) to alter the outcome of a situation. For example, in the case of long-term sickness absence from work, it could involve implementing an organisation's sickness absence policy to help an individual return to work.

Life expectancy

Life expectancy is the expected number of years of life remaining at a given age.

Needs assessment

A process that identifies current and future health and wellbeing needs in light of existing services, and informs future service planning taking into account evidence of effectiveness.

Net present value

The total monetary benefit of an intervention less its costs (compared with an alternative intervention) when discounted to its present value.

Multi-criteria decision analysis

This is a tool that enables decision makers to consider different courses of action when there are multiple (and often conflicting) criteria by which choices can be made and there are trade-offs associated with different choices.

Perspective

The viewpoint from which the costs and benefits of an intervention are assessed. For example an intervention could be assessed from an NHS perspective, a public sector perspective or a private sector perspective.

Public health

In the context of this report public health encompasses health behaviours, screening, health protection such as immunisation, disease prevention and treatment such as COPD and any programme affecting health such as parenting for young families.

Quality-adjusted life year

A measure of disease burden, including both the quality and the quantity of life lived.

Quality, innovation, productivity and prevention

A set of guiding principles, established by the Department of Health, to help the NHS deliver its quality and efficiency commitments, building on the progress made in implementing Lord Darzi's Next Stage Review.

Return on investment

A general term encompassing the techniques for comparing the costs and benefits generated by an investment¹.

Spearhead area

A local authority area which falls within the bottom fifth nationally, based on the health and deprivation indicators listed below. The Spearhead group is made up of 70 local authorities and 88 primary care trusts. These local authority areas are in the bottom fifth nationally for three or more of the following five indicators:

- Male life expectancy at birth

¹ In finance return on investment usually refers to a measure of the benefit (return) of an investment divided by the cost of the investment, with the result expressed as a percentage or ratio.

- Female life expectancy at birth
- Cancer mortality rate in under 75s
- Cardiovascular disease mortality rate in under 75s
- Index of multiple deprivation 2004 (local authority summary), average score.

Time horizon

The length of time chosen to ensure that all important costs and effects are captured within an analysis. For the purposes of this work very short refers to a time horizon of 1 year, short 3 years, medium 10 to 20 years and long a lifetime.

Value for money

This term is widely used to describe the optimal balance between outputs and inputs. Good value for money gives efficiency (the ratio of an activity to the resources input), economy (the purchase of goods or services at lowest cost) and effectiveness (the extent to which objectives are achieved).

Executive summary

Introduction

In 2010, NICE set up the cost impact project to further develop its approaches to assessing the cost effectiveness and cost impact of public health interventions. The aim was to meet growing public sector demands to demonstrate the potential returns on such an investment over the short, medium and long term. (These demands are reflected in the recently published white paper 'Healthy lives, healthy people: our strategy for public health in England' (Department of Health 2010a).)

Background

Cost effectiveness forms an integral part of the decision-making process used by NICE advisory committees to make recommendations. The overall aim is to maximise the health benefits relative to the resources available.

However, NICE's recommendations are not made on the basis of the total cost or resource impact of implementing them. If the evidence suggests that an intervention provides significant health benefits – and the cost per person is acceptable, it is recommended, even if it would be expensive for the whole population.

NICE currently uses cost–utility analysis (CUA) to assess whether or not public health interventions offer value for money.

The resource and cost implications of implementing NICE guidance are assessed separately by the costing team – it is not part of the economic analysis carried out as part of the development of guidance. The costing team produces tools for financial planning (typically over a 3–5 year time horizon) to support local implementation of NICE's recommendations.

Objectives

Overall the project sought to determine the feasibility and usefulness of producing a range of cost effectiveness and cost impact/ROI data and tools to support local

decision-making. It comprised four objectives which sought to determine the feasibility of:

1. Calculating a specific QALY (quality-adjusted life year)/ICER (incremental cost-effectiveness ratio) for each intervention being recommended.
2. Indicating the cost impact of implementing the recommendation at the local level.
3. Indicating the quantity of savings that will accrue in the short, medium and long term as a consequence of implementing, in full or in part, the recommendations at local level.
4. Developing the business case for implementing the recommendations.

Methods

The cost impact project involved the following activities:

1. Three workshops – two with commissioners and local decision-makers in the NHS and one with local government representatives. The local government workshop was held jointly with Local Government Improvement and Development (LGID).
2. An analysis of NICE's current approach to assessing the cost effectiveness and cost impact of public health interventions.
3. A review of return on investment (ROI) methods and tools.
4. Analyses of a number of public health interventions using a range of return on investment metrics methods.
5. Interviews with commissioners and decision-makers to determine which return on investment metrics are most useful – and what other criteria are used when making investment decisions.

Key findings

Workshops

The workshops with local commissioners and decision-makers showed that a range of people can be involved in making investment decisions. In some cases, it might come down to one person (for example, a director of public health); in others it may involve the whole executive management team.

A variety of data are used to inform decisions. Sources include NICE guidance, NHS Evidence, public health observatories (PHOs), Cochrane reviews, financial data, and joint strategic needs assessments. However, decision-makers said that they found it difficult to present a business case for investing in public health interventions, due to a perceived lack of relevant data. They wanted to be able to cite concrete outcomes from an intervention over a period of 1 to 5 years.

A number of prioritisation tools were also used to support decision-making. These included those developed by the Yorkshire and Humber and London public health observatories, the NICE costing team and Health England.

Wide variations between – and within – sectors were observed in participants' ranking of the usefulness of 14 different criteria² for deciding whether to invest in an intervention.

The need for local champions, data to support the business case and strong partnership working between the NHS and local authorities were identified as key to improving the way investment decisions are made.

Analysis of NICE public health guidance and methods

NICE's public health recommendations are various and multi-faceted. For example, a single recommendation may contain multiple actions and settings. It may also target several providers, audiences and life stages. Recommendations fall into two broad categories: those based on interventions which have been found to be

² The 14 criteria assessed were: effectiveness, cost effectiveness, affordability, impact on health inequalities, burden of disease, quality of evidence, cost of intervention, population eligible, cost saving in less than 5 years, feasibility, acceptability, cost saving in more than 5 years, certainty, non-health effect.

effective; and those which aid effective implementation. These characteristics can present considerable challenges when assessing cost impact.

The broad range of objectives (including non-health outcomes) and the importance placed on tackling health inequalities make it particularly difficult to assess the cost effectiveness of public health interventions. Lack of data on current practice, effectiveness and costs – and the differences in time horizons and discounting – were particular challenges.

Review of return on investment methods

Cost-effectiveness analysis (CEA) and cost–consequence analysis (CCA) dominate the published literature. Cost–utility analysis (CUA) accounts for just over a quarter (27%) of the approaches reported in the published literature. Cost–benefit analysis (CBA) – especially net present values (NPV) – and various forms of multi-criteria decision analysis (MCDA) were identified as the main alternatives to cost–utility analysis. In addition, some strategic health authorities are piloting programme budgeting marginal analysis (PBMA).

Test of return on investment methods

Using information obtained in the review of return on investment methods and tools, 22 different return on investment metrics were calculated for 10 different public health interventions. The interventions covered a range of topics, population groups and settings. They included face-to-face interventions to tackle tobacco use and misuse of alcohol, a school-based intervention to prevent obesity and activities to prevent the development of depression among care givers.

The results were ranked – from most to least cost effective – for each intervention. Different return on investment metrics produced different rankings and it was noted that this could result in different decisions (see annex 2 for examples).

The timing of the costs and benefits was determined for each intervention assessed (out of concern that a need to make short-term savings could lead to a disinvestment in public health interventions).

On the basis of the diseases considered, none of the interventions were found to produce savings within 1–3 years. As an example, the health gains from the school-based intervention to prevent obesity – measured by changes in type 2 diabetes, stroke, colon cancer and coronary heart disease – did not start to accrue until 40 years after the intervention was delivered (see annex 3 for examples).

Interviews with commissioners and decision-makers

Commissioners and decision-makers were given the results of 12 different methods of calculating the return on investments of a public health intervention compared with usual care. When asked if they would invest in each intervention based only on the information provided, most said no. This was the case even where a metric reported that the cost-per-quality-adjusted life year (QALY) gained was only £3125, which is well below the NICE ‘threshold’ for determining good value for money for the NHS.

Decision-makers indicated that they require a range of information for making investment decisions and confirmed that an individual return on investment metric is insufficient. (It is unclear from the interviews whether there is a general lack of understanding of economic metrics.)

Much of the information that led to variations in the way the return on investment metrics were ranked was exactly the type of information that decision-makers said they needed for investment decisions. (It includes, for example, details on affordability, reach, burden of disease avoided, short-run cost savings and productivity gains.)

As with the workshop participants (see above), when asked to rank the usefulness of 14 different criteria for the purposes of decision-making, wide variations were observed between and within sectors.

Recommendations

Based on the above, NICE proposes the following, three-step approach to assessing the returns on investment generated by public health interventions.

1. A cost–consequence analysis (CCA): all the key costs and consequences would be displayed in a comparable, disaggregated form. Outcomes would be measured in ‘natural’ units. This would enable a ‘fine grained’ assessment of the intervention. It would also provide data for calculating a variety of return on investment metrics, including the cost–utility analysis in step two below.
2. A cost–utility analysis (CUA): the outcomes would be expressed in one measure that combines information on life expectancy and health-related quality of life (quality-adjusted life years or ‘QALYs’). The cost–utility analysis would allow comparisons across different programmes, for example, prevention and treatment. (In the health sector, which has an agreed ‘cost-effectiveness threshold’, a cost–utility analysis indicates whether an intervention represents good value for money.) Note: cost–utility analyses are not always appropriate for a public health intervention and other methods, such as cost–benefit analysis, may be used.
3. The information gathered in steps one and two would be available to local decision-makers for them to combine with implementation costs and other details, such as eligible population size and the outcome of an assessment of local need. The resulting analysis would help them to decide which interventions are a priority.

Each step should also capture the timing of the costs and benefits – and the sectors affected.

Specifically, the key recommendations are:

Recommendation 1 To support the work of NICE committees and the cost impact team, undertake cost–consequence analysis (CCA) to capture the impact of public health interventions on different sectors. This should be carried out in a way that makes most sense for each sector.

Recommendation 2 To support the work of NICE committees and ensure baseline comparability across the UK healthcare sector and other NICE programmes,

continue cost–utility analyses of public health interventions using quality-adjusted life years.

Recommendation 3 To support the cost impact team and meet the needs of different decision-makers and commissioners, extend the analyses of time horizons to include periods of 1–3 years and use sensitivity analysis to assess different discount rates.

Recommendation 4 To fulfil the needs of different commissioners and decision-makers, calculate a range of return on investments including net present values.

Recommendation 5 To ensure that the prioritisation of CPHE public health referrals are informed by criteria which recognise the importance of a strategic, comprehensive and integrated approach to public health. In addition, the topic selection panel that determines which topics are referred to NICE should specify which elements of this approach would be the subject of effectiveness and cost-effectiveness analyses and return on investment considerations.

Recommendation 6 To build the evidence base for investing in public health interventions, NICE should develop a database of evidence of effectiveness and cost effectiveness. Interventions which seek to achieve the same outcome (for example, smoking cessation) should be grouped together within the database.

Recommendation 7 To support local decision making, NICE should explore other tools including methods for ranking and prioritising interventions. Examples include multi-criteria decision analyses and programme budgeting marginal analysis.

Recommendation 8 NICE should initiate cross-government discussions to establish thresholds that determine the cost effectiveness of public health interventions from the perspectives of the public sector and wider society.

A number of other changes to NICE's methods and processes would also need to be introduced, for example:

- routine use of sensitivity analyses on the discount rates and time horizons (1, 3 and 5 years) used in its modelling

- inclusion of reports on the ‘NHS versus the NHS plus wider public sector perspective’
- involvement of the costing team earlier in the economic analysis
- assessment of current practice and costs
- steps to improve the specificity of recommendations.

Conclusion

NICE’s public health committees will continue to use cost–utility analysis or cost–benefit analysis to determine whether an intervention represents good value for money. However, the results of the analyses suggest a number of changes could be made to improve our current approach.

Many of the recommendations concern data that already are, or could be, collected in the early stages when assessing cost effectiveness. These data, such as the timing of the costs and benefits that arise, will support the cost impact team as well as local decision-makers and commissioners.

Based on findings from the workshops and analysis, NICE is proposing a new, three-step approach to determine the benefits of public health interventions. It should enable decision-makers to consider the short-, medium- and long-term financial consequences (including likely savings) of implementing such interventions. At the same time, it should also allow them to take into account a range of other criteria including national and local priorities.

1. Introduction

NICE is an independent organisation responsible for providing national guidance on promoting good health and preventing and treating ill health. It produces guidance in three areas:

- **Public health** – guidance on the promotion of good health and the prevention of ill health for those working in the NHS, local authorities and the wider public and voluntary sector.
- **Health technologies** – guidance on the use of new and existing medicines, treatments and procedures within the NHS.
- **Clinical practice** – guidance on the appropriate treatment and care of people with specific diseases and conditions within the NHS.

NICE also produces a number of resources to support implementation of its guidance, including a costing tool to assist financial planning (typically over a 3–5 year time horizon).

1.1 *Cost impact for public health*

The overall aim of the NICE cost impact project is to devise a set of methods congruent with current NICE principles in order to enhance current public health guidance and its associated costing tools.

This is so that the existing work on cost effectiveness and cost impact can better inform local decisions about disinvestment and support the business case for investment in public health. This would include an assessment of the quantity of savings that might accrue in the short-, medium- and long-term as a consequence of implementing, in full or in part, NICE public health recommendations. A number of outputs could be added to the current final NICE published guidance and the implementation tools or improvements made to the current outputs.

Other consequences of the project include: revisions to NICE methods manuals to reflect the new cost impact calculations on key areas of public health; recommendations on disinvestment and the case for investment in public health; and

tools to aid local decision-making about cost savings and returns on investment.

The project plan for this project identified two stages. This report describes the completion of stage 1 of that plan (see section 1.2 below) and includes recommendations for taking the project forward, including a proposed methodology for calculating returns on investment (ROI).

It is important to note that the objectives, outputs and timelines for this project were established before the election of the new coalition government in May 2010 and the publication of its subsequent White Paper on Health in July 2010. The White Paper and related documents set out significant changes in the structural arrangements for prioritising and commissioning healthcare and health improvement at local level (see section 2.2 for details). Further, the Public Health White Paper 'Healthy lives, healthy people' was published in November 2010. The ongoing development of the project will reflect the current changes underway in the NHS and local government. What is proposed here is congruent with policy as we currently understand it.

1.2 *Objectives of stage one*

The project plan stated that the feasibility of the following would be explored in stage one:

1. A specific QALY (quality-adjusted life year)/ICER incremental cost-effectiveness ratio) for each intervention being recommended. This would probably be in the form of a range rather than a single value. It would be appropriate to indicate the sensitivities that determine the range.
2. An indication of the cost impact of implementing the recommendation at local level.
3. The quantity of savings that will accrue in the short-, medium- and long-term as a consequence of implementing, in full or in part, the recommendations at local level.
4. The business case for implementing the recommendations.

The objectives in stage one are to some extent already implicit in the work that is done both by the health economists working on each of the pieces of guidance and the costing team who develop the implementation support materials. This paper makes those activities explicit and takes them beyond current methods. The first part of the project is about developing extant methods to meet these four objectives.

1.3 *Proof of concept: aims*

This proof of concept relating to stage one of the cost impact project seeks to:

- Establish whether it is feasible to deliver the stage one objectives of the NICE cost impact project, as outlined in Public health cost impact and business case project.
- Determine the process and methods to deliver each objective.
- Set out the proposed methodology and its strengths and weaknesses and tools.

2 Background

2.1 *Origins of the NICE cost impact project*

This project was initiated in January 2010 and has its origins in the following three sources.

2.1.1 NICE disinvestment workshop

In September 2009, NICE organised a workshop for senior NHS leaders and commissioners on the theme of disinvestment. Among other things, there was widespread support at the workshop for the principle of using public health guidance as the basis for building the case for investing to save at local level. This requires a method for demonstrating the savings that will accrue from investing in public health measures.

In terms of cost utility, NICE's public health guidance is very good value for money (Owen, Morgan, Fisher et al., submitted for publication). It is also clear epidemiologically and from population level modelling that the potential for public health interventions to save lives and prevent morbidity is considerable. It follows that at least some public health interventions offer the potential for savings for the NHS and indeed for wider society. However, as currently presented the value for money is expressed in QALY and ICER terms and informs NICE committee decision-making about what to recommend – whereas, assessment of cost impact or of cost savings is undertaken *after* the recommendations have been made.

It is widely acknowledged, as was voiced at the workshop, and as is reported in feedback to the NICE implementation consultants and to the CPHE team, that information such as cost impact would be of enormous use to local providers and commissioners. It was stressed at the workshop that public health guidance accompanied by cost impact and cost saving information would be very helpful, especially in the light of the current and future pressures on public finances. Information about timing of savings would also be welcomed; quite often there is a

perception that implementing public health interventions involves paying now to save later – with little information about when ‘later’ will arrive.

2.1.2 Health England local prioritisation tool

In 2009 Health England, the DH sponsored committee chaired by Professor Julian Legrand, reported on prioritising investments in preventative health. In its deliberations over the previous two years it had been interested in the question of prioritising public health interventions on the basis of cost effectiveness and value for money. It had examined US data in this regard and tested the US method against UK activities including NICE’s public health work.

Health England concluded that there was a good case to develop a tool which would assist in the prioritisation of preventive activity. Accordingly the Committee worked with Matrix Knowledge Group to produce a tool designed to do this. The tool was based on the QALY values which NICE had determined for its public health interventions and programmes. The tool as it is presently constituted – ‘Prioritising investments in preventative health’ (see <http://help.matrixknowledge.com/>) – is a proof of concept and requires further work, including its application to sectors beyond the NHS. NICE representatives on the Health England Steering Group suggested that the ideas generated in the Health England work could be taken forward by NICE.

2.1.3 Report to the Secretary of State for Health

The report, ‘Enabling effective delivery of health and wellbeing (Bernstein, Cosford and Williams, 2010), which was published in February 2010 contained recommendations to enhance the financial data available to local strategic leaders. The following recommendation was made regarding return on investment:

‘Recommendation 2: The Department of Health should explore with NICE the explicit identification of the impact of clinical and public health guidance on overall life expectancy and on health expectancy, and quality of life for people with disability and long-term conditions. NICE should produce rankings of the most cost-effective clinical and public health guidance, with an expectation of delivery of the most cost

effective. The feasibility to provide assessments of cost impact and return on investment should also be explored.’

The Secretary of State committed the Department of Health to take forward this recommendation, with a request for the work to be available as soon as possible in 2010 to inform planning and commissioning for 2011/12.

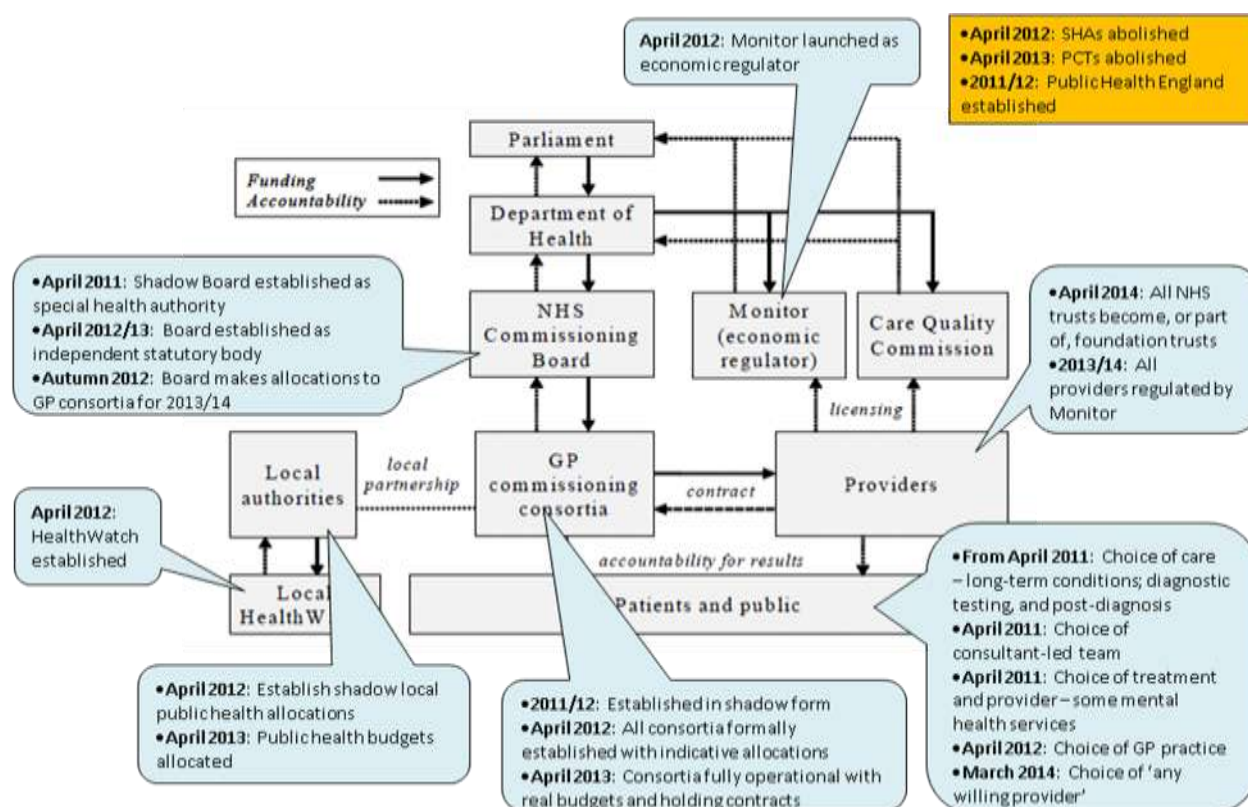
2.2 Commissioning³

Government proposals during 2010/11 have reaffirmed the importance of a 'joined up' approach to commissioning healthcare, public health, and social care services. This section summarises emerging policy on commissioning across these sectors, looks at key functions in proposed commissioning arrangements, and puts recent developments in context.

2.2.1 Equity and excellence – the NHS White Paper

In July 2010, the DH published its White Paper on the NHS, '[Equity and excellence: liberating the NHS](#)', which included a number of major structural changes for the NHS as well as new systems of accountability. Some of the main changes and milestones are captured in the following annotated figure1 from the White Paper.

Figure 1 Major structural changes and new systems of accountability for the NHS (source: NHS White Paper, Department of Health, 2010b)



³ The text and diagrams in section 2.2 were prepared by Nick Doyle, NICE policy adviser.

Also in July 2010, the DH published a series of consultation documents on key White Paper proposals:

- [Liberating the NHS: transparency in outcomes – a framework for the NHS](#) set out plans for an NHS outcomes framework.
- [Liberating the NHS: commissioning for patients](#), a joint publication with the Department for Communities and Local Government (DCLG), described future arrangements for GP commissioning and the role of the NHS Commissioning Board.
- [Liberating the NHS: local democratic legitimacy in health](#) set out proposals to strengthen the role of local government in health so that local authorities take on local public health improvement functions and have a new role in promoting integration. In December 2010, the DH published one of the outcomes of these consultations, [The NHS outcomes framework 2011/12](#).

2.2.2 Public health White Paper – healthy lives, healthy people

The November 2010 public health White Paper, [Healthy lives, healthy people: our strategy for public health in England](#) (Department of Health, 2010a), sets out what is described as a new approach that ‘empowers individuals to make healthy choices and gives communities the tools to address their own, particular needs’. It confirms and adds detail to outline proposals on public health contained in the NHS White Paper and related consultation documents. For example:

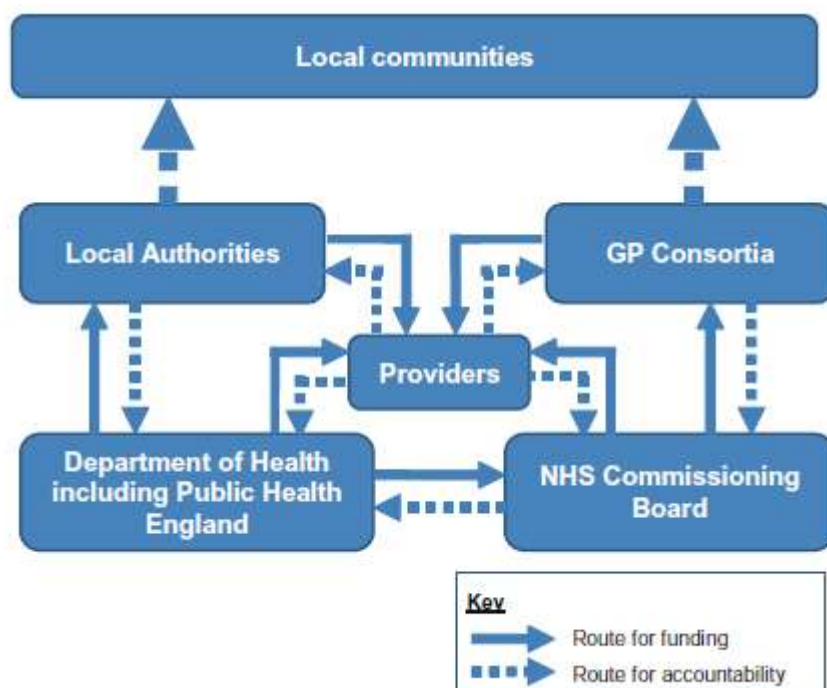
- Local authorities will lead action on public health.
- Health and wellbeing boards will develop joint health and wellbeing strategies based on joint strategic needs assessments (JSNAs), and will bring together the NHS, public health, social care and children’s services to support decisions on health and wellbeing.
- Directors of public health (DsPH) will be the strategic leaders for public health and health inequalities in local communities.
- A professional public health service – Public Health England – will be created as part of the DH to strengthen the national response on

emergency preparedness and health protection, be a centre of public health advice and expertise, support local health improvement efforts, and directly commission a range of services.

- There will be ring-fenced public health funding from within the overall NHS budget. Public Health England is likely to have around £4bn to spend.
- There will be ring-fenced budgets for upper-tier and unitary councils and a new health premium to reward progress against the public health outcomes framework.
- Public health will be part of the NHS Commissioning Board's mandate.
- There will be public health support for NHS commissioning nationally and locally, and stronger incentives for GPs to play an active role in public health.

The following diagram (figure 2) from the White paper (page 60) depicts funding and accountability arrangements in the new public health system.

Figure 2 Funding and accountability arrangements for the new public health system

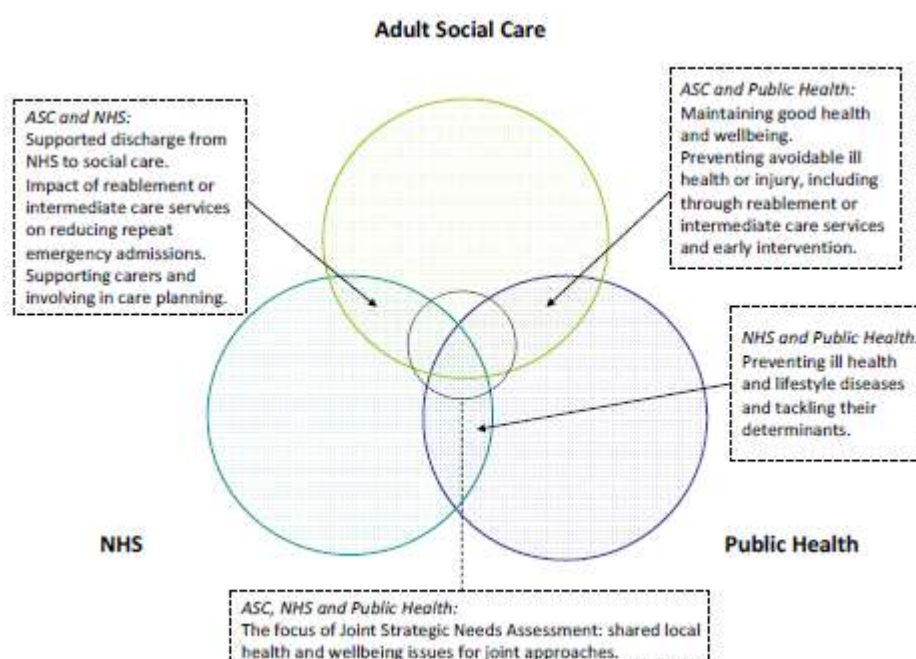


2.2.3 The vision for adult social care and the social care outcomes framework

The DH's statement in November 2010 of the overarching principles for adult social care, [A vision for adult social care: capable communities and active citizens](#), describes the role of councils in supporting communities and helping people to retain and regain independence, particularly through their leadership for health and wellbeing. It highlights the function of joint strategic needs assessment in shaping the commissioning of health, social care and health improvement services.

The related consultation document on the adult social care outcomes framework, [Transparency in outcomes: a framework for adult social care](#), depicts the inter-relationships among the NHS, social care, and public health outcomes frameworks as follows:

Figure 3 Inter-relationships among NHS, social care and public health outcomes frameworks



The consultation document says that NICE will have a new independent role as the

centre of social care evidence and quality standards, starting from 2012/13. Quality standards will define what 'high quality' looks like in adult social care and will be a tool for use in commissioning adult social care.

2.2.4 Health and Social Care Bill

The recently published [Health and Social Care Bill](#) sets out the architecture of the new healthcare, public health and social care delivery systems. It states that the functions of the re-constituted NICE will include preparing Quality Standards for public health services and giving advice, guidance, information and recommendations on matters connected with public health services.

2.2.5 New commissioning arrangements – key functions

It is possible to describe key functions in future commissioning arrangements in some detail on the basis of information in these white papers and consultation documents, and in the Health and Social Care Bill.

GP commissioning consortia will be responsible for commissioning the majority of care for patients. They will also have a duty to promote equalities and work in partnership with local authorities on adult social care, early years' services and public health. They will contribute to local authority-led joint strategic needs assessments (JSNA) and ensure that consortia commissioning plans reflect the health needs identified. The public health White Paper reaffirms their responsibility for the whole population in their area and for improving health and reducing health inequalities. Consortia will receive a management allowance to cover commissioning costs. They can decide what commissioning to carry out themselves and what commissioning they will buy in from local authorities or the private and voluntary sectors.

Local authorities will be local leaders of the new public health system, with new ring-fenced budgets, enhanced freedoms and responsibilities to improve the health and wellbeing of their population and reduce inequalities. They will join up the commissioning of local NHS services, social care and health improvement and therefore be responsible for:

- Promoting integration and partnership working between the NHS, social care, public health and other local services and strategies.
- Leading joint strategic needs assessments, and promoting collaboration on local commissioning plans, including by supporting joint commissioning arrangements where each party so wishes.
- Building partnership for service changes and priorities. There will be an escalation process to the NHS Commissioning Board and the Secretary of State, which retain accountability for NHS commissioning decisions.

Local authorities' 'convening role' will provide opportunities for local areas to further integrate health and adult social care, children's services (including education) and wider services such as disability services, housing, and tackling crime and disorder.

Clauses 178–180 of the [Health and Social Care Bill](#) set out the requirement on local authorities to establish a health and wellbeing board, and specify the board's composition and general functions. Each board will have four main functions:

- assessing the needs of the local population and leading the statutory joint strategic needs assessment
- developing a local, joint health and wellbeing strategy that will provide the overarching framework for specific commissioning plans for the NHS, social care, public health, and other services that the board considers necessary
- supporting joint commissioning and pooled budget arrangements where all parties agree this makes sense
- undertaking a scrutiny role in relation to major service redesign.

Health and wellbeing boards would enable local authority influence over: NHS commissioning and influence for NHS commissioners over health improvement; reducing health inequalities; and social care. They would lead in determining strategies and allocations involving place-based budgets for health. They would have

an important role in relation to other local partnerships. The minimum membership of boards would be elected representatives, GP consortia, DsPH, Directors of Adult Social Services, Directors of Children's Services, local HealthWatch and, where appropriate, the participation of the NHS Commissioning Board.

Directors of public health will be employed by local government and jointly appointed by the relevant local authority and Public Health England. They will be responsible for the health improvement functions of upper-tier and unitary authorities. They will be the strategic leaders for public health in local communities, working to achieve the best possible public health and wellbeing outcomes across the whole local population, in accordance with locally agreed priorities. They will collaborate with local partners on improving health and wellbeing, including GP consortia, other local DsPH, local businesses and others.

The NHS Commissioning Board will have five main functions, including national leadership on commissioning for quality improvement by, for example, 'setting commissioning guidelines on the basis of clinically approved quality standards developed with advice from NICE, in a way that promotes joint working across health, public health and social care'. To ensure accountability to patients and the public, the NHS Commissioning Board, supported by NICE and working with patient and professional groups, will develop a commissioning outcomes framework that measures the health outcomes and quality of care achieved by GP commissioning consortia. As part of its mandate for public health it will work with Public Health England in supporting consortia to achieve maximum impact on improving health and reducing health inequalities.

Public Health England will be part of the DH. Its mission will be across the whole of public health – protecting the public from health threats, improving the healthy life expectancy and wellbeing of the population, and improving the health of the poorest, fastest. It will work closely with the NHS to ensure that health services play a strong part in this mission. Its role will include:

- commissioning or providing national-level health improvement services, including appropriate information and behaviour change campaigns

- commissioning some public health services from the NHS, for example via the NHS Commissioning Board
- allocating ring-fenced funding to local government and rewarding them for progress made against elements of the proposed public health outcomes framework
- jointly appointing DsPH and supporting them through professional accountability arrangements
- providing public health advice, evidence and expertise to the Secretary of State and the wider system, including working with partners to gather and disseminate examples of what works
- delivering effective health protection services.

Local requirements for public health evidence will drive Public Health England's evidence function. Its approach to evidence will be based on principles of quality (evidence will be timely, reliable, relevant to the audience and aim, and produced in a scientifically robust and independent way), transparency (evidence will be as accessible and user-friendly as possible), and efficiency (information will be collected once but used many times and new knowledge will be rapidly applied).

The **outcome frameworks for the NHS, public health and social care** will provide a major focus for efforts to improve performance through commissioning by each sector and by the sectors in partnership, and will be an important element in enabling accountability within delivery systems and to the public locally and nationally. The consultations on the NHS and adult social care outcomes framework presented fairly well developed models. The public health white paper presented only the five domains proposed for the public health outcomes framework, pending further consultation. These domains are:

- Domain 1 – Health protection and resilience: protecting people from major health emergencies and serious harm to health.

- Domain 2 – Tackling the wider determinants of ill health: addressing factors that affect health and wellbeing.
- Domain 3 – Health improvement: positively promoting the adoption of ‘healthy’ lifestyles.
- Domain 4 – Prevention of ill health: reducing the number of people living with preventable ill health.
- Domain 5 – Healthy life expectancy and preventable mortality: preventing people from dying prematurely.

2.2.6 Conclusion on commissioning for public health

Commissioning in the NHS has been subject to organisational changes in the past, and is due to change substantially with the introduction of GP commissioning consortia and an enhanced role for local authorities particularly in the public health field. As well as organisational change, the public sector is facing challenging times with respect to funding, which makes understanding the short-, medium- and long-term cost impact of decisions and the return on investment even more important.

NICE is ideally positioned to continue to provide high quality, authoritative public health guidance and supporting tools that can assist decision makers in understanding the cost effectiveness of the recommendations and the cost impact of implementing them. The guidance and tools should supplement the work done by commissioners of public health services in understanding the local needs and prioritising investment in public health. One main advantage is the economies of scale that can be realised through NICE undertaking the work on a one-off basis. In so doing, NICE can reduce the risk of any unnecessary duplication at a local level and ensure a consistency of approach across many of the emerging organisations.

2.3 Current NICE methods for cost effectiveness and cost impact

This section briefly summarises the existing methods that NICE uses to determine cost effectiveness and cost impact for public health.

2.3.1 NICE cost effectiveness for public health

NICE uses cost-utility analysis (CUA) as its main method for assessing cost effectiveness. This method expresses the outcomes of an intervention in terms of QALYs.

The QALY combines information on life expectancy and health-related quality of life. A number of factors are considered when measuring someone's quality of life, in terms of their health. They may include, for example, the level of pain the person is in, their mobility and their general mood. The quality of life rating can range from negative values below 0 (states regarded as being worse than death) to 1 (which represents the best possible health state). A value of 0 is equivalent to being dead.

CUA using the QALY was originally adopted to ensure baseline comparability across the UK healthcare sector and across NICE's programmes (that is, technology appraisals and clinical guidelines). The Public health methods manual (NICE (2009)) states it also helps to prioritise which recommendations should be implemented locally. Wanless (2004) suggested that: "To achieve the objective of allocating funding more efficiently between health care and public health, it is vital that similar analytic[al] methods be used."

In public health, it is acknowledged that CUAs are not appropriate for some topics and other methods (such as cost benefit analysis (CBA) or cost consequence analysis (CCA)) or outcomes (such as life years gained, cases averted) may be considered.

However, the adoption of different methods and outcomes imposes considerable limitations on baseline comparability across public health interventions as well as across NICE's different types of guidance.

Aims of NICE assessment of cost effectiveness

Health economics is about using resources efficiently to improve the population's health. It forms an integral part of the public health guidance development process in determining what can be considered cost effective. The Public Health Interventions

Advisory Committee (PHIAC) and the Programme Development Groups (PDGs) are required to make decisions informed by the best available evidence of both effectiveness and cost effectiveness.

Economic evaluation compares the costs and consequences of alternative courses of action. The cost effectiveness of an intervention or programme is assessed to ensure maximum health gain from the available resources which are finite. If resources are used for interventions that are not cost effective, the population as a whole gains less health benefits (that is, there is a greater 'opportunity cost'). However, a balance must be struck between efficient allocation of resources on the one hand and an equitable allocation of those resources on the other.

Public health recommendations are based on the estimated cost of interventions and how that relates to the expected health benefits (that is, recommendations should be cost effective). Recommendations are not made on the basis of the total cost or the resource impact of implementing them. So, if the evidence suggests that an intervention provides significant health benefits and the cost per person is acceptable, it is recommended, even if it would be expensive to implement across the whole population.

Although commissioners need to know the resource and cost implications of implementing NICE guidance, this assessment is not within the remit of the economic analysis. NICE undertakes a separate cost-impact analysis after the public health guidance is published and this forms part of the implementation tool set.

Components of economic analysis

The NICE approach to cost effectiveness typically involves two steps. The first step entails a review of economic studies in the published literature. The second step involves the adaptation or development of an economic model. These two steps are briefly described below.

Economic review

The review of economic studies is systematic but focused. It mirrors the method, including critical appraisal, and scope of the effectiveness reviews. It provides a

check on whether effective interventions have already been found to be cost effective and it helps to determine whether there is a need for additional economic analysis. If a high quality economic study has been published that addresses a structured public health question and is relevant to current practice, then further economic modelling will not be necessary.

Economic model

Some further analysis is usually undertaken as the health economic literature is rarely comprehensive or conclusive enough. Additional economic analyses may involve adapting an existing model or developing a new one. Many of the costs and benefits of public health interventions accrue a long time into the future. To reflect these longer time frames (including a lifetime horizon) extrapolation modelling is often necessary. Where the impact of the intervention beyond the results of the studies is uncertain, the model should explore the impact of different assumptions about future intervention effects. Modelling is also necessary where intermediate outcomes are used rather than health related quality of life and survival.

Given the broad scope of much public health guidance, it is not possible to model the cost effectiveness of every intervention or question. Various criteria are taken into account to decide which interventions should be modelled. The main ones are listed below:

- Likelihood of influencing a recommendation
- Significant health and resource impact
- Degree of uncertainty in the cost-effectiveness literature and likelihood the model will clarify matters
- Availability of sufficient data to allow useful modelling.

Currently, NICE uses the following 'reference-case' assumptions as a basis for the cost-effectiveness analysis:

Table 1 Summary of the public health reference case

Element of assessment	Reference case
Defining the decision problem	Scope developed by NICE
Comparator	Interventions routinely used in the public sector, including those regarded as current best practice
Cost perspective	Public sector, including NHS and PSS
Outcome perspective	All health effects on individuals
Type of economic evaluation	CEA (primary), CCA or CBA (secondary)
Synthesis of evidence on outcomes	Systematic review
Measure of health effects	QALYs
Source of HRQL data	Patients and/or carers
Valuation of HRQL	General public
Discount rate	Annual rate 3.5% on costs and health effects
Equity weighting	Equal weight regardless of individual characteristics
Time horizon	Most commonly life-time

Departures from the reference case may be made with the agreement of CPHE. The reasons why the reference case was not followed must be given in the report.

Economic evidence and guidance recommendations

The purpose of the economic analysis is to inform the public health guidance recommendations.

If there is strong evidence that an intervention **dominates** the alternatives (that is it is both more effective and less costly) it should be recommended. If one intervention is more effective but more costly than another then the incremental cost-effectiveness ratio (ICER) should be considered. Here the cost per QALY gained should be compared with the next most effective alternative. This involves calculating the difference in mean cost divided by the difference in mean QALYs for

one intervention compared with the next most effective alternative.

If one intervention appears to be more effective than another, PHIAc/the PDG will have to decide whether any increase in cost associated with the increase in effectiveness represents reasonable value for money. In doing so it should refer to the principles outlined in NICE's report *Social value judgements: Principles for the development of NICE guidance* (NICE 2008a). It states that:

- If the intervention is more effective and less costly than the comparator (that is, dominant) it should be recommended.
- Interventions with an ICER below £20,000 per QALY are considered to be cost effective.
- ICERs between £20,000–£30,000 may be considered an effective use of resources if certain characteristics are satisfied. Judgements about the acceptability of the intervention as an effective use of resources will specifically take account of the following factors:
 - The degree of uncertainty around the ICER. Advisory bodies should be more cautious about recommending an intervention when they are less certain about the ICERs presented in the cost-effectiveness analysis.
 - The presence of strong reasons suggesting that the change in quality of life hasn't been adequately captured and may therefore misrepresent the health gain.
 - When the intervention is an innovation that adds demonstrable and distinct substantial benefits that may not have been adequately captured in the measurement of health gain.

ICERs above £30,000 require an increasingly stronger case with regard to the above factors if they are to be considered an effective use of resources. Decisions about whether to recommend interventions should also take into account the need to prevent discrimination, to promote equality and to consider the trade-off between efficient and equitable allocation of resources.

2.3.2 NICE cost impact for public health

NICE introduced the systematic assessment of cost impact for all types of guidance in 2005. All public health guidance has an accompanying costing tool – usually available at the point of publication, or very shortly afterwards. The objective of the costing tools is to assist financial planning (typically over a 3–5 year time horizon) for people implementing NICE guidance (NICE 2008b).

A very basic assessment of cost impact is undertaken very early on in the process when potential topics (which anyone can suggest) are being considered. NICE reviews each of the suggestions received to ensure they are appropriate and to check whether they are already included in its work. The suggestions are then filtered according to a checklist based on the Department of Health's selection criteria, with the DH having final say on which topics it requests NICE to produce guidance on. One of the topic selection criteria is cost impact. In the topic selection process more weight is given to topics that are potentially cost saving, or have significant cost implications, than those that are cost neutral or low cost. In the case of the latter, the rationale is that if something is likely to have a significant impact then it is important it is fully assessed by NICE. However, cost impact is only one criterion of the prioritisation process. The other criteria are: burden of disease (population affected, morbidity, mortality), policy importance (that is whether the topic falls within a government priority area), whether there is inappropriate variation in practice across the country, and factors affecting the timeliness or urgency for guidance to be produced. Topics that are subsequently referred to NICE by the DH will be developed by the appropriate committees and the costing team next get involved when draft recommendations are available. Draft costing tools are developed and are subject to a limited consultation involving guidance developers and a sample of potential users, and following a quality assurance process will be published on the NICE website in electronic format (not as a hard copy) when the guidance is published. Frequently information from the costing work is also noted in press releases or other material supporting the guidance launch.

The systematic assessment of cost impact was introduced to assist people implementing NICE guidance to estimate the costs and savings arising from

implementation. A financial management perspective is taken with costs or savings considered on an annual basis which is the period that most organisations' budgets cover. Although predictions also look at the 3–5 year time horizon regarding what can be achieved, rather than just the year following publication, it does not include longer-term costs or savings that may be considered in the cost-effectiveness models.

Cost impact assessment is undertaken by:

- Assessing the recommendations, interventions and other related areas in guidance and identifying areas most likely to have resource impact.
- For areas identified, investigating what the current baseline level of service/utilisation is. In addition to the costs to deliver services the potential savings arising from recommendations, such as cardiovascular events avoided are also estimated.
- Working with professionals to predict the optimum⁴ level of service/utilisation following implementation of the recommendations. This also includes predicting the impact on potential savings.
- Quantifying the resources required to move from current position to optimum position.

The output from consideration of cost impact is a costing tool(s) that is (are) produced for each published public health topic. The costing tools take a number of different forms:

1. **Costing report** – where there is an expectation that there will be cost impact that requires discussion a costing report will be produced (sometimes accompanied by a template). This will highlight the population

⁴ The level of service if people followed the recommendations – taking account of the fact that some recommendations may not be appropriate for every patient. For example medicine uptake might be 95% on the assumption that 5% would be contra-indicated.

affected, the potential increase/decrease in costs and any savings anticipated to arise from implementing the recommendations. Where data are available and assumptions have been made to quantify the costs and savings arising from implementing the recommendations then the source of data and assumptions will be noted in the report.

2. **Costing template** – where data are available and reasonable certainty about the response of services in implementing the recommendations then a costing template is produced that quantifies costs and savings. This is done at a national level for England, and the template also provides users with an opportunity to estimate local cost impact based on their population; changing assumptions to reflect local circumstances where appropriate.
3. **Business case** – some NICE public health guidance that is aimed at employers has had a business case tool produced that takes employers through the elements to consider regarding costs and savings from implementing recommendations. Different elements could include the number of employees in the organisation, average pay rates, rates of sickness and the potential improvements that could be achieved that, in some instances, have been shown to more than offset investment by the employer. In these circumstances it is not possible to estimate national cost impact for England because employers have more freedom to choose whether or not to implement the guidance.
4. **Costing statement** – where there is an expectation that cost impact of an individual recommendation will not be significant (defined as less than £1 million for England) a costing statement is produced that explains why cost impact is not considered significant. A costing statement may also be produced where there are little data on baseline level of service delivery. If it is not possible to predict the service's response to implementing the recommendations then a costing statement may be produced if there is insufficient material to discuss in a full costing report.

Quite often a costing template is produced that will enable people to consider their

local situation and quantify local costs and savings, where it has not been possible to quantify the national impact of guidance implementation.

For some topics (selected through a comprehensive review identifying guidance that has implications for commissioners of services) a **commissioning guide**, and accompanying benchmarking and commissioning tool has been produced.

Appendix B summarises the costing tools that have been produced for public health topics published up to February 2010.

2.4 *Limitations of current approaches to cost effectiveness and cost impact*

2.4.1 Cost-effectiveness analysis

The limitations of cost-utility analysis (CUA) and its application to public health are well documented (Drummond et al. 2007; Drummond et al 2008; Weatherby et al. 2009). Here we focus on the limitations of the current methodology in relation to the specific objectives outlined in stage one in section 1 above.

Individual versus population impact

Deciding which interventions to invest in to improve health requires consideration of the population. A criticism of the cost-utility analysis is that it is insufficient to address the efficiency of resource allocation, for which the specific opportunity cost of a decision is required, or to examine equity goals. According to Heller and colleagues (2006): 'Since ICERs are based on aggregate average individual treatment benefits, they lack a population perspective'.

Commissioners need to be able to compare alternative interventions in terms of the health gain for their population. They need to know the costs of the interventions and the potential savings. An ICER fails to provide a population perspective; that is to say, it fails to provide an indication of the scale of the problem that will be addressed by an intervention. In the absence of having an ICER for all possible interventions, a CUA and cost-effectiveness threshold simply provides an indication of whether an

intervention represents good value for money. A commissioner needs to know what impact an intervention will have on the disease burden in their local population, that is the number of people in the population that could be impacted by the intervention.

Health inequalities, equity and efficiency

The goal of many public health interventions is to reduce inequalities in health, so the distributional impact of interventions on vulnerable populations in terms of their reach and benefit is an important consideration. However, CUA is concerned with efficiency (that is, maximising health gain) rather than equity (that is, the distribution of health gain (equity)). These two objectives are not necessarily consistent so consideration needs to be given to how to handle the trade off between the two. The current approach, which assumes that the value of the QALY is the same regardless of who receives it, has been called into question (for example Dolan et al. 2005).

National and local priorities

The characteristics of a local population are one of a number of factors that might influence the decision over what to commission. National and local priorities and targets, health inequalities, pressures on current and future budgets are just a few of the other likely influencing factors.

Time horizon

Another important consideration is the time horizon over which costs and benefits are considered. For public health interventions in most cases a lifetime horizon is chosen. This is to ensure all important costs and effects have been captured. However, commissioning cycles entail a considerably shorter timeframe (1 to 3 years). Similarly the cost impact work which seeks to inform financial management typically focuses on a 3–5 year timeframe.

Discounting

Related to the above point is the use of discounting: the costs and benefits occurring at different times in the future are reduced to a 'present value' for comparison. In the NICE reference case, an annual discount rate of 3.5% is applied to both the costs and benefits. In practice this means that a year of life gained in 40 years time (due to an intervention delivered today) would be discounted by a factor of 76% compared

with a year gained tomorrow. This can lead to the prioritisation of immediate treatment at the expense of prevention and works against long-term public health interventions (Severens et al. 2004; Schwappach et al. 2007).

The above contrasts with the approach employed in commissioning where decisions are made on the basis of much shorter timeframes and do not usually entail discounting. Financial management methods will consider discounting when preparing information such as business cases to support decision making, but for day to day budgeting purposes all budgets are considered without reference to discounted net present value.

Wider benefits

The QALY, which measures the quality and quantity of life gained (that is, is restricted to health outcomes), can be a serious limitation when used to assess public health interventions which often have other non-health benefits as well as benefits to other individuals not directly targeted by the programme. For example, programmes to tackle alcohol misuse have been shown to reduce level of crime and smoke-free legislation aimed at protecting non-smokers has been shown to also have a positive impact on the numbers of smokers trying to quit smoking.

Perspective

The range of costs (and benefits) included in a particular economic evaluation depends on the perspective taken which could be that of the individual, health care provider, public sector, or society. This is important as the perspective taken can influence the results. For example, an intervention which cost more than treatment as usual when a community health service perspective was taken was found to be cost saving when a criminal justice perspective was taken (Byford et al., 2003, Drummond et al. 2008).

As the impact of public health interventions can be wide ranging and the costs and benefits can fall on different parts of the public sector, a public sector perspective is adopted. Where necessary, a societal perspective is taken so that wider economic effects impacting on patients, carers, other areas of public expenditure and the wider

economy can be formally incorporated. The principle is to ensure that all relevant costs are included regardless of who pays for them (Jonsson 2009).

It has been argued that a societal perspective is necessary for making optimal societal decisions (Drummond et al. 2008). Ignoring important costs and benefits in an economic evaluation may lead to an inefficient allocation of resources in the short- and long-term and a corresponding loss in the total welfare of society (Jonsson 2009; Byford and Raftery 1998). Indeed, the societal perspective is the standard approach for assessing health benefits from investments in other sectors of the economy (for example, Department for Transport) and cost-benefit analysis is a widely used technique for assessing the wider costs and benefits (Jonsson 2009).

However, the adoption of a societal perspective can, in practice, be difficult (Byford and Raftery 1998). For instance, it may not always be possible to include all relevant costs and benefits in an economic evaluation because of funding or time constraints. A good case can be made for excluding particular effects if they are likely to have little impact on the overall results (Byford and Raftery 1998). Brouwer et al. (2006) argue that not all costs have to be considered equally important for healthcare decision making. They suggest it may be useful to adopt a two perspective approach as standard, one presenting a strict health care per perspective and the other a societal perspective. An alternative is to adopt a multi-sector perspective in which an intervention should be recommended if the benefits are greater than the costs from the perspective of all stakeholders necessary to deliver the intervention (Claxton 2007).

Threshold

The threshold used by NICE, and adopted by the NHS, for judging cost effectiveness is around at £20k–£30k per QALY. However, such thresholds do not exist outside the health sector making it difficult to judge whether benefits accruing to the non-health sector are cost effective (for example reduced levels of civil disobedience resulting from reduced alcohol consumption; value of increased educational attainment).

Comparator

The NICE public health reference case specifies that comparators should be interventions routinely used in the public sector, including those regarded as best practice. However there will often be more than one relevant comparator because routine practice may vary between locations and because best alternative practice may differ from routine practice. In addition, it is often the case that evidence concerning current routine or best practice is lacking. This issue is crucial as the same intervention may appear to be dominant (cost saving) or dominated (less effective and more costly) depending on the comparator.

2.4.2 Cost impact

There is some overlap with the limitations in the approach to cost effectiveness and those relating to cost impact. However, specifically considering limitations relating to cost impact it has not been possible to quantify the national cost impact for all guidance topics. This is due to a number of factors, including:

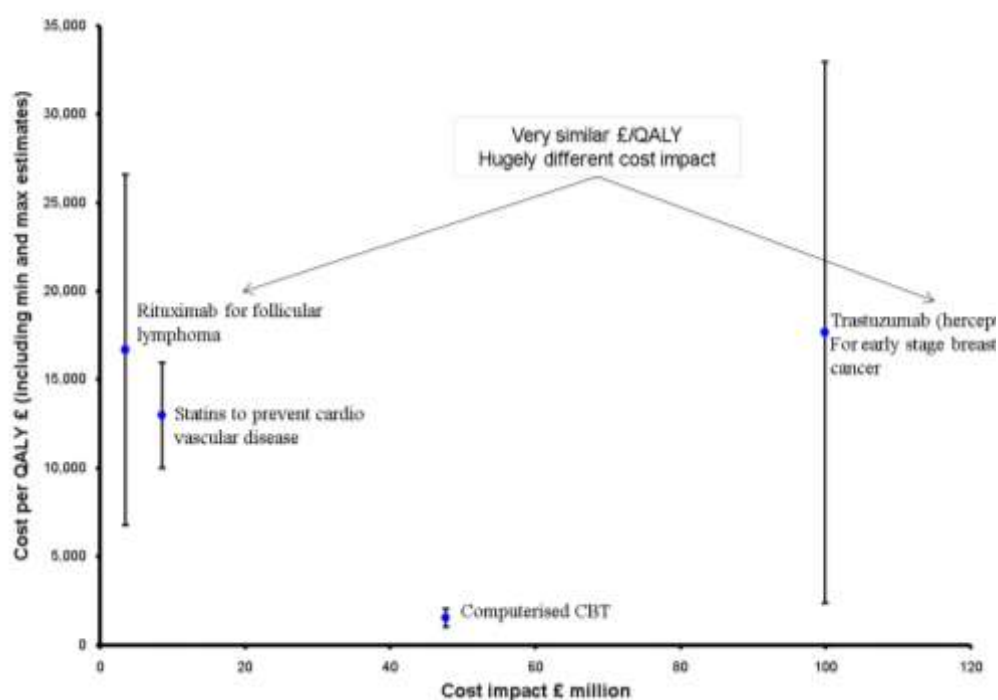
- Lack of data to establish what activity is currently taking place and current level of compliance with recommended practice.
- Uncertainty regarding the population affected by the guidance – particularly overlapping populations where someone may fall into two or more target groups – for example, people who are at risk of sexually transmitted infections include men who have sex with men and people who are drug users – these are not mutually exclusive groups.
- Lack of clarity/consensus to be able to forecast how services and activity levels may change following implementation of the guidance, particularly for guidance that is underpinning principles that may apply in a wide variety of settings or situations such as behaviour change or community engagement. Sometimes this is due to different ways in which local services may chose to implement recommendations.
- More detail on what the specific facilitating factors are for each intervention. For example what constitutes ‘training’ for each type of intervention if the recommendation states it should be delivered by a

trained professional? What is adequate service provision? For example, should the intervention be implemented in 100% of the target group? The resources required to reach 80% and those required to reach the last few hard-to-reach within a target group could differ substantially, and this may have implications for reducing inequalities (the Pareto effect: 80% of effects stem from 20% of causes).

- Uncertainty regarding the consequences of implementation. There are reasonable estimates of the cost impact of smoking-related diseases, but when considering the potential diseases avoided, what they will be, what level of avoidance, and when would they have occurred are difficult to predict.
- Being able to establish what are real additional costs rather than additional activity that might be absorbed through redirecting activities within current resources. Similarly when activity is prevented it is necessary to understand what are real cash savings. Real cash savings occur when there is a reduction in expenditure, this is different to a reduction in demand for healthcare services where for example staff time maybe free up to spend more time with patients or focus on other activities. Over time, a number of reductions in activity may reach a critical mass and mean that staffing levels can be reduced or whole buildings or services are no longer necessary, at which point expenditure could be reduced and real cash releasing savings made.
- Issues also arise where costs and benefits fall across different sectors, for example, investment in schools to promote mental wellbeing is likely to result in benefits for the health sector and potentially future employers if it avoids mental illness. An alternative example is guidance aimed at local authorities with the objective of increasing rates of physical activity – it could deliver savings for the health sector if obesity rates are reduced, or for the workplace if it reduces time off work for musculoskeletal problems.
- The acceptability of the proposals to the target groups as well as those delivering it is important, as evidenced by the increasing use of social marketing to design effective programmes.

A question that is often levelled at guidance producers is why cost impact is not explicitly considered when guidance is developed. Figure 4 illustrates that when mapping cost impact on an x-axis against cost effectiveness (£/QALY) on a y-axis interventions with similar cost effectiveness can have vastly different cost impact. In this instance the difference in cost impact is driven by the size of the patient population. It would be inequitable to not recommend the high cost impact intervention if it is equally cost effective.

Figure 4: Comparison of cost impact and cost per QALY



2.5 *Other related work*

2.5.1 Yorkshire and Humber PHO

Yorkshire and Humber Public Health Observatory is leading the development of a DH commissioned project which aims to provide a programme budgeting factsheet for every PCT in England, and to develop and maintain a health outcome and expenditure comparison tool. The tool will enable PCTs to analyse spending and outcomes across all programme budgeting categories on one chart. PCTs can then ascertain on which programmes their expenditure and/or outcomes are different from the England average.

By undertaking pilots in Hull, Norwich and Newcastle they are also investigating the practical application to the NHS of programme budgeting and marginal analysis (PBMA). In addition they are working with several PCTs to explore a framework to investigate disinvestment scenario planning.

They also produce, with input from regional and local DH and NHS colleagues, QIPP resource packs which enable organisations in their region to understand some of the challenges and opportunities presented by the QIPP agenda. Each pack includes a better-for-less example (local schemes that have potential to develop better quality at lower cost), a hot topic designed to offer insight/raise questions about variation in performance and QIPP metrics.

Yorkshire and the Humber PHO has also contributed to work being carried out by the DH to map out a timeline for obesity within Yorkshire and the Humber. The timeline tries to identify when an intervention can make the greatest clinical and cost difference.

2.5.2 London PHO inequalities tool

To support Primary Care Trusts and local authorities, the Association of Public Health Observatories and Department of Health have developed the Health inequalities intervention toolkit. This is designed to assist evidence-based local service planning and commissioning, including Joint Strategic Needs Assessments.

The toolkit contains tools to support planning to achieve both objectives within the national health inequalities target. Currently there are separate tools for Spearhead areas only, and one for all local authorities in England. Besides supporting planning to help meet the national health inequalities target, the tools can also be used to help meet targets set within Local Area Agreements, or as national priorities within the 2010 Operating Framework, particularly the Vital signs and LAA national indicator set indicator for reducing all-age all-cause mortality⁵.

The tool for Spearhead areas has been updated and is available as a web-based application within the intervention toolkit. The tool presents gaps in life expectancy between each Spearhead area and England as a whole, based on data for 2006–08. To support commissioning decisions the Spearhead tool has been revised to allow users to model the impact that systematically implementing evidence-based interventions, to scale, can have on reducing inequalities in life expectancy and all-age all-cause mortality between each Spearhead area and England.

2.5.3 Local government improvement and development ‘Business case for health’

Local government improvement and development supports improvement and innovation in local government. It is currently undertaking a project to improve local government’s capacity to calculate, capture and apply the business benefits of health improvement activity. There are five main outcomes of the work:

- Raise awareness of the business benefits with a focus on efficiency gains
- Identify potential savings and how these can be measured
- Support local authorities to produce their own business cases
- Support local authorities to measure and evaluate the financial impact of health improvement activities
- Determine notable practice.

⁵ The toolkit is available at:
www.lho.org.uk/LHO_Topics/Analytic_Tools/HealthInequalitiesInterventionToolkit.aspx

They are currently undertaking a series of pilot projects in five sites across the UK. These pilot programmes are due to complete in Spring 2011 and they are proposing to publish and launch by Autumn 2011.

2.5.4 National Social Marketing Centre

The National Social Marketing Centre (NSMC), in consultation with NICE and others, has been asked to develop guidance on how to estimate the cost and benefits of a social marketing project and provide an online VfM tool that practitioners and commissioners can access and use. The work is due to be completed in early 2011.

3 Methods

The feasibility of the stage one objectives (see section 1.2) was explored through the following:

- workshops with commissioners and decision makers in the NHS
- workshop with local authority officers and members
- analysis of published NICE public health guidance published to date
- commissioned work via Matrix Evidence Ltd
 - review of existing methods and tools
 - ROI calculations
 - interviews with commissioners and decision-makers.

3.1 *Workshops with commissioners and decision makers in the NHS*

In May and July 2010, NICE organised workshops in Cambridge and Manchester with senior commissioners and budget holders with an interest in public health, working in the NHS at local and regional level.

3.1.1 Purpose of the workshops

The workshops aimed to ensure that any tools developed by NICE would help commissioners and budget-holders when making commissioning decisions in public health. The objectives were to:

- gain a better understanding of current local decision making and commissioning processes (including the sorts of tools and data used or required)
- update participants on progress of the NICE cost impact project
- overview the current methods used by NICE to assess:
 - cost effectiveness
 - cost impact of public health guidance.

The first and main objective was met through small group work with delegates attending the workshop. In addition, those attending the Manchester workshop completed an exercise which involved ranking from most to least useful, 14 different criteria that could be used to help inform commissioning decisions. The last two objectives were covered in the workshops through presentations given by the NICE team.

3.2 *Workshop with local authority officers and members*

In August 2010, NICE and the Healthy Communities programme in Local Government Improvement and Development jointly organised a ‘Business case for health’ workshop in London with representatives from local government (including chief executives and councillors), the Audit Commission, and directors of public health.

3.2.1 Purpose of the workshop

For NICE, the workshops aimed to ensure that any tools developed by NICE would be relevant to the needs of decision-makers in local government. The objectives were to:

- gain a better understanding of the context and priorities for current local government decision-making on health and wellbeing (including the sorts of tools and data used or required)
- update participants on progress of the Local Government Improvement and Development of Business Case for Health project
- update participants on the NICE cost impact project
- establish common objectives and potential areas for collaboration between Local Government Improvement and Development and NICE
- overview the current methods used by NICE to assess:
 - cost effectiveness
 - cost impact of public health guidance.

The first and main objective was met through small group work with delegates attending the workshop. Discussion on this main objective also touched on how local authorities may respond to their increased responsibilities arising from proposed changes as discussed in section 2.2. The remaining three objectives were covered in the workshops through presentations and discussion.

3.3 *Analysis of public health guidance*

Before describing the approach that was taken to the analysis of NICE public health, section 3.3.1 below gives an overview of the main structure and content of the guidance.

3.3.1 Overview of public health guidance

Guidance document

The full guidance document is split into several sections, each of which provides the reader with different pieces of information. The first section details the recommendations of the committee (the structure of which is explained below). The second section, Public health need and practice, outlines the rationale for producing guidance in this area. It will frequently provide information on the current epidemiology of the condition and the associated costs to the NHS and/or society as a whole. The Considerations section gives the reader an insight as to what issues the committee considered when developing the recommendations. This is followed by sections that address implementation, recommendations for research, details on related pieces of guidance and appendices, one of which provides the evidence statements from which the recommendations were derived.

Recommendations

Typically the recommendations made within pieces of public health guidance all have the same structure. Until recently the recommendation would first ask the question “Who is the target group population?” This would either be the population targeted by the intervention, or a professional who would ultimately intervene and deliver the intervention. However, more recently this has been altered to “Whose health will benefit?” The next part of the recommendation asks “Who should take action?” This tends to be either the practitioner working on the front line (that is,

those responsible for delivering the intervention) or a commissioner of the service (intervention). Finally the recommendation will state the action(s) that should be undertaken.

3.3.2 Approach to analysis

In order to achieve the objectives set out in the project plan, an analysis of the format and content of the recommendations in currently published public health guidance was undertaken. This would allow a determination as to what, if any, changes would be necessary to meet those objectives.

In order to review each of the 26 published pieces of public health guidance each recommendation was analysed and the information summarised within the following categories:

- The number of actions and sub actions within each recommendation – how many elements were contained within each recommendation?
- The sector that was asked to intervene – was the recommendation targeted at the NHS, GPs and/or local authorities?
- The elements within each recommendation – was the recommendation asking practitioners to identify, intervene or ensure adequate service provision?
- The intervention type – which types of interventions were being recommended? (For example, brief advice, pharmacotherapy, motivational interviewing.)
- Framework – what was the broad framework of the recommendation? (that is, was it about ‘informing and supporting’, ‘provision of effective services’ or ‘healthy environments’?)
- Life course stage – who was the target population to benefit and at what stage of their life course were we asking for action to be taken? (for example children in school, adults in employment.)

3.4 *Matrix commission to inform methodological development*⁶

To inform the methods employed by NICE to assess the return on investment (ROI) generated by public health interventions and provide outputs more useful to decision makers, Matrix Evidence was commissioned to undertake a project with the following three objectives:

- To identify and assess ROI methods employed within the existing literature.
- To test whether different ROI approaches generate different decisions.
- To assess which ROI approaches decision-makers find most useful.

3.4.1 Method for identifying and reviewing existing ROI methods

Search strategy

Examples of ROI methods applied to public health interventions were identified using a search strategy that comprised three elements: a review of relevant databases; a review of relevant websites; and contacting experts and stakeholders.

Review of databases: The project was run to a tight schedule (two weeks) which meant the search strategy had to be as precise as possible while at the same time targeting a broad proportion of the literature to inform the final research. The list of resources chosen, while short, was picked by Matrix on the basis it offered an optimum (forensic) approach to searching with regard to the project and in view of the time frame. The database search strategy can be found in appendix 2 of the Matrix report. Examples of the terms used to identify ROI methods are given below:

Cost-Benefit Analysis/
"cost savings"/ or (cost saving? or cost avoidance or cost impact or cost offset or long term cost\$ or short term cost\$ or Cost effectiveness ratio or Incremental cost effectiveness ratio or Net present value or Net benefit or net saving or net return or Benefit-cost ratio or break even or Break even threshold or break even point or averted cost\$ or ROI or return adj1 investment or (return and (investment))).mp.

⁶ Much of the text in this section is extracted directly from the Matrix report, available in the background information section accompanying this report. Please see the [Developing NICE public health guidance section](#) of the NICE website for details.

"Costs and Cost Analysis"/ec, mt, sn, td [Economics, Methods, Statistics & Numerical Data, Trends]

*Health Care Costs/

*Health Promotion / ec [Economics]

Models, Theoretical or Models, Economic

The results of the searches were exported to a bibliographic management tool. Minor changes were made to the strategy between databases to reflect changes of the internal thesaurus across our resource portfolio.

Significant duplication between the resources was anticipated and a de-duplication exercise was undertaken. Table 2 lists the searched databases and the number of resulting hits.

Table 2 Databases searched and number of hits (source: Matrix 2011)

Database	Number of hits
Medline	1120
Embase	579
HMIC	14
NHS EED	270
Econlit	44

Review of websites: A list of websites searched is presented in appendix 1 of the Matrix report. In total 51 web resources were identified.

Contacting experts and stakeholder: 40 experts were contacted via email to enquire about relevant methodologies (the list of experts contacted is available in appendix 4 of the Matrix report). Either through the recommendations of the experts, or through resources already available at Matrix, another 15 relevant sources were identified.

The results of the searches are shown in table 3.

Table 3 Results of searches (source: Matrix 2011)

Databases	Web	Other
2027 relevant sources identified	51 relevant sources identified	15 relevant sources identified
1727 remained after removal of duplicates	28 articles prioritised	6 sources prioritised for review
117 remained after screening of abstracts	Data extracted from 28 sources	Data extracted from 6 sources
75 articles prioritised		
Data extracted from 65 articles		

Data extraction

An Excel worksheet was created to standardise the process of extracting data from the studies/tools identified in the search. Separate extraction worksheets were designed for cost-savings publication and ROI publications. If publication was relevant to both categories, it was entered in both worksheets.

Data was extracted according to the following categories:

- authors
- year of publication
- relevance: cost, ROI, both
- document type: study, tool, guidance, discussion/review
- sector: public health, health-other, other
- location (country)
- description: a description of the methods employed
- readiness for use: is this approach currently in use?
- usefulness: is the output relevant to decision makers?

- methods: what is the quality of estimates produced?
- stakeholder involvement: are stakeholders involved in the analysis?
- level of assessment – geography (PCT, SHA, national etc)?
- level of assessment – subgroups
- contents/perspective
- feasibility: data, analytical, software requirements?
- uncertainty: is uncertainty quantified?
- accessibility: is the approach easy to use? Is it accessible for decision makers?

The results of the data extraction exercise are presented in the supplementary Excel file (which can be found in the Matrix report).

3.4.2 ROI and other calculations on selected topics: do different approaches produce different decisions?

The aforementioned review identified a number of economic metrics; different perspectives as well as a range of criteria often included in MCDA such as inequality effects and affordability. In this phase of the project these metrics and criteria were applied to a number of public health interventions to assess whether they would produce different decisions. The rationale for testing different ROI methods was to determine whether the debate about the importance of different metrics (which metrics decision makers would want to be provided with) would be likely to make a difference to decisions. That is, a case could be made for moving to a NPV based approach, but this may be an academic debate if it ranked interventions exactly the same way as the £/QALY.

Method

Eleven interventions were included in the analysis, each was agreed with NICE and selected on the basis of the following criteria:

- interventions addressing important public health problems (alcohol misuse, smoking, obesity, physical activity, and mental health)
- interventions with different target populations, cost per QALY gained, and benefits profiles. Smoking and alcohol interventions are characterised by long-run healthcare impacts while the effects of mental health interventions are observed in the short term
- interventions for which data were readily available. The need to construct eleven models in a short space of time meant that seven interventions were chosen which were included in the HELP tool (Matrix, 2009) and five interventions were selected from reports recommended by NICE.

Existing models were developed to estimate the different parameters required to construct the economic metrics and other criteria summarised in table 3 below (22 in total). The 11 interventions modelled were:

- nicotine replacement therapy to reduce smoking
- assessment and support of caregivers for preventing depression in caregivers
- school-based group education to reduce population levels of obesity
- brief interventions delivered in GP surgeries to reduce problem drinking
- brief GP opportunistic advice to smokers
- 30 minute counselling and information leaflet provided to smokers by pharmacist
- mass media anti-smoking campaign for the disadvantaged
- alcohol screening and a brief intervention at A&E department

- alcohol screening and a brief intervention when patient registers with new GP practice
- detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers
- brief interventions delivered in GP surgeries to improve uptake of physical activity (presented separately).

Limitations in the evidence base for the short-run healthcare cost savings associated with physical activity (the healthcare cost savings generated within 5 years of the intervention as a result of improvements in physical activity levels) meant that the results for the brief intervention to increase physical activity were included in the analysis only to be compared to the remaining interventions when all interventions were stripped of short-run healthcare cost-savings. Results including the physical activity intervention are presented in appendix C and are compared to 8 of the interventions listed above. Two mental health interventions were removed from this comparison due to the absence of long-run effects.

All 11 models followed a similar structure: the short-term behavioural effects of the intervention, for example increased probability of quitting smoking, were modelled into change in the likelihood of experiencing different health problems in the short- and long-term. These were then translated into the following outcomes:

- Long-run health gains:
 1. health care cost savings
 2. QALYs gained
 3. productivity gains
 4. life years saved, and
 5. deaths avoided
- Short-run health gains:

1. productivity gains, and
2. health care cost savings.

However, not all of the outcomes were produced for all 11 interventions due to data availability (absence of short-term costs for the physical activity intervention) and the nature of intervention itself (for example, mental health interventions did not produce long-run outcomes and the obesity intervention did not produce short-term productivity outcomes).

Table 4 summarises the metrics and other criteria tested. These were designed to include a range of different economic metrics, different perspectives (including non-health outcomes: productivity gains), as well as a range of criteria often included in MCDA, such as inequality effects and affordability.

Unless stated otherwise the costs and benefits included in the metrics are estimated over the lifetime of the recipient of the intervention and are discounted using a rate of 3.5%.

Table 4 Metrics/criteria tested

Metrics	Description
NPV (including health care cost saving)	The sum of health care cost savings per recipient less implementation cost per recipient. A positive value indicates that the value of the benefits exceeds the intervention costs.
NPV (including health care cost saving and health gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained) per recipient less implementation cost per recipient. A positive value indicates that the value of the benefits exceeds the intervention costs.

NPV (including health care cost saving, health gain and SR productivity gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained) per recipient, plus productivity gain for years 1–5 per recipient, less implementation cost per recipient. A positive value indicates that the value of the benefits exceeds the intervention costs.
NPV (including health care cost saving, health gain and productivity gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained) per recipient, plus lifetime's productivity gain per recipient, less implementation cost per recipient. A positive value indicates that the value of the benefits exceeds the intervention costs.
Net benefit as a proportion of investment	NPV (including health care cost saving, see above) divided by the cost of the intervention.
B:C ratios (including health care cost saving)	The sum of health care cost savings divided by the cost of the intervention. A value greater than 1 indicates that the benefits of the intervention exceed its costs.
B:C ratios (including health care cost saving and health gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained), divided by the cost of the intervention. A value greater than 1 indicates that the benefits of the intervention exceed its costs.
B:C ratios (including health care cost saving, health gain and SR productivity gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained), plus productivity gain for years 1–5, divided by the cost of the intervention. A value greater than 1 indicates that the benefits of the intervention exceed its costs.
B:C ratios (including health care cost saving, health gain and productivity gain)	The sum of health care cost savings and value of health gains (monetary value of QALY multiplied by the number of QALYs gained), plus lifetime's productivity gain, divided by the cost of the intervention. A value greater than 1 indicates that the benefits of the intervention exceed its costs.
Cost per QALY gained	Intervention cost minus health care cost savings divided by the number of QALYs gained. A negative number indicates that the health care cost savings are greater than the original cost of the intervention.

Cost per death avoided	Intervention cost minus health care cost savings divided by the number of deaths avoided. A negative number indicates that the health care cost savings are greater than the original cost of the intervention.
Cost per LY saved	Intervention cost minus health care cost savings divided by the number of life years saved. A negative number indicates that the health care cost savings are greater than the original cost of the intervention.
Short run productivity gain	Productivity gains per recipient for the first 5 years following the intervention.
Lifetime productivity gain	Productivity gains per recipient for the lifetime of the intervention recipient.
Reach	Percentage of population affected by the condition and that could potentially benefit from the intervention.
Preventable burden of disease (QALYs)	The product of number of QALYs gained per person and the population reached by the intervention (the population reached is the proportion of the UK population affected by the condition). This provides an indication of the scale of the health problem that can be resolved by the intervention.
Inequality score	Ratio of the percentage of disadvantaged population to the percentage of the general population that could potentially benefit from the intervention. A value greater than 1 indicates that the intervention will benefit a larger proportion of the disadvantaged population than the population as a whole.
HELP affordability score	A comparative scale of total cost for the intervention. At national level, these equate to 1 = over £1bn, 2 = between £100m and £1bn, 3 = less than £100m.
Net cost saving, 1 year	Net health care cost savings per recipient for year 1 (health care cost savings in the first year minus the cost of the intervention).
Net cost saving, 3 years	Net health care cost savings per recipient for years 1–3 (health care cost savings in the first 3 years minus the cost of the intervention).

Net cost saving, 5 years	Net health care cost savings per recipient for years 1–5 (health care cost savings in the first 5 years minus the cost of the intervention).
First year health saving as proportion of incremental cost	Health care cost savings for year 1 divided by the cost of the intervention. A value of less than 1 indicates that the cost of the intervention exceeds the health cost savings in the first year following the intervention.

The perspective adopted by the metrics is primarily a health care perspective (either health costs, health costs savings, health gain, or different combinations of these). The exception to this rule is the inclusion of productivity gains in some metrics.

Full details of the specific models constructed for each intervention can be found in appendices 7–11 of the Matrix report⁷. The intervention models vary from the generic model described in figure 2 (see page 30 of the Matrix report) in the following ways:

- The smoking and alcohol models include all 22 of the metrics and criteria listed above
- The depression model includes only short run outcome on:
 1. health care cost savings
 2. QALYs gained, and
 3. productivity gains.
- The obesity model includes all the long run outcomes; however, no short-run productivity is included as the intervention is designed for children.
- The physical activity model includes the long-run outcomes on all metrics but excludes short-run cost savings.

⁷ The Matrix report is available in the background information section accompanying this report. Please see the [Developing NICE public health guidance section](#) of the NICE website for details.

Many of the parameters required to construct the models of long-term health outcomes were sourced from the HELP tool. Data to estimate short-term productivity and health care cost-savings calculations were sourced through a supplementary literature search, including the following sources:

- The studies identified in the aforementioned review of ROI methods.
- Studies identified by Drummond's (2007) review of economic evaluations of public health interventions.
- A review of research published on the NICE website.

Table 5 summarises the number of potentially relevant articles identified from the above sources for each intervention outcome. Full copies of the UK studies were retrieved and evaluated. If these provided relevant, good-quality evidence on the short-term cost savings and productivity gains associated with the outcomes, the data were then used in the analysis. If not, the international studies were reviewed. If international studies were used, resource use data was collected from the study but UK prices were used to cost the resource use. All prices in this modelling project were converted to 2009 GBP.

Table 5 Studies reviewed for short-term cost savings and productivity gains
(source:Matrix 2011)

Intervention	UK	International	Total
Smoking	7	16	23
Alcohol	1	0	1
Depression	7	9	16
Obesity	0	5	5
Physical activity	2	5	7
Total	17	35	52

All the sources identified to extract data to calculate the short term outcomes can be found in appendix 12 of the Matrix report. However, most publications either did not provide relevant data or had suboptimal quality or a non-transparent methodology and had to be ignored. Thus, only articles described in appendix 12 of the Matrix report were used to extract data for short-run calculations.

Standard discount rate of 3.5% was applied to all costs and benefits incurred more than 1 year after the intervention, including QALYs gained, cost saved, deaths avoided, life years saved, and productivity gains.

3.4.3 Interviews with key informants (Matrix)

To determine which return on investment (ROI) approaches decision-makers find most useful, interviews were undertaken with 19 senior decision-makers (out of the 44 individuals asked to participate). The decision-makers came from a range of professions, including: public health directors, PCT directors, general practitioners, and local authority representatives. The interviews were conducted by phone and took between 30 minutes and 1 hour.

Interviewees were presented with 12 different scenarios describing the ROI of a public health intervention compared with usual care. A summary of the scenarios is provided in table 6; full details can be found in appendix 14 of the Matrix report.

Table 6 Scenarios assessed through stakeholder engagement (source: Matrix 2011)

Scenario	Metrics
1	Cost per QALY gained
2	Net benefit
3	Total cost of implementation Life years saved Cost per life year saved

4	Cost per QALY Preventable burden of disease (QALYs)
5	Net cost savings
6	Total cost of implementation Deaths avoided Cost per death avoided
7	Cumulative net cost savings per person (graph)
8	Cost Weighted benefit score Ratio of cost to benefit
9	Net cost savings per person Productivity gains per person
10	Years to break even
11	Cost per QALY Proportion of population eligible Proportion of recipients who are disadvantaged
12	Benefit score Cost per person (graph)

Each scenario presented the same intervention using a different set of ROI metrics, thus isolating the effect of metrics on decisions. The metrics included in the interviews were constructed to represent the alternative ROI approaches identified in the review of existing methods. Interviewees were asked the following questions:

- would they invest in the intervention?
- how useful is the information provided? and

- what other information would help them assess the intervention?

Following the exercise above, interviewees were asked to rank in order of usefulness 14 different criteria that could be used to decide whether or not to invest in an intervention: a rank of 1 = most useful through to rank 14 = least useful. The 14 criteria were:

- cost of intervention
- effectiveness
- cost-effectiveness score
- population eligible
- impact on health inequalities
- burden of disease
- cost saving in less than 5 years
- cost saving after 5 years
- acceptability
- affordability
- feasibility
- quality of evidence
- certainty.

3.5 *Reference group*

A reference group was established to provide expert advice, guidance and comment on matters related to the project (see Appendix A for membership list). The main tasks are outlined below:

- To provide technical expertise in the areas of: health economics; costing; commissioning; epidemiology; data sources; public health practice; local authority perspective.
- To identify and provide links with related projects and organisations, avoid duplication and explore collaborative working.
- To comment on draft methods, documents and tools produced by the project.

A teleconference was held to provide an initial briefing about the project for prospective reference group members.

Directly after the conference call, and the membership of the group had been finalised, members were sent a draft of the report Identification and assessment of methodologies for measuring the cost savings and return on investment generated by public health interventions, for comment. Members were also invited to a half-day workshop to discuss and provide feedback on the report.

In addition, several members of NICE's Public Health Interventions Advisory Committee (PHIAC) expressed an interest in the project and provided helpful comments on the Matrix report.

4 Findings

This section presents the findings of the workshops and analysis of public health guidelines undertaken by the NICE project team and the analyses undertaken by Matrix which covered a review of existing economic methods and tools, calculation and ranking of ROI metrics for a selection of public health interventions and interviews with key informants.

4.1 *Workshops with commissioners and decision makers*

The overall purpose of the workshops was to gain a better understanding of the current local decision-making and commissioning processes (including the sorts of

tools and data used or required). This knowledge was critical to ensure that any tools developed were capable of answering the key questions commissioners of public health (wherever they sit in the future) ask when making priority decisions in public health.

The following key questions were asked:

- Who is involved in making the decisions?
- What data sources do you currently need in order to make an informed decision?
- Are there any existing decision-making tools that you use already?
- What are the difficulties in making decisions related to this scenario?
- What sorts of things convince commissioners to invest in public health over other topics?
- What sorts of arguments would we need to make in order to convince decision makers to invest in the very short-(less than 1 year), short- (1 to 3 years), medium- (4 to 10 years) and long-term (over 10 years)? Are these the sorts of timescales you use?

4.1.1 Group work – scenarios

As noted earlier, part of the workshops took place in small groups and used scenarios as a way of facilitating discussions around the context, opportunities and barriers for local decision-making processes to prioritise public health interventions. By sharing their experiences, participants were expected to raise issues that NICE needs to take into account when developing tools to assist local decision-making.

The scenarios were:

	Scenario
A	£Xm ⁸ ring-fenced budget for (for example, alcohol, smoking, obesity, physical activity) – how would you decide how best to

⁸ For Cambridge, the amount was £1m in each scenario and feedback was that this was too low, so it was changed to £10m for the Manchester workshop.

	spend? (that is, which interventions). If ring-fenced budgets don't exist please just take as money available.
B	£Xm ring-fenced budget for public health – how would you decide how best to spend? (that is, which topics and interventions?) If ring-fenced budgets don't exist please just take as money available.
C	£Xm saving ⁹ (the group needs to make explicit their definition of a saving) to be found across health (clinical and public health) – how would you approach this?
D	£Xm saving (ditto scenario C definition of saving) to be found across public health – how would you approach this?
E	Making the business case for public health interventions – what do you need to know? What should be included as part of the case?

A number of questions were used as prompts by the facilitators. The feedback from each group has been organised under these and other key themes:

People involved in making the decisions

A range of people can be involved in helping to assess need, prioritise and make decisions about which health issues and interventions to invest in.

It can include public health practitioners, clinicians, finance, local government and other partners within the local health economy. It is important that both commissioners and providers are involved in the process.

It can also mean consulting with the public, but being careful that issues do not become overly political.

In terms of decision-making, in some cases it might come down to one person (for example director of public health). In other cases, decisions are made by the full executive management team, in cooperation with those who are proposing (and making the business case for) the potential projects.

⁹ Cost savings were sometimes categorised by the participants as cash releasing; cost avoidance; efficiency/productivity and/or added value.

Data and sources used or needed to make an informed decision

The Joint Strategic Needs Assessment (JSNA) is usually the starting point to identify local priorities and needs of different population groups. Localities need flexibility to commission according to local intelligence about needs.

The data and sources cited include:

- NHS Evidence
- NICE guidance
 - public health guidance
 - other (general, clinical)
- PHO (Public Health Observatory)
- SHA targets
- Cochrane reviews
- York health economic data
- Stakeholder consultations
- Service activity data (health and social care)
- Financial data
- Prevalence data
- Health needs assessment (including JSNA)
- Project evaluations.

Existing decision making tools and processes

Some people use prioritisation tools to aid decision-making, however these do not make the decision for you. Examples of some of these can be found in a review of prioritisation tools and frameworks undertaken by Yorkshire and Humber Public Health Observatory (available at www.yhpho.org.uk/resource/item.aspx?RID=69847).

Some of the tools mentioned in our workshops were:

- NICE costing tools
- PHO work
- EPACT (prescribing) analysis
- local government reviews.

A typical decision-making process might be:

- review of all public health programmes with specific reference to what works (what is the evidence base behind the investment decision)
- link this to the population needs assessment
- match what works with population needs, and then
- disinvest in what is least cost effective and not a major local health problem.

Most people cited the world-class commissioning criteria. Some referred to decision-making tools such as MCDA, possibly using a decisions conferencing approach where all stakeholders are involved in determining the costs and benefits and rank interventions according to locally determined criteria. This needs to engage a wide range of stakeholders. Some PCTs use a clinical priorities forum involving clinical staff (GPs and secondary care clinicians) and use clinical priorities policies to rank interventions.

Other approaches included using prioritisation templates, where you take how much money you have and then you spend as you go through your priorities.

Difficulties in making decisions

Some of the difficulties cited were:

- political – visible, challenging
- disinvesting

- information on what to disinvest in would be very useful
 - for each intervention NICE recommends, it should identify others that could be replaced. Otherwise both will continue to be used/funded
 - avoiding expenditure on interventions with no evidence base
- reducing duplication
- increasing productivity
- robust evidence-based outcomes and commissioning
- social value judgements have to be made
- strength/validity of the data not certain
- realising real savings
 - need will always outstrip supply
 - saved beds from one person/condition will be filled by someone else
 - either cut programmes, cut staff costs or use cheaper interventions
 - acute sector savings are falls, vaccination, alcohol, smoking, drugs
- organisations want quick savings but public health benefits may take 10 years
- difficult to assess impact on other sectors (education, housing and so on)
 - critical when involving local authority in discussion about priorities in public health.

Convincing commissioners and decision-makers to invest in public health over other topics: in the very short- (less than 1 year), short- (1 to 3 years), medium- (4 to 10) and long-term (over 10 years)?

Commissioners need to be able to cite concrete outcome measures that are easy to understand, for instance 100 myocardial infarctions (MIs) avoided and 1500 admissions avoided.

There was some diversity in the use of timescales, with trusts facing large deficits operating on 1-year timescales at best, and others looking forward (though not comfortably) up to 5 years. There is a need to show when and where the benefits fall – from a return on investment perspective, it needs to be less than 5 years (although there is often the need to invest for at least 3 years to reap the benefits). Most agreed that early returns on investment and quick wins (less than 1 year) are crucial.

Some of the criteria have already been reported above. Others cited were:

- local intelligence about needs
- evidence-based services and interventions
- cost implications in terms of capital and revenue
- health outcomes
 - in terms of health gain
 - impact on health services
 - ideally quantified in terms of cash
- impact on health inequalities
- value for money
- cost effectiveness
 - in a language that can be understood by lay audience
 - QALYs not useful, prefer first year rates of return, 1–3/5 year costs/savings (hepatitis C example)
- affordability – the cost per QALY does not reflect affordability – knowing cost or saving for x number of people in every 100,000 would be helpful
- healthy life expectancy and cost effectiveness of primary prevention versus secondary/tertiary prevention
- national targets and priorities

- sustainability of interventions (some, like health education for diabetic patients, help only the cohort trained; others, like paths for walking or cycling may produce ongoing benefits).

Local authorities

Several participants mentioned the importance of the local authority audience for NICE and current guidance is not in the language/format local authorities can relate to. Unfortunately, the impacts of public health interventions beyond the NHS are often not well understood or articulated. A better appreciation of potential conflicts, synergies, overlaps and gaps would be helpful. They suggested that NICE looks at big spends for local authorities and produces guidance in these areas.

Cross sector/joint commissioning/pooled budgets

In future, it may be more common to consider non-NHS budgets, including local authority (for example, spend on leisure) and the wider local economy.

The White Paper on the NHS, [Equity and excellence: liberating the NHS](#) (Department of Health, 2010b), was released in time for the Manchester workshop and referred to ring-fenced budgets for public health. Some participants felt that although ring-fencing may encourage longer-term outcomes, this will depend on what is included within 'public health'. For example, the provision of statins may be preferred over other interventions because it has a more immediate impact.

Importantly, when asked about the potential to achieve cost savings, participants in the workshops shared similar views. In Manchester, workshop participants commented that cost savings could only be realised by cutting back on services, for example, by closing a hospital or shifting the flow of patients from expensive services to cheaper (and more appropriate) services (that is, moving people from secondary to primary care, and from primary care to community care (for example pharmacy) and/or self care).

4.1.2 Ranking of criteria (Manchester only)

For the Manchester workshop, participants were asked to rank 14 criteria that could

be used to decide whether or not to invest in an intervention: a rank of 1 = most useful through to rank 14 = least useful. The 14 criteria were:

- cost of intervention
- effectiveness
- cost-effectiveness score
- population eligible
- impact on health inequalities
- burden of disease
- cost saving in less than 5 years
- cost saving after 5 years
- acceptability
- affordability
- feasibility
- quality of evidence
- certainty.

Non-health effect (benefits in health and other public sectors for example education, criminal justice)

The ranks of the individual respondents and median ranks for each of the criteria are shown in table 7 below. The criteria are organised in rank order based on the median value for all respondents.

Table 7 Usefulness of criteria for investment decisions

Manchester	R1	R2	R3	R4	R5	R6	R7	Median	Rank
Effectiveness	7	3	1	1	4	1	1	1	1
Cost effectiveness score	2	2	2	2	8	5	2	2	2
Affordability	14	13	3	4	10	2	3	4	3
Impact on health inequalities	4	4	9	6	3	6	5	5	4
Burden of disease	1	5	11	5	1	3	7	5	4
Quality of evidence	5	12	5	9	5	10	2	5	4
Cost of intervention	8	1	7	3	7	4	10	7	7

Population eligible	6	11	10	8	2	8	6	8	8
Cost saving in <5 years	3	10	8	7	8	9	9	8	8
Feasibility	9	8	4	10	11	11	4	9	10
Acceptability	11	7	12	12	6	12	8	11	11
Cost saving in >5 years	12	6	6	13	9	13	12	12	12
Certainty	13	14	5	11	12	14	11	12	12
Non health effect*	10	9	13	12	13	7	13	12	12

With the caveat that the sample size was small and opportunistic, not all of the participants in the workshop returned the ranking exercise, the following observations were made:

- The two criteria ranked as most useful for decision making were effectiveness and cost effectiveness. Affordability was ranked third followed by impact on health inequalities, burden of disease and quality of evidence which were jointly ranked fourth.
- Participants' rankings of the individual criteria varied substantially. For example the effectiveness of an intervention was considered overall to be the most useful criterion of those listed. However, individual participants' rankings for this criterion ranged from 1 to 7. Similarly, affordability was ranked third overall but individuals' rankings ranged from 2 to 14.

4.2 *Workshop with local authority officers and members*

Part of the workshops took place in small groups and used scenarios as a way of facilitating discussions relating to the context, opportunities and barriers for local decision-making processes. By sharing their experiences, participants were expected to raise issues that NICE needs to take into account when developing tools to assist local decision-making.

The scenarios were:

	Scenario
A	A unitary authority is faced with a savings target of 20%. How would you evaluate the implications of this for the health and wellbeing of the community? How would you prioritise disinvestment decisions from a public health perspective?

B	A ring-fenced budget for the reduction of health inequalities is to be made available to your authority. How would you prioritise investment decisions?
C	How could a council, trying to address the root causes of health inequalities, encourage partners to pool funding for local government led activity? How would the health gain be calculated? How would the efficiencies and savings for partners be calculated? How would/should the benefits be distributed, relative to the investment?
D	<p>Making the business case for health and wellbeing interventions:</p> <ul style="list-style-type: none"> • Do you apply business case techniques currently? (If so can you offer examples?) • What makes a robust argument – for senior management team? For political leaders? For partners? • Are other council departments, and partner agencies, motivated by health and wellbeing outcomes? • What information do you need to know to make good decisions? What tools or techniques would help?

Scenarios A–C were assigned to a group and each group also considered scenario D.

A number of questions were used as prompts by the facilitators.

- How likely is this scenario in your work on a scale of 1 to 5?
- Who is involved in making the decisions?
- What data sources do you currently need in order to make an informed decision?
- Are there any existing decision-making tools that you use already?
- What are the difficulties in making decisions related to this scenario?
- What sorts of things convince commissioners to invest in public health over other topics?

- What sorts of arguments would we need to make in order to convince decision makers to invest in the very short (under 1 year), short (1 to 3 years), medium (4 to 10) and long term (over 10)? Are these the sorts of timescales you use?

4.2.1 Group work findings

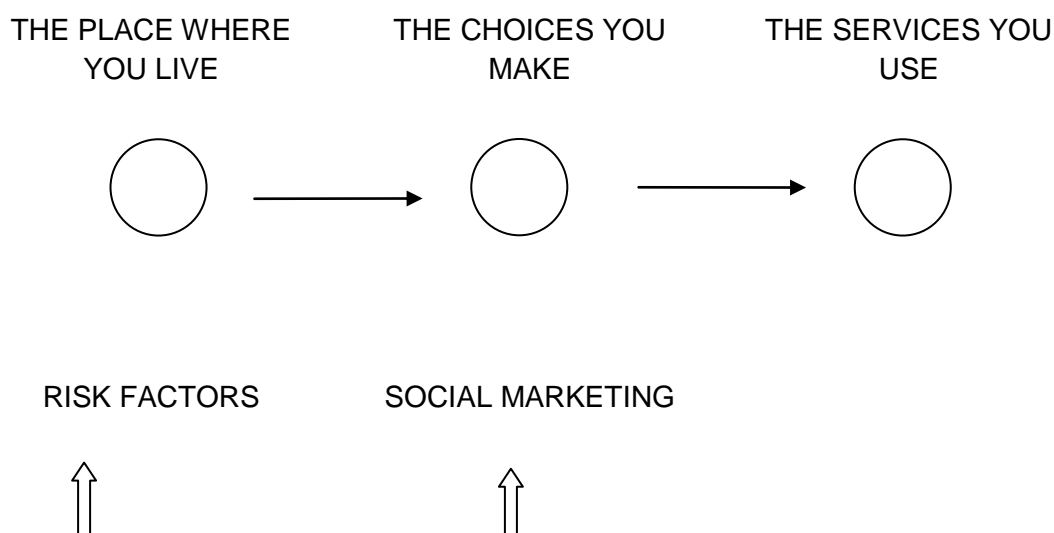
Group A

The scenario set was that the local authority faces a 20% saving target and therefore how would this impact on health improvement work?

Another approach to this question is to concentrate on how you improve health with the remaining 80%, although a 20% cut would inevitably be across all services – so the issue is about ensuring health remains on the agenda.

A significant barrier to address is the difference in language and culture between local authorities and the health sector. This can also be linked to asking local communities what can be done to improve health and then assessing how this fits with the 20% cuts proposed. It is vital to ensure that there are mechanisms to address the business case for health, for example through using 'health champions', investing in local councillors, using current initiatives like Place Based Budgeting and the local authorities learning from the well-established procurement processes of the NHS. It is also important to acknowledge the impact that these new initiatives, changes and cuts can have on the workforce, their morale and productivity.

Diagrams exploring the different ways in which health and efficiency savings can be approached:



Need to work across all three

Group B

The scenario concerned how to prioritise a ring-fenced budget for health inequalities. It was suggested that there were a series of steps to address this issue. First, to look at mapping out the need in a similar way to a Joint Strategic Needs Assessment, but with more detail – looking at existing services and what criteria should be used and also the cost benefit flows to different commissioners. Similar to Group A, it was mentioned that the cultures between health and local authorities are very different and therefore there should be an agreed shared agenda, with an acknowledgment of the differences in approaches. There also needs to be a safe environment and relationship to acknowledge and share limitations.

Group C

The group discussed how to get partners to engage in addressing health inequalities and how to calculate health gain and benefits and savings made for partners.

There were several issues that were raised that need to be addressed in order to ensure engagement – for example, looking at the tension between public health long-term and short-term drivers to achieve cost savings. Working across cultures can be helped by independent objective information and focusing on the choices that

are going to have the most positive impact. There is also a need to work with councillors to ensure strong leadership and that they have access to robust evidence.

4.2.2 General discussion following group work

A number of the participants of the IDeA workshop commented that in the current economic climate only core services would continue to be funded. Discretionary services and interventions such as public health preventive interventions would be axed.

There was discussion about a more confident approach from the Audit Commission when looking at the business case for health and ensuring that the process is vigorous in its approach, emphasising that the purpose of a business case is very different depending on whether it is a time of cuts or affluence. This also relates to balancing short-term needs for cuts and the longer-term gains from the preventative agenda.

In summary:

- Need to look at how to focus impact and the overlaps between the work of NICE and Healthy Communities, which may have similar outcomes however have very different processes.
- There needs to be a strong strategy for involving local authorities in the work.
- NICE needs to assess its image and how it is currently perceived by local authorities if they are to access its work.
- The Healthy Communities programme is to follow up work and involve those who are directors of finance and in similar positions.
- The Healthy Communities work needs to decide whether it will take into account the Social Return on Investment model in its pilot programme, which as well as economic benefits to organisations also considers and attempts to quantify the societal and environmental benefits.

4.2.3 Ranking of criteria

Participants were asked to rank 14 criteria that could be used to decide whether or not to invest in an intervention: a rank of 1 = most useful through to rank 14 = least useful. The 14 criteria were:

- cost of intervention
- effectiveness
- cost-effectiveness score
- population eligible
- impact on health inequalities
- burden of disease
- cost saving in less than 5 years
- cost saving after 5 years
- acceptability
- affordability
- feasibility
- quality of evidence
- certainty
- non-health effect (benefits in health and other public sectors for example education, criminal justice).

They were able to add and rank other criteria that they felt were relevant.

Only one respondent suggested an additional criterion which was 'overall impact on health' and ranked it first equal to the rank given for the criterion 'impact on health inequalities'. The same respondent also commented that the criterion of 'cost saving in less than 5 years' should be reduced to 'less than 2 years' for the NHS. The respondent also explained that the high score of 3 for 'effectiveness' only applied if multiple outcomes are considered and that a low score of '12' had been applied to

the ‘cost effectiveness’ because the perspective of the analysis can be limited.

A second respondent gave a rank of 6 to ‘non-health effects’ and commented that these effects would become increasingly important, particularly in terms of impact on jobs.

The ranks of the individual respondents and median ranks for each of the criteria are shown in table 8. The criteria are organised in rank order based on the median value for all respondents. Note: two respondents (R6 and R7) did not score each and every criterion so their results have been omitted from the calculation of the median and overall ranking.

Table 8 Usefulness of criteria for making investment decisions

	R1	R2	R3	R4	R5	Median	Rank	R6	R7
Impact on health inequalities	7	3	1	1	1	1	1	1	1
Cost-effectiveness score	9	1	12	3	3	3	2	3	3.5
Effectiveness	6	11	3	4	4	4	3	NA	2
Cost saving in < 5 years	1	4	5	2	6	4	3	6	7
Cost of intervention	5	12	9	5	5	5	5	NA	NA
Affordability	2	9	6	6	7	6	6	NA	3.5
Quality of evidence	4	7	10	7	2	7	7	2	5
Acceptability	11	6	7	9	8	8	8	NA	NA
Feasibility	3	8	8	13	9	8	9	4	NA
Population eligible	10	10	4	11	11	10	10	NA	NA
Burden of disease	8	14	13	12	10	12	11	5	NA
Cost saving in > 5 years	12	5	14	10	14	12	11	NA	8
No- health effect*	14	2	2	13	12	12	11	7	6
Certainty	13	13	11	8	13	13	14	NA	NA

Not all of the participants returned the ranking exercise and so like the sample of health sector participants, the sample size of local authority participants is small and opportunistic. Nevertheless, the following observations were made:

- The criterion ranked as most useful for decision-making was impact on health inequalities and the second most useful was cost effectiveness.
- There were substantial variations in participants’ rankings of the individual criteria. For example, ‘health inequalities’, which was ranked the most

useful criterion overall had a range of scores from 1 to 7. The 'cost effectiveness' criterion which was ranked the second most useful ranged from 1 to 12.

Although the sample sizes for the health and local authority sectors are quite small, comparison of the two rankings for these two sectors suggest they may differ in the relative importance they place upon the criteria that could be used to support decision-making. For example:

- Local authority participants ranked health inequalities more highly than health sector participants (first versus fourth).
- Local authority participants ranked interventions that are cost saving in less than five years more highly health sector participants (fourth versus ninth).
- Participants from both sectors ranked cost effectiveness as the second most useful criterion.
- Effectiveness featured among the top three rankings for both health sector and local authority participants.
- Health sector participants ranked affordability more highly than local authority participants (third versus sixth).
- Health sector participants ranked burden of disease more highly than local authority participants (fifth versus eleventh).

The analysis of the ranking of criteria is limited by the number of workshop participants who returned the ranking exercise. As the findings potentially have important implications for the information necessary to support local decision makers, further research with a larger sample size of decision makers, particularly those within the newly established NHS, public health and social care commissioning frameworks, is necessary.

4.3 *Analysis of public health guidance*

Overview

The 26 pieces of public health guidance analysed contained a total of 168

recommendations. The number of recommendations made within each piece of guidance ranged from as low as 3 to as many as 24. In addition, each recommendation frequently contained more than one 'action' bullet and on occasions multiple sub actions.

Throughout the pieces of guidance multiple sectors were asked to take action. The sectors included the NHS, primary care, local authorities, the voluntary and community sector, education, criminal justice and the private sector. Frequently these sectors would be mentioned together and therefore all be asked to undertake the subsequent actions. Two of the more recent pieces of guidance, 'Alcohol use disorders – preventing harmful drinking' and 'Prevention of cardiovascular disease at a population level', included recommendations to government.

Many of the guidance documents were structured to lead the reader through the recommendations in a logical manner from an initial needs assessment to set up through to intervention. The recommendations contained an array of different elements/actions. These included the need for strategy development, partnership working, investment, training, needs assessment, service provision, identification, intervention and follow up. Some recommendations contained multiple elements, for example they may cover the need for identification, intervention and follow up.

The guidance documents contained a range of recommended interventions including the provision of advice and education, pharmacotherapies, changes to the physical environment and the introduction/amendment of legislation. It should be noted that in some pieces of guidance it was recommended that interventions should be tailored to the individual in question. The predominant framework that covered the interventions was that of 'informing and supporting'.

In terms of the target populations and their position within the life course, the current suite of public health guidance appears to cover most stages of an individual's life. It includes children at many different stages (pre-natal, school) and adults (family, employment) including older adults.

4.4 *Review of existing economic methods and tools for calculating cost impact and returns on investment (Matrix)*¹⁰

The review begins with some background information on the research challenges faced in trying to assess the returns on investment of public health interventions. It then goes on to report the findings of the review of existing ROI approaches. Full details can be found in the Matrix report.

4.4.1 Research challenges

The report notes a number of challenges which arise from the NICE reference case as follows:

- the use of the QALY is too narrow to capture the value generated by public health interventions.
- public health interventions impact on a range of non-health outcomes such as criminal justice outcomes, employment outcomes and family and care-giver outcomes, so require a wide perspective.
- many public health interventions also have as one of their aims to reduce health inequalities associated with socio-economic status so consideration needs to be given to the trade off between the policy objective of maximising health (and other) gains and one of reducing health inequalities.

The report also notes issues relating to the paucity of information on equity considerations when evaluating public health interventions, the use of weights to deal with equity issues, the assumption that each QALY gained has the same value to society regardless of who receives it and the resource implications of recommending that descriptive information on the effects of interventions on different sub-populations be presented (Drummond et al. 2007; McDaid and Needle, 2006; Rawlins et al. forthcoming; Dolan and Tsuchiya, 2006; Matrix 2008; Byford et al. 2003).

¹⁰ The majority of this is extracted from the Matrix report which is available in the background information section accompanying this report. Please see the [Developing NICE public health guidance section](#) of the NICE website for details.

Table 9 summarises the types of economic evaluation identified by two recent reviews is presented.

Table 9 Types of economic evaluation undertaken on public health interventions (source: Matrix 2011)

Method	Drummond et al. (2007)	McDaid and Needle (2006)
	n = 154	
CEA – Cost-effectiveness analysis	37%	59%
CCA – Cost-consequences analysis	36%	22%
CUA – Cost-utility analysis	27%	14%
CBA – Cost-benefit analysis	-	5%

The report included two further tables showing the perspectives adopted and costs included in the studies covered by the review carried out by Drummond and colleagues (see table 10 below, adapted from Matrix report).

Table 10 Perspectives adopted and costs included in economic evaluations of public health interventions (source: Matrix 2011)

Perspective	Number	%	Types of costs	Number	%
Health service, health care payer, third party payer	50	32	Health care	154	100
Societal	48	31	Productivity losses	23	15
Hospital, local authority, provider	12	8	Out of pocket	14	9
Government	2	1	Social care	6	4
Patient	1	1	Criminal justice	6	4
Multiple	4	3	Voluntary	5	3
Not stated	37	24	Education	4	3
			Law enforcement	4	3
			Private	3	2
			Housing	3	2
			Employment	2	1
			Environment	1	1
			Transport	1	1

Finally, this section of the report referred to a recent stakeholder engagement exercise which assessed decision-makers' preferences for different types of economic evaluation (Phillips et al, forthcoming). The results suggested that CBA

and CUA were the preferred approaches rather than CEA and CCA, although participants required benchmarks to place net benefit estimates from cost-benefit analyses into context.

4.4.2 Review of existing ROI methods (source: Matrix 2011)

The review identified two types of ROI approach that might offer alternative to the CUA analysis currently prescribed by NICE: cost benefit analysis (CBA) and multi-criteria decision analysis (MCDA). CBA allows for a range of outcomes to be incorporated into the assessment of ROI by valuing outcomes in monetary terms. MCDA ranks interventions by scoring and weighting them based on a range of criteria.

4.4.2.1 Cost-benefit analysis (CBA)

CBA is recommended by HM Treasury's Green Book due to its ability to 'take account of the wider social costs and benefits' and provide outcome measures that are directly comparable with intervention costs. There are different methods for combining the monetary valuations of intervention costs and benefits to assess ROI. The Green Book recommends that an intervention's ROI should be assessed based on its net present value (NPV).

The review of literature showed that different methods are used in CBAs (see table 11) and in broad terms mean any ROI approach that compares the cost and benefit of interventions in monetary terms.

Table 11 Examples of ROI metrics generated from monetary valuations of costs and benefits (source: Matrix 2011)

Source	CBA metric	Content
Applied Economics (2003)	Net Present value (NPV)	Health improvement (DALY gain * \$60,000) + health costs saved – intervention costs
Beard et al. (2006)	NPV	Health costs saved – intervention costs
Holtgrave et al. (2009)	NPV	Health costs saved – intervention costs ¹¹
NICE (2010) ¹²	NPV	Costs saved per 100,000 recipients
Whitley et al. (2006)	Benefit : cost (B:C) ratio	Cost savings/intervention cost
Trogon et al. (2009)	Years to break even	Intervention cost/annual cost savings
NHS Institute	Annual financial gain Cumulative financial gain NPV	Content driven by user of the tool

The report noted that the advantage of CBA is that it allows multiple outcomes to be compared in a single metric – money. However, a number of key challenges to the application of CBA methods to public health interventions were also noted.

Firstly, CBA is often recommended because it best captures a societal perspective (HM Treasury 2003). However, this perspective is rarely of interest to specific groups (Byford et al. 2003). A societal perspective is only justified where decision-makers both set and allocate within budgets (Claxton et al. 2007), and where the objective of the decision-maker is to maximise the welfare of society. However, from the perspective of the decision-maker, budgets can be fixed at departmental level and objectives are narrower than societal wellbeing (Byford et al. 2003; Claxton et al.

¹¹ If the intervention does not have a positive NPV based on this metric, Holtgrave et al. (2009) then go on to assess the intervention's ROI according to its net cost per QALY gained.

¹² www.nice.org.uk/usingguidance/benefitsofimplementation/costsavingsguidance.jsp

2007).

It is argued that this challenge can be overcome by undertaking the analysis from a different perspective. In a situation of department-specific budgets and objectives, a multi-sector perspective is more appropriate. An intervention should be recommended if benefits are greater than costs from the perspective of all stakeholders necessary to deliver the intervention, or if inter-stakeholder transfers can be undertaken to ensure that this is the case (Claxton et al. 2007). Such a rule can be considered optimal if the allocation of budgets between departments is also considered optimal. Claxton et al. (2007) argue that this is a pragmatic assumption to make, given the data-demanding task of determining whether budget allocations are optimal.

Second, the use of CBA to assess the ROI generated by an intervention requires the monetary valuation of intervention outcomes even though there is often an absence of market prices for the outcomes, such as improved health outcomes.

Furthermore, generation of monetary values for public sector outcomes, such as improved health or wellbeing, raises difficult questions about what is 'good' and how to value such outcomes (Drummond et al. 2007). For example, whose judgment about the value of outcomes has legitimacy – the general public's, service users', or decision-makers' and should such values be derived from people's preferences or from their experiences?

In response to the above challenges attention has turned to the use of measures of subjective wellbeing to value outcomes (Phillips, submitted for publication).

4.4.2.2 Multi-criteria decision analysis (MCDA)

The report notes the challenges – both methodological and conceptual – to valuing monetarily the multiple outcomes generated by public health interventions and states that a number of authors have recommended that cost consequence analysis (CCA) is the appropriate economic evaluation technique to apply when assessing the ROI of public health interventions (Drummond et al. 2007; Kelly et al. 2005).

However, a limitation of CCA is that it provides no guidance on how to weight the different outcomes in the 'balance sheet' against each other. The report goes on to note the use of MCDA to resolve this problem and summarises some of those

available in the literature. It also notes that MCDA is the approach recommended by the Treasury's Green Book in instances when intervention outcomes cannot be valued monetarily.

MCDA ranks interventions by scoring and weighting them based on a range of criteria. They can incorporate the outputs (for example NPVs or cost per QALY gained) of more conventional economic approaches, such as CBA or CUA as one of the criteria important for assessing the ROI of an intervention. The report notes that the different approaches to MCDA can be distinguished by the criteria included in the analysis and the techniques employed to measure and weight the criteria.

A summary of the criteria included in MCDA of public health interventions is shown in table 12 below.

Table 12 Summary of criteria included in MCDA of public health interventions
(Source: Matrix 2011)

Source	Location	Cost	Effectiveness	Burden of disease	Equity	Feasibility	Acceptability	Affordability	Certainty
Maciosek et al. (2001, 2006)	USA	✓	✓	✓					
Wilson et al. (2006, 2007)	UK	✓	✓	✓	✓	✓	✓		✓
USOTA (1992)	USA	✓	✓						
Heller et al. (2006)	UK	✓	✓	✓					
Matrix (2009)	UK	✓	✓	✓	✓			✓	✓
Health Foundation	UK	✓	✓	✓	✓	✓			
Portsmouth Scorecard	UK	Determined on a case-by-case basis							

In table 12 the criteria are defined as:

- Cost: the cost of delivering the intervention per recipient.

- Effectiveness: the impact of the intervention on behavioural or health outcomes per recipient.
- Burden of disease: the impact of the intervention on community health (a combination of the effectiveness of the intervention and the number of people receiving the intervention).
- Equity: whether the intervention addressed health inequalities.
- Feasibility: the ease with which the intervention could be implemented (for example whether staff with the necessary skills are available to implement the intervention).
- Acceptability: whether there were moral objections to the interventions (for example where people are considered responsible for their health others may object to interventions).
- Affordability: the budget required to deliver the intervention (a combination of the unit cost of the intervention and the number of people receiving the intervention).
- Certainty: the quality of the evidence available to estimate the criteria.

The techniques employed to measure and weight the criteria can either be data-driven, deliberative, or a mix of the two. Data driven components are primarily based on research evidence such as assessments of the effectiveness or cost effectiveness of particular interventions. Deliberation refers to the process of negotiating between various stakeholders, based on factors such as their own knowledge of the field, existing policy commitments, ethical values and so on. The literature contains examples of MCDAs covering the whole range of approaches from data driven to deliberative (see table 13 for examples).

Table 13 Summary of MCDA methods applied to public health interventions
(Source: Matrix 2011)

Source	Measuring criteria	Combining criteria	Geographical level	Deal with uncertainty	Used by the NHS	Output
Maciosek et al. (2001, 2006)	Data	Researcher	National	No	No	Ranking
Wilson et al. (2006, 2007)	Mix	Decision-maker	Local	Yes	Yes	Ranking
USOTA (1992)	Mix	Decision-maker	Local	Yes	No	Ranking
Heller et al. (2006)	Data	Multiple	Not specified	Yes	Yes	Ranking
Matrix (2009)	Data	Discrete choice experiment	Multiple	Yes	Yes	Ranking
Health Foundation	Mix	Decision-maker	Local	Yes	Yes	Ranking
Portsmouth Scorecard	Mix	Decision-maker	Local	No	Yes	Ranking

The extent to which the MCDA technique relies on data driven or deliberative processes is noted as important for NICE as it can be viewed as a trade-off between the validity of the analysis and the ability to engage stakeholders and build consensus. The report also notes that although data driven approaches are considered to have higher internal validity deliberative approaches are considered a key advantage of the MCDA approach.

4.5 ROI calculations on selected topics/recommendations (Matrix 2011)

The ROI metrics identified in the existing literature were applied to 10 different public health interventions. Table 3 in section 3.4.1 of the current report summarises the metrics tested. These were designed to include a range of different economic metrics, different perspectives (including non-health outcomes: productivity gains), as well as a range of criteria often included in MCDA, such as inequality effects and affordability.

The results were then ranked to assess whether the different ROI metrics produce different decisions. The rationale for testing different ROI metrics was to determine whether the debate about the importance of different metrics (which metrics decision makers would want to be provided with) would be likely to actually make a difference to decisions. That is, a theoretical case could be made for moving to a NPV based approach, but this may be an academic debate if it ranked interventions exactly the same way as the £/QALY.

4.5.1 Results of calculation of ROI metrics

As noted in the methods section, limitations in the evidence base for the short-run healthcare cost savings associated with physical activity meant that the results for the brief intervention to increase physical activity could only be compared to the remaining interventions when all interventions were stripped of short run healthcare cost-savings. These results are presented in appendix C. Two mental health interventions were removed from this comparison due to the absence of long-run effects.

Tables 14 and 15 report the ROI metrics for the ten interventions. The definition of the metrics is available in table 4 (page 60). Other than where stated otherwise, short-term refers to a period of 5 years after the intervention and long-term refers to remaining lifetime of those receiving the intervention.

Table 14 ROI for ten public health interventions based on different metrics

Intervention	NPV/Cost	Cost/QALY	NPV (including HC cost savings)	NPV (including HC cost savings and H gain)	NPV (including HC cost savings, H gain and SR productivity gain)	NPV (including HC cost savings, H gain and LR productivity gain)	B:C (including HC cost saving)	B:C ratio (including HC cost saving and H gain)	B:C ratio (Including. HC cost saving, H gain and SR productivity gain)	B:C ratio (oncluding HC cost saving, H gain and lifetime productivity gain)	Cost per death avoided	Cost per death avoided
Nicotine replacement therapy to reduce smoking	76%	£(3,273)	£44	£315	£345	£411	1.76	6.41	6.94	8.07	£(22,943)	£(22,943)
Assessment and support of caregivers for preventing depression in caregivers	-99%	£124,479	£(6,712)	£(5,634)	£(4,801)	£(4,801)	0.01	0.17	0.29	0.29	No deaths avoided	No deaths avoided
School-based group education to reduce population levels of obesity*	-21%	£1,058	£(5)	£90	£90	£152	0.79	4.71	4.71	7.24	£22,250	£22,250
Brief interventions	200%	£(3,021)	£214	£1,627	£2,132	£3,245	3.00	16.27	21.01	31.46	£(81,088)	£(81,088)

NICE Cost impact project – Stage one: Proof of concept

delivered in GP surgeries to reduce problem drinking												
Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	267%	£(5,507)	£29	£135	£147	£173	3.67	13.35	14.45	16.80	£(38,607)	£
Smoking cessation – pharmacist vs. normal care	418%	£(6,111)	£515	£2,201	£2,391	£2,801	5.18	18.87	20.42	23.74	£(42,838)	£
Smoking cessation – social marketing campaign (disadvantaged population)	229%	£(5,269)	£77	£367	£400	£471	3.29	11.97	12.96	15.07	£(36,938)	£
Alcohol screening and brief intervention in A&E setting	54%	£(1,583)	£21	£287	£382	£592	1.54	8.33	10.75	16.10	£(42,480)	£

NICE Cost impact project – Stage one: Proof of concept

Alcohol screening and brief intervention when patient registers with GP practice	-17%	£913	£(4)	£88	£121	£194	0.83	4.51	5.82	8.72	£24,506
Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	-94%	£14,533	£(113)	£43	£163	£163	0.06	1.35	2.35	2.35	No deaths avoided

* The cost of the school-based intervention may be borne by local authorities. Given the predominantly healthcare perspective adopted by the analysis, it is assumed that this cost of incurred by the healthcare system.

In Table 14 (above) a negative cost per QALY indicates that the health care cost savings are greater than the original cost of the intervention. Interventions producing negative cost per QALY are dominant. Thus, in table 14, there are six dominant interventions.

Table 15 ROI for ten public health interventions based on different metrics (cont.)

Intervention	SR productivity gain	Lifetime productivity gain	Net cost saving, 1 year	Net cost saving, 3 year	Net cost saving, 5 year	1st year rate of return	QALY	Reach	Population reached	Avoidable burden of disease (QALYs)	Inequality Score	HELP Affordability score
Nicotine replacement therapy to reduce smoking	£31	£96	£(58)	£(55)	£(49)	0.94%	0.014	0.13	5,478,512	74,041	1.47	2.00
Assessment and support of caregivers for preventing depression in caregivers	£832	£832	£(6,746)	£(6,712)	£(6,712)	0.26%	0.054	0.03	1,388,858	74,889	1.00	1.00
School based group education to reduce population levels of obesity*	£0	£62	£(24)	£(24)	£(23)	0.00%	0.005	0.04	1,642,447	7,806	1.00	3.00
Brief interventions	£505	£1,618	£9	£25	£41	8.25%	0.071	0.16	6,777,628	479,000	1.78	2.00

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delivered in GP surgeries to reduce problem drinking												
Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	£12	£38	£(11)	£(10)	£(7)	1.96%	0.005	0.19	8,195,546	43,471	1.55	3.00
Smoking cessation – pharmacist vs. normal care	£191	£600	£(120)	£(101)	£(66)	2.77%	0.084	0.13	5,622,526	473,902	1.55	2.00
Smoking cessation – social marketing campaign (disadvantaged population)	£33	£103	£(33)	£(30)	£(24)	1.76%	0.015	0.08	3,517,081	51,111	**	2.00
Alcohol screening and brief intervention in A&E setting	£95	£305	£2	£5	£8	4.22%	0.013	0.03	1,130,641	15,049	1.78	3.00

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Alcohol screening and brief intervention when patient registers with GP practice	£33	£106	£1	£2	£3	2.28%	0.005	0.01	531,874	2,462	1.78	3.00
Detection of depression in retirees	£120	£120	£(118)	£(113)	£(113)	2.12%	0.008	0.01	635,798	4,944	1.08	3.00

* The cost of the school-based intervention may be borne by local authorities. Given the predominantly healthcare perspective adopted by the analysis, it is assumed that this cost of incurred by the healthcare system.

**Inequality score calculation is not applicable in this case because the intervention is rolled out for the disadvantaged group only.

Timing of costs and benefits

The temporal breakdown of the costs and benefits included in the metrics is summarised below. The purpose of the graphs is to show how the findings relating to the costs and benefits change with changes in the time horizon.

Figure 5 shows the cumulative [health care] cost savings and health gains [monetary value of QALY multiplied by the number of QALYs gained] generated by an intervention to support caregivers and prevent depression, and the corresponding cost per QALY gained and NPV. As the intervention was focused on the short-term mental health of caregivers (that is, 3 years post intervention), no change in mortality was modelled. It demonstrates that the benefits of the intervention are seen over the subsequent 3 years. The value of the health gains generated by the intervention never exceed the net cost of the intervention, causing the NPV to be negative and the cost per QALY gained to far exceed a £20,000–£30,000 threshold. The estimated cost per QALY of this intervention over the three year time horizon was £124,479.

Figure 5 The timing of costs and benefits of support for caregivers to prevent depression (Source: Matrix 2011)

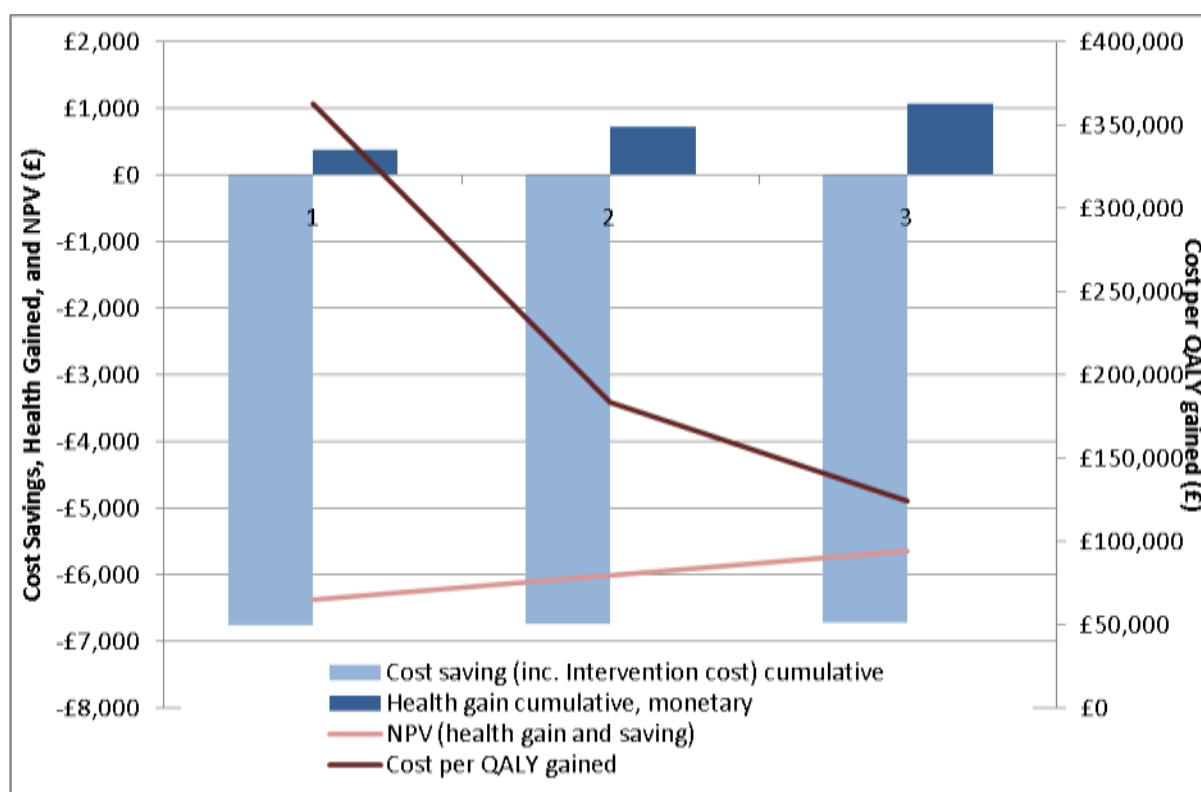


Figure 6 shows the cumulative cost savings and health gains generated by a school-based educational intervention to prevent obesity, and the corresponding cost per QALY gained and NPV. It demonstrates that the intervention generated benefits over the 75 years after the intervention. The cost savings generated by the intervention fail to offset the cost of the intervention. However, the value of the gains in health related quality of life from 40 years after the intervention cause the NPV to be positive from about 45 years after the intervention. By definition, the cost per QALY gained drops below a £20,000 per QALY threshold at the same time point. The obesity intervention takes longer to impact chronic disease outcomes as it is target at children. Over a lifetime horizon the estimated cost per QALY gained for this intervention was £1058.

Figure 6 The timing of the costs and benefits of school-based education to prevent obesity (Source: Matrix 2011)

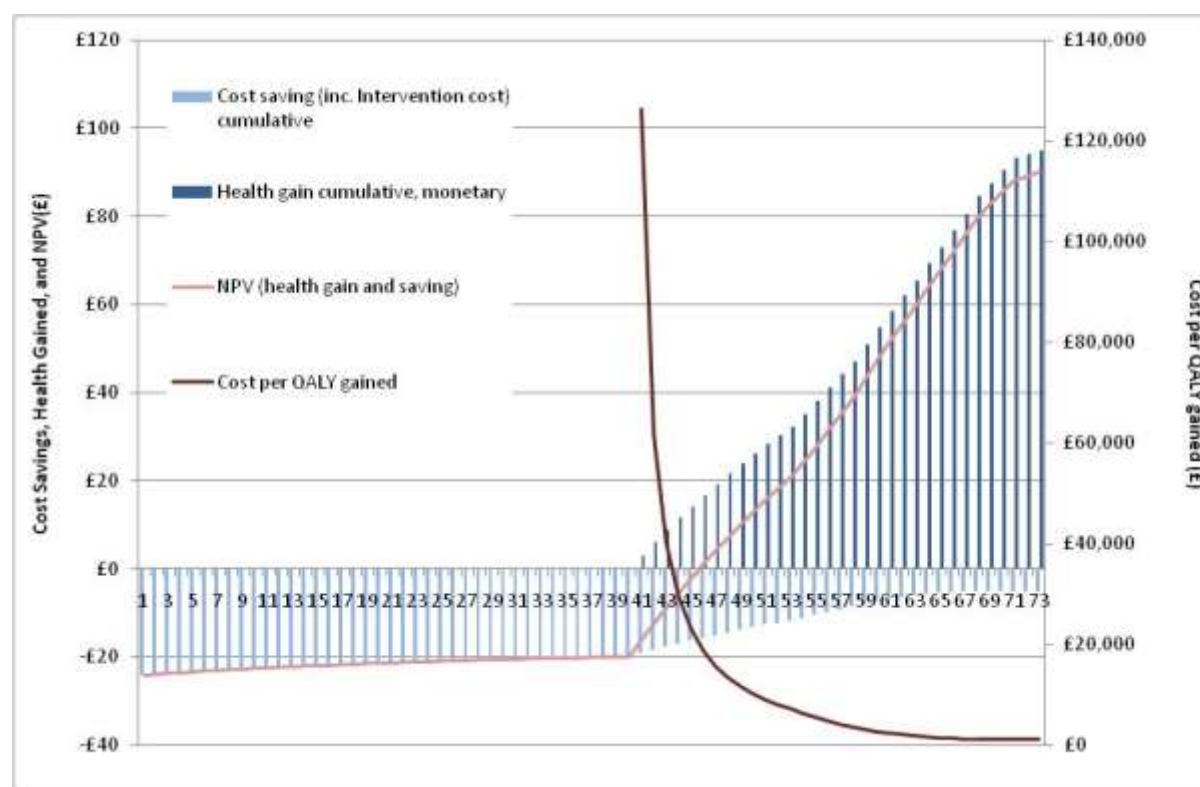


Figure 7 shows the cumulative cost savings and health gains generated by a brief GP intervention to prevent problem drinking, and the corresponding cost per QALY gained and NPV. It demonstrates that the intervention generated benefits over the 35 years after the intervention. The cost savings generated by the intervention exceed the cost of implementing the intervention about 10 years after the intervention. These cost savings, as well as the health related quality of life gains of the intervention mean that the intervention has a positive NPV. Over a lifetime horizon the estimated cost per QALY gained was -£3021.

Figure 7 The timing of the costs and benefits of GP-based brief interventions to prevent problem drinking (Source: Matrix 2011).

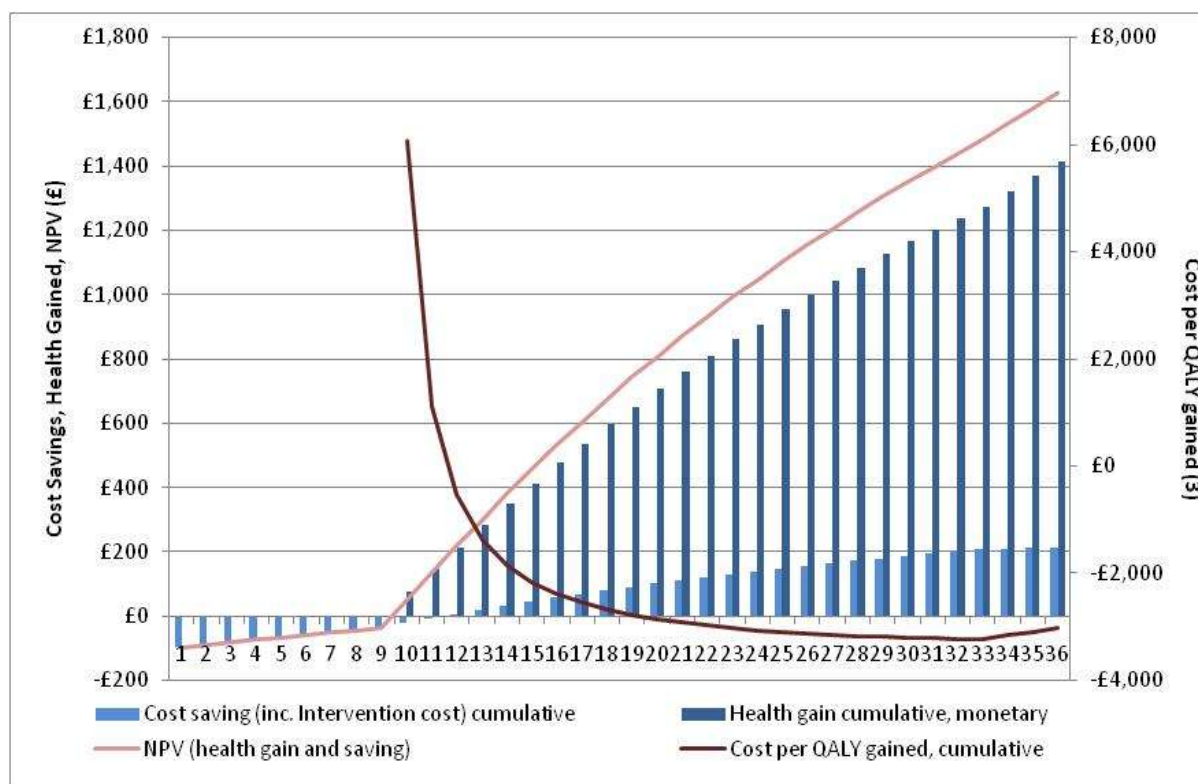
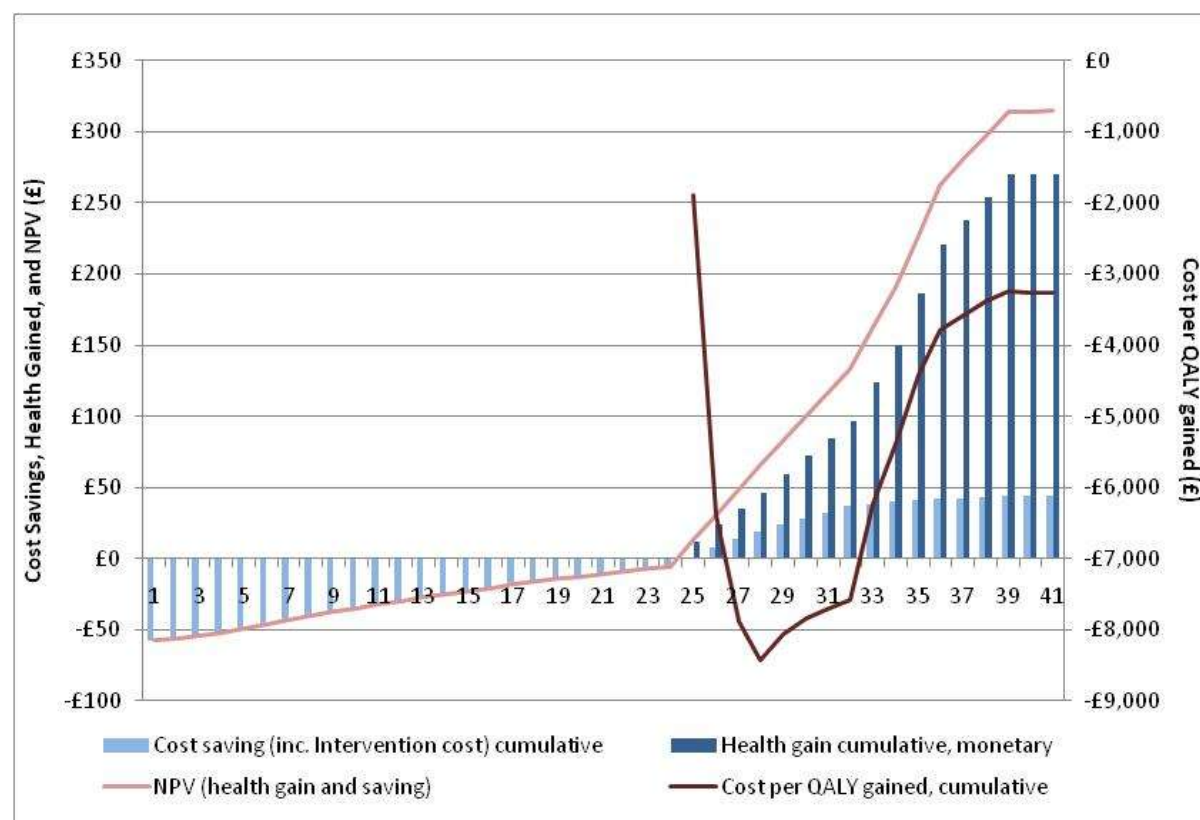


Figure 8 shows the cumulative cost savings and health gains generated by nicotine replacement therapy, and the corresponding cost per QALY gained and NPV. It demonstrates that the intervention generated benefits over the 45 years after the intervention. The cost savings generated by the intervention exceed the cost of implementing the intervention about 25 years after the intervention. These cost savings, as well as the health related quality of life gains of the intervention mean that the intervention has a positive NPV. Over a lifetime horizon the estimated cost per QALY gained was -£3273.

Figure 8 The timing of the costs and benefits of NRT (Source: Matrix 2011)



The strange shape of the cumulative cost per QALY gained curve requires some consideration. As the intervention generates more health gains and saves more costs, the cost per QALY gained first declines to £-8500 and then increases to £-3500. This is the consequence of the challenges comparing interventions with negative cost per QALY gains. Appendix E describes the challenge in interpreting negative cost per QALY gained estimates in more detail. In this instance, the fact that the marginal QALY gains are of a higher value than the marginal health cost savings causes the cost per QALY gained to become less negative. The conventional rule that the lower the cost per QALY gained the more efficient the intervention clearly does not hold in this instance.

Figure 9 shows the cumulative cost savings and health gains generated by brief GP opportunistic advice to smokers, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was -£5507.

Figure 9 The timing of costs and benefits of brief GP opportunistic advice to smokers

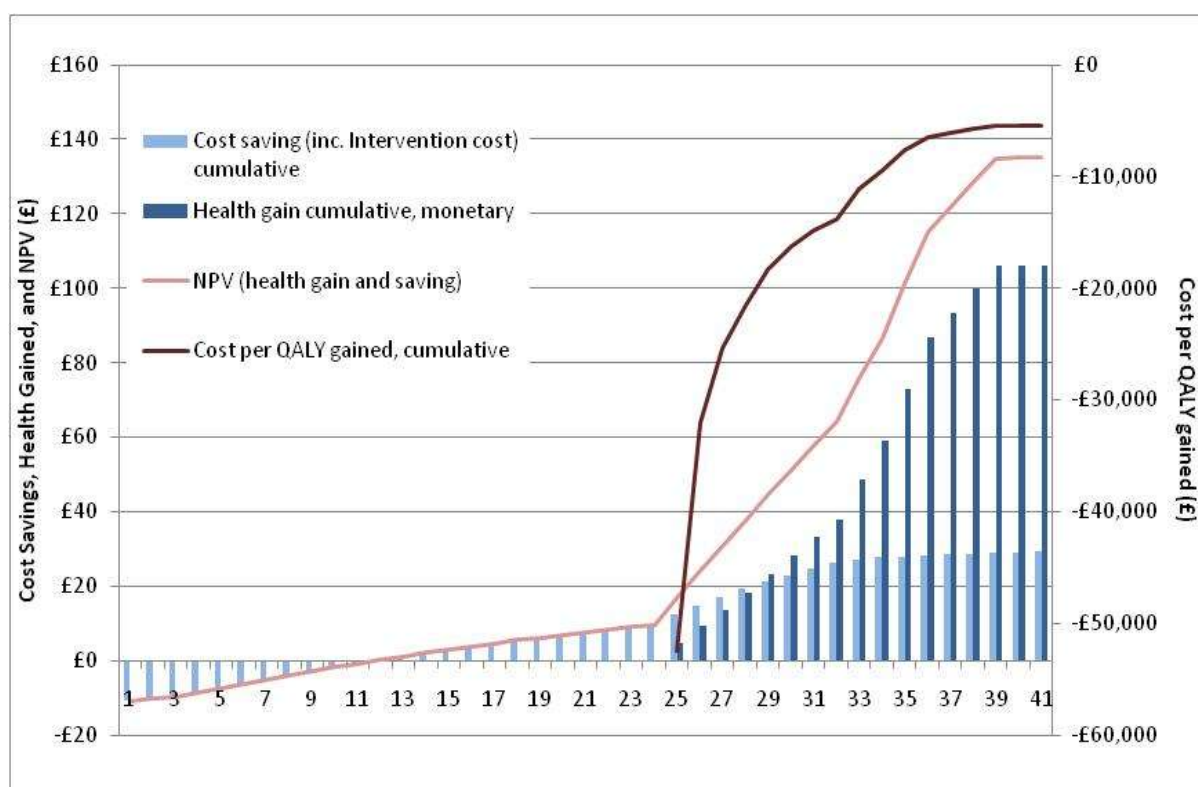


Figure 10 shows the cumulative cost savings and health gains generated by 30 minute counselling and an information leaflet provided to smokers by a pharmacist, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was -£6111.

Figure 10 The timing of costs and benefits of intervention based on 30 minute counselling and information leaflet provided to smokers by pharmacist

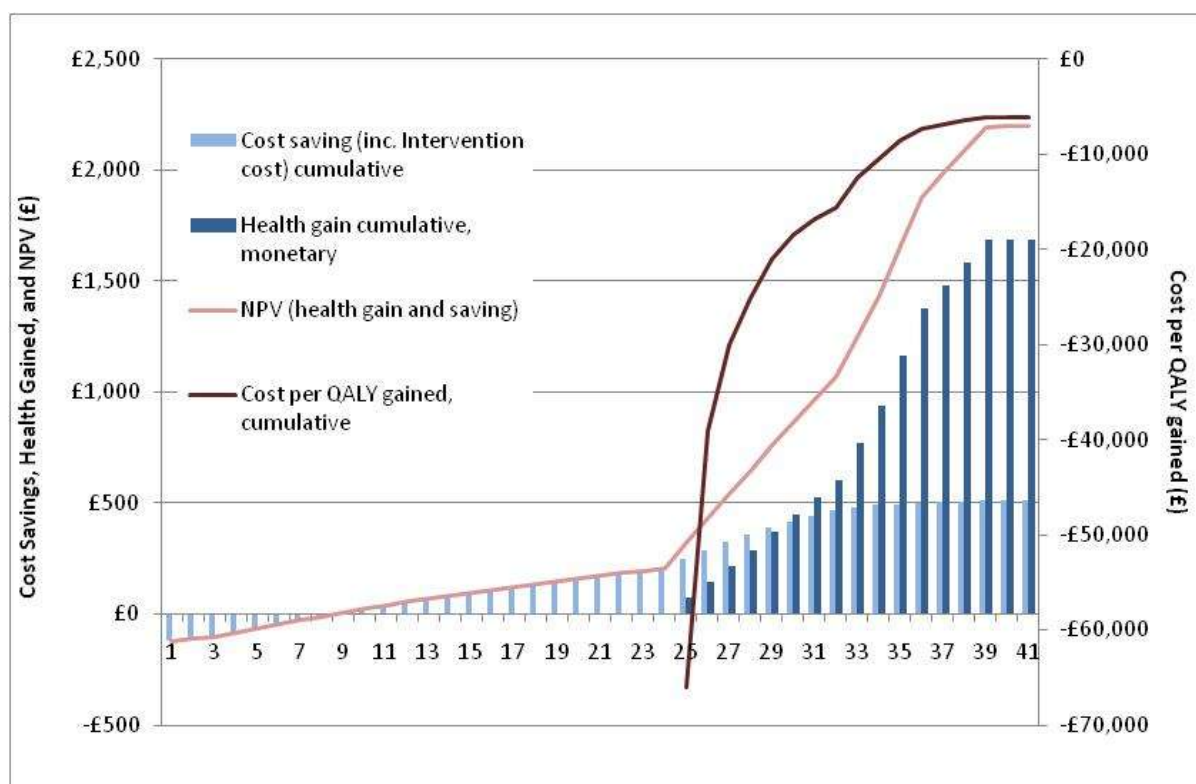


Figure 11 shows the cumulative cost savings and health gains generated by a mass media anti-smoking campaign for the disadvantaged, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was -£5269.

Figure 11 The timing of costs and benefits of mass media anti-smoking campaign for the disadvantaged

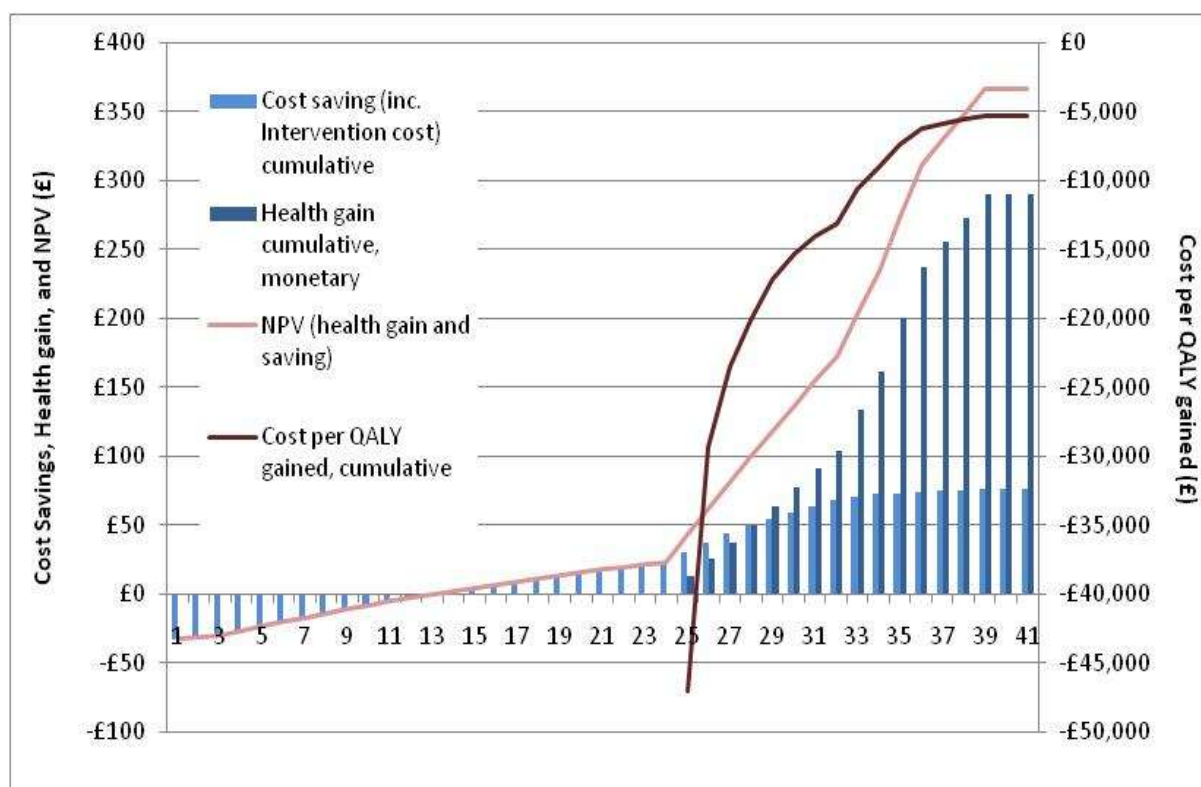


Figure 12 shows the cumulative cost savings and health gains generated by alcohol screening and a brief intervention at A&E department, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was -£1583.

Figure 12 The timing of costs and benefits of alcohol screening and a brief intervention at A&E department

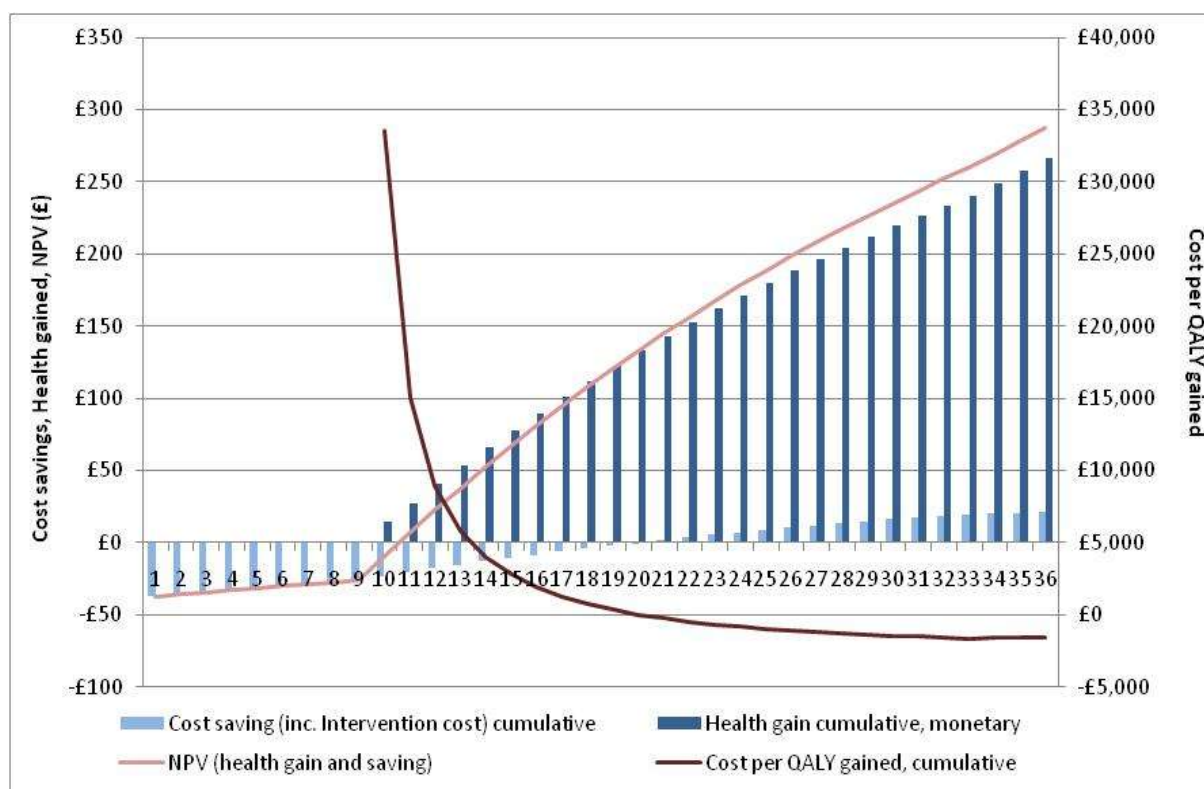


Figure 13 shows the cumulative cost savings and health gains generated by alcohol screening and a brief intervention when a patient registers with new GP practice, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was -£913.

Figure 13 The timing of costs and benefits of alcohol screening and a brief intervention when patient registers with new GP practice

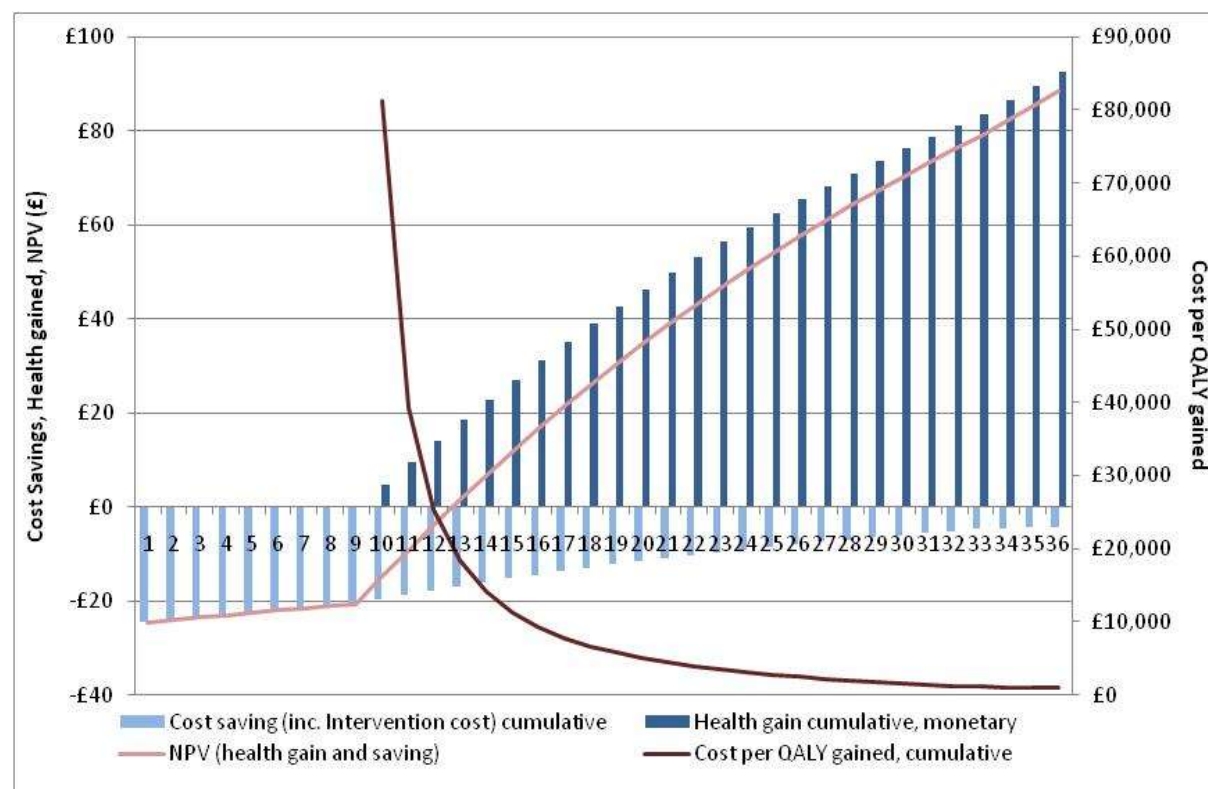


Figure 14 shows the cumulative cost savings and health gains generated by detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, and the corresponding cost per QALY gained and NPV. Over a lifetime horizon the estimated cost per QALY gained was £14,533.

Figure 14 The timing of costs and benefits of detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers

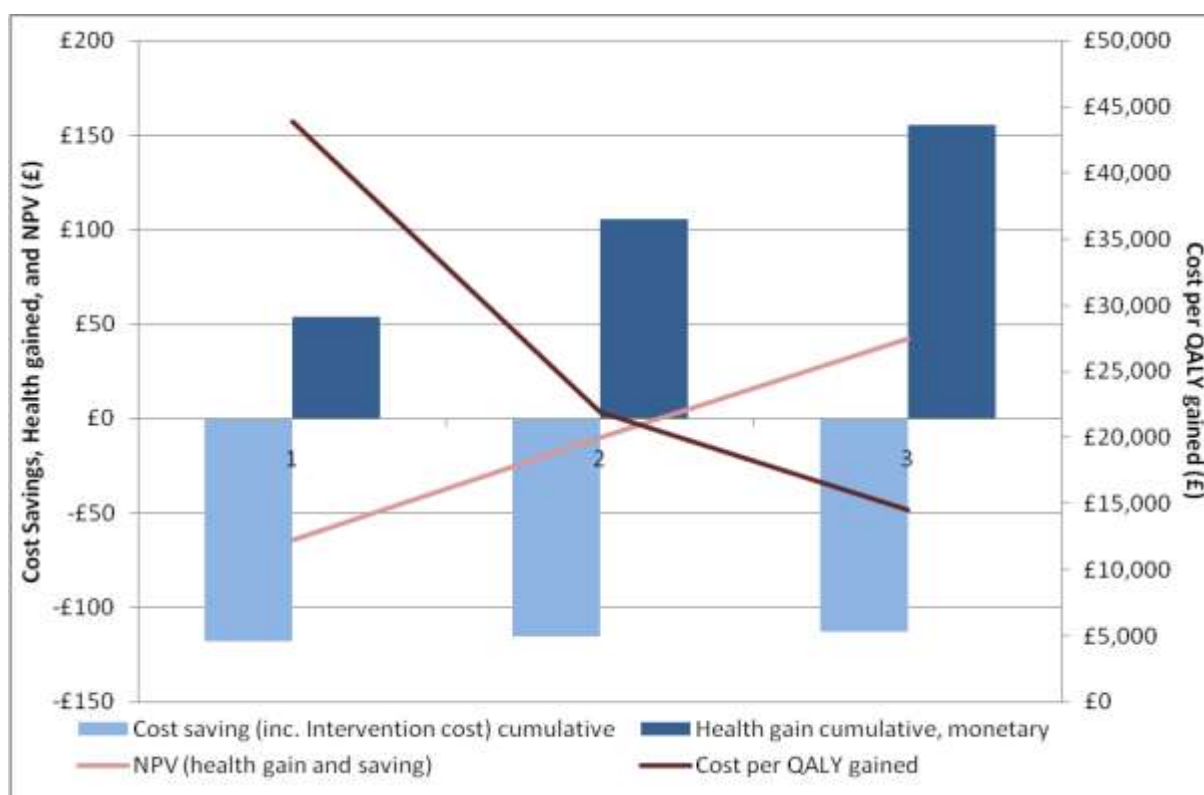


Table 16 shows how cost per QALY gained and NPV change when different discount rates (0–10%) are used for each intervention. Table 16 ranks these ROI metrics to determine whether different discount rates change the priority given to interventions.

Table 16 Impact of changing discount rates on cost per QALY gained and NPV (source: Matrix 2011)

	Intervention	Cost per QALY gained					NPV (including HC cost, HC gain, and LR productivity gain)				
		0.00%	3.50%	5.00%	7.00%	10.00%	0.00%	3.50%	5.00%	7.00%	10.00%
1	Nicotine replacement therapy to reduce smoking	£(3,776)	£(3,273)	£(2,252)	£727	£12,187	£1,147	£411	£272	£159	£72
2	Assessment and support of caregivers for preventing depression in caregivers	£116,185	£124,479	£128,089	£132,954	£140,355	£(4,663)	£(4,801)	£(4,856)	£(4,926)	£(5,022)
3	School based group education to reduce population levels of obesity	£(2,138)	£1,058	£6,531	£25,514	£127,973	£945	£152	£73	£26	£0
4	Brief interventions delivered in GP surgeries to reduce problem drinking	£(3,217)	£(3,021)	£(2,809)	£(2,359)	£(1,219)	£5,851	£3,245	£2,608	£2,001	£1,414
5	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	£(4,486)	£(5,507)	£(5,842)	£(5,928)	£(4,079)	£462	£173	£118	£74	£40
6	Smoking cessation – pharmacist vs. normal care	£(4,677)	£(6,111)	£(6,812)	£(7,726)	£(8,472)	£7,392	£2,801	£1,933	£1,232	£689
7	Smoking cessation – social marketing campaign (disadvantaged population)	£(4,410)	£(5,269)	£(5,460)	£(5,219)	£(2,346)	£1,262	£471	£321	£200	£107
8	Screening and brief intervention in A&E setting	£(2,554)	£(1,583)	£(862)	£481	£3,554	£1,083	£592	£472	£358	£247
9	Alcohol screening and brief intervention when patient registers with GP practice	£(1,404)	£913	£2,515	£5,410	£11,836	£365	£194	£153	£113	£74

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10	Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	£13,510	£14,533	£14,979	£15,580	£16,494	£183	£163	£155	£145	£131
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Tables 17 and 18 show the rankings of the interventions based on the ROI metrics reported in tables 12–14. The rankings are generated by giving the intervention with the greatest ROI a ranking of 1 and that with the lowest ROI a ranking of 10. In most cases this only requires a simple ordering of the interventions based on the ROI metrics. For instance, an intervention with a higher NPV will have a better ranking. The exception to this simple rule is the cost per QALY gained metric. In this instance, when interventions have a negative cost per QALY gained (due to the cost savings generated by the intervention exceeding the cost of the intervention) it is not always the case that a lower cost per QALY gained represents a more efficient intervention. For further information on this phenomenon see appendix E. In this instance, interventions are ranked manually as it is not possible to do this algorithmically.

Table 17 suggests that different ROI metrics produce different intervention rankings and thus will result in different decisions when applied by policy makers.

- ROIs based on the ratio of costs and benefits (for example benefit cost ratio) produce different rankings to ROIs based on the difference between costs and benefits (for example NPV) even when based on the same perspective.
- Within the same metric type, different perspectives make a difference. For instance, based on an NPV metric, different rankings are achieved as health gains, and productivity gains are added to the calculation.
- Different rankings are produced by different cost-effectiveness-type metrics, such as cost per QALY gained, cost per death avoided, and cost per life year saved.
- Different rankings are achieved by cost per QALYs gained metrics and short-term cost savings metrics or first year rate of returns metrics.

Furthermore, intervention rankings vary between the traditional economic ROI metrics referred to above and other metrics, such as:

- affordability

- reach
- avoided burden of disease.

Table 18 demonstrates that different rankings are achieved when discount rates are varied. Unsurprisingly, those interventions with long-term costs (for example school-based obesity interventions) move down the ranking as the discount rate is increased, and those interventions with returns over shorter timescales (for example depression for care givers) tend to move up the rankings as discount rates are included.

NPV estimates follow a consistent and expected pattern as the discount rate changes, while the pattern for the ICER behaves ‘less well’. Some of the trends in the change in ICERs when calculated with different discount rates are counter-intuitive. For instance, the ICER will first fall and then rise as the discount rate increases. These trends are explained by the peculiarities in the interpretation of negative ICERs (see appendix E). While the cost and QALY gained elements of the ICER follow a consistent pattern – both decreasing as discount rates increase – the ICER does not follow a similarly consistent pattern. This is because costs and QALY gained are adjusted to different degrees as the discount rate changes.

Caveats: The models constructed to estimate the ROI of public health interventions are subject to a number of limitations as a result of the limited time available for the project and the data available on public health interventions, including:

- The models are all static. It might be preferable to assess behavioural interventions using dynamic models but such models are time consuming and expensive to construct.
- The models aimed to estimate both the short-term and long-term cost savings and health gains generated by the interventions. It was not possible, however, to identify the relevant data to estimate short-term cost savings generated by improvements in physical activity levels. A rapid review of the literature was employed to identify data. It is possible that relevant data existing in current surveys.

- The perspective of the analysis was restricted to health costs and quality of life gain, and improvements in productivity. Further research is required on how other public health outcomes, such as criminal justice effects, impact the relevant efficiency of intervention.

Table 17 Intervention ranking by metric (source: Matrix 2011)

Intervention	NPV/cost	Cost/QALY	NPV (including HC cost)	NPV (including HC cost and H gain)	NPV (including HC cost, H gain and SR productivity gain)	NPV (including HC cost, H gain and LR productivity gain)	B:C (including HC cost)	B:C ratio (including HC cost and H gain)	B:C ratio (including HC cost, H gain and LR productivity gain)	Cost per death avoided	Cost per LY saved
Nicotine replacement therapy to reduce smoking	5	4	4	4	5	5	5	6	7	4	4
Assessment and support of caregivers for preventing depression in caregivers	10	10	10	10	10	10	10	10	10	N/A	N/A
School based group education to reduce population levels of obesity	8	8	8	7	9	9	8	7	8	8	8
Brief interventions delivered in GP	4	2	2	2	2	1	4	2	1	2	2

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surgeries to reduce problem drinking											
Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	2	6	5	6	7	7	2	3	3	5	5
Smoking cessation – pharmacist vs. normal care	1	1	1	1	1	2	1	1	2	1	1
Smoking cessation – social marketing campaign (disadvantaged population)	3	3	3	3	3	4	3	4	5	3	3
Alcohol screening and brief intervention in A&E setting	6	5	6	5	4	3	6	5	4	6	6
Alcohol screening and	7	7	7	8	8	6	7	8	6	7	7

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brief intervention when patient registers with GP practice											
Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	9	9	9	9	6	8	9	9	9	N/A	N/A

Table 17 Intervention ranking by metric cont.

Intervention	SR productivity gain	LR productivity gain	Net cost saving , 1 year	Net cost saving , 3 year	Net cost saving , 5 year	1 st year cost saving/Intervention cost	Avoidable burden of disease	Reach	Inequality Score	HELP Affordability score
Nicotine replacement therapy to reduce	8	8	7	7	7	8	5	5	6	6

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smoking										
Assessment and support of caregivers for preventing depression in caregivers	1	2	10	10	10	9	4	7	8	10
School based group education to reduce population levels of obesity	10	9	5	5	5	10	8	6	8	1
Brief interventions delivered in GP surgeries to reduce problem drinking	2	1	1	1	1	1	1	3	1	6
Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	9	10	4	4	4	6	6	2	4	1
Smoking cessation – pharmacist vs. normal care	3	3	9	8	8	3	2	4	4	6
Smoking cessation – social marketing campaign (disadvantaged population)	7	7	6	6	6	7	3	1	1	6
Alcohol screening and brief intervention in A&E	5	4	2	2	2	2	7	8	1	1

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setting										
Alcohol screening and brief intervention when patient registers with GP practice	6	6	3	3	3	4	10	10	1	1
Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	4	5	8	9	9	5	9	9	7	1

Table 18 Intervention ranking by metric and discount rate (source: Matrix 2011)

	Intervention	Cost per QALY gained					NPV (Including HC cost, HC gain, and LR productivity gain)				
		0.00%	3.50%	5.00%	7.00%	10.00%	0.00%	3.50%	5.00%	7.00%	10.00%
1	Nicotine replacement therapy to reduce smoking	4	4	5	5	6	4	5	5	5	7
2	Assessment and support of caregivers for preventing depression in caregivers	10	10	10	10	10	10	10	10	10	10
3	School based group education to reduce population levels of obesity	5	8	8	9	9	6	9	9	9	9
4	Brief interventions delivered in GP surgeries to reduce problem drinking	2	2	2	2	1	2	1	1	1	1
5	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	6	6	6	6	5	7	7	8	8	8
6	Smoking cessation – pharmacist vs. normal care	1	1	1	1	2	1	2	2	2	2
7	Smoking cessation – social marketing campaign (disadvantaged population)	3	3	3	3	3	3	4	4	4	5
8	Screening and brief intervention in A&E setting	7	5	4	4	4	5	3	3	3	3
9	Alcohol screening and brief intervention when patient registers with GP practice	8	7	7	7	7	8	6	7	7	6

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10	Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	9	9	9	8	8	9	8	6	6	4
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4.6 *Interviews with key informants (Matrix 2011)*

Interviews were conducted in two parts. The first aimed to determine which ROI metrics decision makers find most useful. The second explored the usefulness of 14 different criteria that could be used to decide whether to invest in an intervention.

4.6.1 **Do decision makers prefer certain ROI metrics?**

In the first set of questions, interviewees were presented with 12 different scenarios describing the ROI of a public health intervention compared with usual care. Details on the scenarios presented are available in appendix 14 of the Matrix report. Each scenario presented the same intervention using a different set of ROI metrics, thus isolating the effect of metrics on decisions (respondents were not told that it was the same intervention). The metrics included in the interviews were constructed to represent the alternative ROI approaches identified in the literature (reported earlier). Table 19 below summarises the metrics included in each scenario.

Table 19 Scenarios assessed through stakeholder engagement

Scenario	Metrics
1	Cost per QALY gained
2	Net benefit
3	Total cost of implementation Life years saved Cost per life year saved
4	Cost per QALY Preventable burden of disease (QALYs)
5	Net cost savings
6	Total cost of implementation Deaths avoided Cost per death avoided
7	Cumulative net cost savings per person (graph)
8	Cost

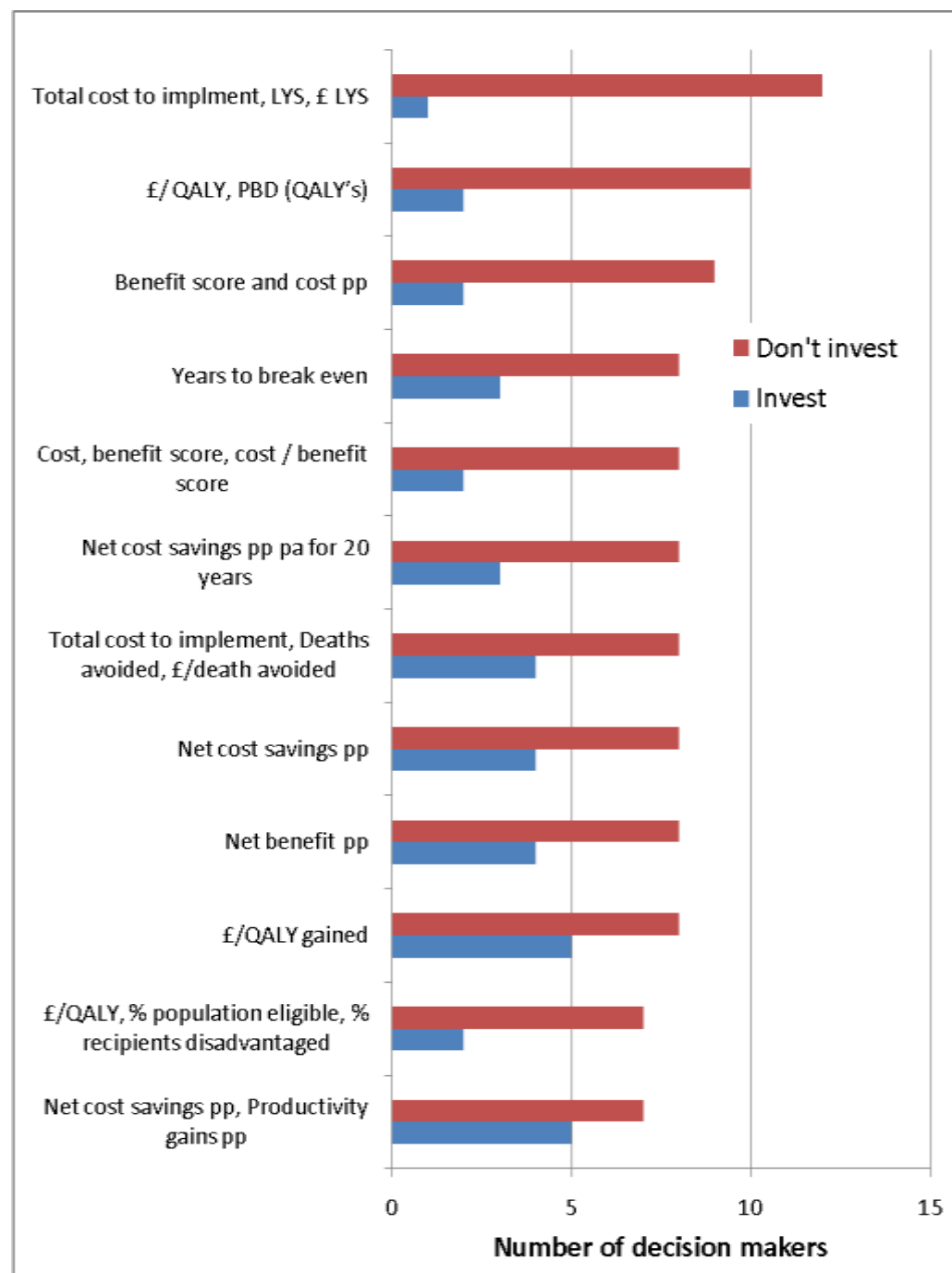
	Weighted benefit score
	Ratio of cost to benefit
9	Net cost savings per person Productivity gains per person
10	Years to break even
11	Cost per QALY Proportion of population eligible Proportion of recipients who are disadvantaged
12	Benefit score Cost per person (graph)

Respondents were asked: “Would you invest in the intervention based on the information provided?” Figure 11 summarises the responses (a breakdown of responses by stakeholder group is available in appendix 15 of the Matrix report). It demonstrates that, regardless of the metric employed to represent the intervention, most stakeholders said that they would not invest in the intervention based on this information alone. This is despite the fact that the intervention would be considered cost-effective based on accepted metrics – for example, it had a cost per QALY gained of only £3125, suggesting that decision makers require more information than the economic efficiency of an intervention.

Given the lack of variation in response, it is difficult to identify metrics that decision-makers prefer more than others from the evidence presented in figure 11. Rather it is likely that decision-makers require a range of information rather than a small number of preferred types of evidence. For example, the intervention was relatively warmly received when cost per QALY gained data was presented but less well received when cost per QALY gained data is supplemented with other data, such as the preventable burden of disease, population reached, or disadvantaged population reached. Thus, 5/19 said they would invest on the basis of cost/QALY but only 2/19 said they would when additional data were provided. This might suggest that these supplementary metrics are considered important by decision-makers, with their presence overriding the positive message provided by the cost per QALY metric.

However, given the size and heterogeneity of the sample, only very tentative conclusions should be drawn from this analysis.

Figure 11 Stakeholder decisions by ROI metric (n=19*) (source: Matrix 2011)



*Respondents were provided with the option of stating that they didn't know whether they would invest in the intervention, which explains why the N varies between ROI metrics.

Following each question, respondents were asked "How useful is the information

provided?” and “What other information would you need?” A number of common themes emerged following these questions. Unsurprisingly, given the results reported in figure 11, respondents asked for more information in response to all metrics, stating that the data provided was insufficient to judge the intervention. Other themes included:

- In most scenarios where the information was not already available, respondents requests data on:
 - the number of people benefiting from the intervention
 - the population sub groups that benefited (for example different age groups)
 - the total cost of implementing the intervention.
- Where scenarios presented metrics aggregated over a long period of time, respondents often stated that a shorter timescale, such as less than 5 years, would be more useful.

The importance of the timing of costs and benefits is supported by the positive reaction to those metrics that either disaggregated costs and/or benefits over time, or which focused on the shorter term (for example, scenario 7 which depicted cumulative net cost savings per person in a graph).

The two scenarios that presented the interventions using the type of weighted benefit score metrics that are produced through stakeholder workshops (scenarios 8 and 12) were considered confusing. This is not surprising, as the scores generated by this method have little meaning other than to those participating in the workshops, or if the methods used to arrive at the scores are described in detail. The fact that these methods were based on the subjective assessments of stakeholders also raised concerns about the validity of the resulting metrics.

Respondents also stated that the use of visual and graphic presentations of metrics, rather than just numbers, was useful (for example scenario 12).

A number of the metrics were regarded with suspicion or confusion due to their ‘black box’ nature (these included scenarios 2, 3, 4, 8, 9 and 11). That is, respondents thought the approaches lacked transparency in their methods or

content. This is, to an extent, to be expected given the limited space to provide methodological background within the interview design.

A number of respondents identified a benchmark – another intervention against which to assess the intervention – as an important gap in the evidence necessary to make a decision. This was despite the fact that each analysis was clearly presented as having been undertaken comparing the intervention against usual care. This might point to the value or ranking when presenting ROI metrics for decision-makers.

Finally, in response to many of the metrics, respondents requested information on the cost savings generated by the intervention.

4.6.2 Results of decision-makers' ranking of criteria

Following questions on the investment scenarios, respondents were asked to rank 14 different criteria according to their usefulness where 1= most useful and 14 = least useful. Table 20 summarises the results of this ranking exercise. Within each professional group, it shows the average of the ranks given to the metrics. Thus, a lower score indicates a higher ranking. The metrics are organised in rank order based on the sample of all respondents. The bold and italic numbers indicate the lowest and highest ranked metrics in different respondent groups.

Across profession types the 'cost effectiveness score' was ranked the highest priority and 'acceptability' the lowest. Other metrics that ranked highly were short-run cost savings, implementation cost, and the quality of the evidence available to inform decisions. Metrics that scored low were burden of disease, non-health costs, and the population eligible for the intervention.

Table 20 Results of decision-makers' ranking of criteria (average rank*), by different respondent groups (PH = directors of public health, PCT = PCT chief executives, GP = general practitioners, and LA = local authority chiefs) (source: Matrix 2011)

			Field of professional			
		Total (n=16)	PH (n=7)	PCT (n=4)	GP (n=3)	LA (n=2)
	Criteria					
1	Cost-effectiveness score	3	3	2	1	7
2	Cost saving <5 years	4	4	5	7	1
3	Cost of implementation	5	6	2	6	1
4	Quality of the evidence	5	3	6	3	9
5	Effectiveness	6	8	2	7	7
6	Feasibility	6	8	6	4	1
7	Impact on health inequalities	7	8	5	8	7
8	Affordability	7	7	5	6	9
9	Cost saving >5 years	7	7	11	5	1
10	Certainty	8	7	10	11	1
11	Burden of disease	9	10	7	6	9
12	Population eligible	9	11	6	11	9
13	Non-health effects	9	10	10	11	1
14	Acceptability	10	11	9	6	9

* The average of the rankings given to the criteria by respondents in each professional group.

With the caveat that the sample sizes for the sub-groups of professional types were small, Matrix made the following observations:

- Health professionals ranked cost effectiveness considerably more highly than local authority representatives did.
- Non-health effects and longer-term cost savings were not ranked highly, except by the local authority representatives.
- PCT chief executives tend to rank the eligible population and burden of disease associated with an intervention higher than other professional groups.

Given the likely greater involvement in public health decision making of local authorities in the future, Matrix comment these findings potentially have important implications for the evidence base necessary to support decision makers.

5 Discussion

The overall aim of the cost impact project was to develop NICE's approaches to cost effectiveness and cost impact to better inform local decisions about disinvestment and support the business case for investment in public health.

The proof of concept set out to examine current practice and explore and test other methods for assessing the cost effectiveness and cost impact of public health interventions and to determine the feasibility of delivering the stage one objectives outlined in section 1.2. This section discusses each objective in turn and highlights the issues which have significant implications for NICE's current methods regarding public health.

The overall conclusions and recommendations for changes to NICE's methods of cost effectiveness and cost impact are set out in section 6.

5.1 *Objective 1: A specific QALY (or ICER) for each intervention being recommended. This would probably be in the form of a range rather than a single value. It would be appropriate to indicate the sensitivities that determine the range.*

To address this objective we undertook an analysis of NICE's public health recommendations and its current approach to assessing the cost effectiveness of public health interventions. We considered whether a specific ICER can be calculated for each intervention recommended taking into account the feasibility and usefulness of doing so as well as the method of calculation. We also considered issues relating to reporting a range of values.

5.1.1 Current situation

Our analysis of NICE public health recommendations showed they can be grouped into two broad categories: those concerned with specific interventions and those concerned with the factors considered to be important to the successful delivery of interventions such as partnership working, training, needs assessment, adequate

service provision, policy and strategy development (termed facilitating recommendations).

So far, CPHE has assessed the cost effectiveness of only specific interventions. Even then, only a limited number of the recommended interventions within a given piece of guidance will have been the focus of economic analysis. The cost effectiveness of facilitating recommendations or actions has rarely if ever been assessed.

ICERs for specific interventions

One of the difficulties in providing an ICER for every intervention recommended is that a published piece of guidance can contain many different interventions. The economic literature rarely covers the interventions of interest, so in most cases it is necessary to undertake economic modelling. Given the resources available, it is not possible to assess all the interventions recommended. Nor is it possible to consider them in all situations and settings or being delivered by all possible interveners. Instead, a selection of which interventions to model, and under which circumstances, must be made. The CPHE methods manual states that the selection should be based on a systematic consideration of the potential value of carrying out an economic analysis across all interventions.

To further complicate matters the elements comprising an intervention may be split across several recommendations and/or actions and a recommendation may reflect an amalgam of different interventions. In other words, there is rarely a direct linear relationship between an ICER calculated for an intervention and a particular recommendation, which means that an ICER cannot be attached to an individual recommendation (in most cases).

A paucity of information may also make it difficult to produce an ICER. For example, some recommendations specify that interventions should be tailored according to the individual. In the absence of sufficient detail on the precise content of tailored interventions, it is difficult to cost them and consequently produce associated ICERs.

Some recommendations specify that different groups of professionals should deliver the same intervention. This poses a number of challenges to calculating ICERs. For

instance, this ‘scattergun’ approach can lead to an individual receiving an intervention, such as brief advice, several times in several different settings. Repeating interventions in this way is likely to impact on both costs and efficacy. So far, these impacts have not been considered in our analyses of cost effectiveness. Modelling has tended to focus on those who would typically carry out the intervention based on the source of evidence and committee suggestions.

Range of values

Most, if not all, of the public health economic evaluations report a range of values rather than a single ICER. There are two main reasons for this.

The first arises from the fact that few parameters in public health economic analyses are known with any high degree of accuracy. To address this uncertainty, sensitivity analyses are used to explore the impact of varying assumptions on the findings.

The second concerns the nature of public health interventions and associated delivery mechanisms. The value of an ICER for a specific intervention will depend on a variety of factors including who delivers the intervention, the setting in which it is delivered and the number of different groups targeted by the intervention. For example an intervention that costs £5 when delivered by a school nurse might cost £25 if delivered by a GP in primary care. This difference in cost could result in vastly different ICERs.

The characteristics of those targeted by the intervention such as age and gender can also lead to differences in the value of an ICER. In addition, some interventions have multiple target groups such as children and their parents. This raises the question as to who is receiving the benefit and thus will have an impact on the associated QALY and calculation of the ICER.

The framing of the recommendations can also present a difficulty in reporting an ICER for each intervention. To assist with implementation, interventions may be ‘deconstructed’ so that important elements can be specified and actions identified for different providers in different settings. For example, a mass media intervention which has been identified as cost effective might lead to the development of several recommendations around campaign development, campaign messages and

campaign strategies. Although the cost effectiveness of the individual elements may not have been assessed, the package as a whole will have been.

The issues noted above raise important questions about the extent to which the guidance documents and recommendations, as currently written, lend themselves to good ROI information or whether they need to be written very differently.

It is interesting to note that while technology appraisal guidance commonly starts with the intervention that is to be assessed, public health guidance instead starts with the condition/behaviour that we wish to change. The consequence of this is that much of the development time for public health guidance is taken up assessing which interventions could potentially affect said condition/behaviour and not the assessment of the cost effectiveness of the intervention. As a consequence the time to develop a bespoke model is shorter and the result is that not all of the interventions can be assessed. A move towards a more strategic approach with packages of specific interventions being identified from the outset could lead to a process that more closely resembles that of technology appraisals and clinical guidelines. However, this assumes that as a first step in the process of prioritisation the 'problem' has been clearly specified along with the population who has it, the contributory factors and which of these are the most effective in tackling the problem. This applies to any pathway/programme whether clinical or behavioural or other topics.

ICERs for facilitating recommendations

The difficulty in providing ICERs for facilitating recommendations is primarily a function of the way in which such recommendations are developed, although there is probably an absence or paucity of data too.

As noted earlier, facilitating recommendations tend to be concerned with the factors that might be expected to influence the effective implementation of the intervention. For example, in order for a particular intervention to be delivered effectively, professionals must have the appropriate knowledge and skills to deliver what that intervention entails (for example in delivering smoking cessation support practitioners should, for example, know how to calibrate CO monitors and correctly interpret the readings). Typically, facilitating recommendations emerge through a

synthesis and discussion of the evidence which includes expert papers, expert testimony and a review of facilitators and barriers. In other words, they are developed after the reviews of effectiveness and cost effectiveness have been completed. Nevertheless it is possible that the cost effectiveness of facilitating recommendations could be explored should more resources become available.

5.1.2 Conclusion

Returning to the original objective of calculating an ICER for every intervention recommended, lack of data, poor quality data and limited resources mean that it is not always feasible to do so. Currently, the problem of limited resources is dealt with pragmatically: where multiple interventions are recommended within a single piece of guidance the CPHE methods manual provides a list of criteria that should be applied to decide which interventions should be modelled. A lack of data, or poor quality data, may be dealt with through the use of a break-even analysis which estimates the effect size that would be needed in order for an intervention to be cost effective. Uncertainty around the key parameters of an intervention is dealt with through the use of sensitivity analyses.

5.2 Objective 2: An indication of the cost impact of implementing the recommendation at local level and Objective 3: The quantity of savings that will accrue in the short, medium and long term as a consequence of implementing, in full or in part, the recommendations at local level

These two objectives are considered together, as cost impact typically encompasses estimating both the costs and savings to arrive at a 'net' impact. To address them we analysed the current approach to assessing the cost impact of public health interventions and where necessary, aspects of the assessment of cost effectiveness. In addition, the review of existing ROI methods and tools, testing of the methods and interviews with commissioners and decision makers informed these objectives.

5.2.1 Current situation

Cost-effectiveness modelling typically takes a long-term view and the output is usually in the form of cost per QALY. This does not explicitly provide an indication of

the quantity of costs or savings that will accrue.

In previous sections a distinction was drawn between two groups' recommendations: those concerned with interventions and those concerned with facilitating factors.

Whilst the assessment of cost effectiveness has so far focused on interventions, the costing work takes into consideration any recommendations that are likely to have significant costs (that is exceed £1million) so may include facilitating recommendations (for example training and staff recruitment) as well recommendations about specific interventions.

Cost impact estimates (where available) are produced to support financial planning and take a 3–5 year time horizon, which is typically the extent of financial planning in the NHS (similarly the Treasury's Strategic Review of Budget process being a 3 year process). Cost impact estimates tend to present all costs at current values.

Appendix B provides a summary of existing costing tools and these have been developed to provide the best information possible with the resources available. One constraining factor is time available as the current process means that developing costing tools usually starts when draft guidance is available for consideration and this doesn't leave very long before publication of final guidance when the costing tools are also published.

With regard to the current approach, the business case for implementing the recommendations is dependent on being able to quantify the cost estimate for organisations and the time horizons over which savings are quantified. This is considered more fully in the section 5.3 below.

As discussed in section 2.4.2, interventions that are equally cost effective can have a vastly different cost impact. This could be due to differences in the size of the population affected by the intervention or differences in timing of costs and benefits. Some topic areas that CPHE produces guidance on have little, if any, possibility of producing a short-term return. For example an intervention aimed at reducing obesity in pre-teens is unlikely to see any return in the short term as these children may not

be taking any significant resource out of the healthcare system for a substantial number of years. Therefore any calculation of a return for these interventions will only be realised over the long term.

The likelihood of financial pressures on the NHS (£15–£20 billion productivity savings over the next few years) and the pressure on organisations to meet financial targets and break even, or plan for a small surplus each year can be expected to encourage a short-term view with respect to investment in services. Decision makers are looking at investing where the pay back period is less than one year. This is despite a number of reports (such as Wanless 2004) that forecast much greater healthcare need if public health issues such as obesity, smoking and physical activity do not see improvements.

To enable better measurement and quantification of costs and savings first we need to define what short-, medium- and long-term are and apply these consistently. For this report we define these as follows:

- Very short: less than one year
- Short: 1–3 years
- Medium: 4–10 years
- Long: over 10 years up to lifetime.

These definitions need to be checked with commissioners to see if they are reasonable, and to be refined based on feedback.

The usefulness of providing information on costs and savings beyond 5 years for the initial objective of assisting with financial planning should be explored. This is beyond the timeframe normally considered when setting budgets for future years. Also, the further into the future you forecast the less certainty you have in the forecast's accuracy. The likelihood also increases that other initiatives or research or changing priorities will impact upon the recommendations.

The above issues raise an important question about the time horizon for the cost-

effectiveness analyses and whether different time horizons should be included to mirror the time horizons adopted in cost impact assessments.

The analysis of the timing of the costs and benefits of the ten interventions modelled showed that none yielded cost savings or health gains in less than 7 years. The workshops with commissioners and decision-makers revealed a preference in the current economic climate for data relating to short-term outcomes that might demonstrate savings. Suggestions included reductions in hospital admissions and bed days. The research with decisions makers and commissioners also suggested there may be a role for providing information and support regarding cost effectiveness and cost impact.

The perspective adopted in the analysis of cost impact is an important consideration; a decision-maker may focus on the costs and benefits to their organisation only when there are wider implications for other sectors. For example, an intervention aimed at reducing drug use in young people could indirectly benefit the criminal justice sector through reducing drug-related crime, resulting in costs for the education sector, that are more than outweighed by benefits in the criminal justice system. A review and discussion of these issues can be found in a paper by Claxton and colleagues (2010).

As noted earlier in section 2.3.2 it is disappointing to not be able to quantify the national cost impact for all guidance produced to date. This is due to a number of factors:

- Lack of data to establish what activity is currently taking place
- Uncertainty regarding the population affected by the guidance – particularly overlapping populations where someone may fall into two or more target groups
- Difficulty in establishing a clear link between the evidence base and recommendations made.
- Lack of clarity/consensus to be able to forecast how services and activity levels may change following implementation of the guidance. Sometimes

this is due to different ways in which local services may choose to implement recommendations. This is particularly true for guidance that provides underpinning principles that may apply in a wide variety of settings or situations such as behaviour change or community engagement.

- More detail is needed on what the specific facilitating factors are for each intervention. Many of the recommendations recommended the provision of adequate services, the training of staff, and the linking with relevant partners or the carrying out of a needs assessment. These aspects have a fundamental impact on the overall costs of implementing the recommendations and any associated benefits but the lack of specificity makes it difficult to quantify the costs. What, for example, is meant by 'adequate services'; is that more than the current level of provision? If staff are to be trained, which staff and what type of training should be included in the costs?
- Uncertainty regarding the consequences of implementation. Although there are reasonable estimates of the cost impact of smoking-related diseases, estimating the impact of the guidance on the potential number of cases of diseases avoided – what they will be, what level of avoidance, and when – is difficult to quantify with any degree of certainty.
- Many recommendations ask for multiple sectors and practitioners to intervene. This can raise several issues for the calculation of any potential return on investment. Should everyone mentioned in the recommendations be trained or should only the group that delivers the biggest return be trained? In addition, the more individuals that are trained to deliver the intervention the greater the cost of training, which means the effectiveness needs to be much greater to realise that return.
- There are also potential problems in assessing the cost impact of an intervention when the target population is not adequately defined or where it is difficult to determine. This can occur, for example, when the resources needed to deliver the intervention are costed on the basis of delivering it to all those under the age of 18 but only a section of this population will

ever actually receive the intervention. In this example, the costs may outweigh the benefits.

- Ensure committees decide which specific sectors, the organisations within those sectors and the personnel within those organisations are best placed to take action.

As noted previously, in some instances it may be possible to provide estimates of the impact of some of the above uncertainties through the use of sensitivity analyses.

5.2.2 Conclusion

There is potential for cost impact methodology to be refined and improved to provide more detail for local organisations on sectors and timing of costs and savings. The provision of data on the quantity of savings that will accrue in the short-, medium- and long-term as a consequence of implementing, in full or in part, the recommendations at local level would be greatly assisted by the proposed changes to the current approach to assessing cost effectiveness. However, it is likely that there will still be occasions when estimating the cost impact of recommendations with any degree of accuracy is not possible.

5.3 Objective 4: The business case for implementing the recommendations

The aim of a business case is to convince a decision maker that it is in their best interests to invest in a certain intervention. They can be highly detailed and structured or they can be very informal. It should ultimately present a well thought through proposal that takes into account the important issues and provides the decision-maker with all of the information that they need to make a decision.

The elements that make a business case are ultimately driven by the information that is available. However, it is likely that there are certain elements that should be included (Melendez 2008):

- An analysis of the potential scenarios – that is the anticipated project benefits in terms of not only what is the ‘most likely’ outcome, but what are the best and worst case scenarios.
- Defining and linking each action with a benefit
- Identifying a performance indicator
- Stating the risk of not investing
- Making explicit how investment in the intervention is in line with the organisation’s strategic goals.

In developing the business case it is also important to bear in mind the impact of implementing the intervention, particularly in terms of the inverse care law where the availability of good medical care tends to vary inversely with the need for it in the population served (Hart 1971). The acceptability of the intervention, its impact on different groups within the population and other sectors also warrant consideration.

5.3.1 Current situation

Taking each of the elements above in turn:

5.3.1.1 Analysis of potential scenarios

There are obvious parallels here with Objectives 2 (cost impact) and 3 (cost savings). Any business case for implementing the recommendations is dependent on being able to quantify for organisations the costs incurred and savings that arise from implementing interventions and the time horizons over which they occur. Much of what is done during economic modelling provides a basis from which potential scenarios can be presented. The sensitivity analyses can provide a basis from which the ‘average’, ‘best’ and ‘worst’ case scenarios can be presented to the decision-maker. These are already done when the QALY values are calculated for the committees.

Decision makers are able to alter certain assumptions within the costing tools. For example, within the costing tool for smoking in the workplace, employers were able to adjust the possible future smoking rates within their workforce and the rate of intervention uptake. It would be relatively easy to amend the tool to include the range

of effectiveness rates that committee considered and therefore provide the decision-maker with the average, best and worst case scenarios.

5.3.1.2 Defining and linking each action with a benefit

In order to provide a solid business case the decision-maker must be able to see the benefit arising from each of the actions invested in. Implicitly this element lies within several documents that are produced by NICE. The business case/costing report, links back to the guidance document, which contains the recommendations and the considerations of the committee. The guidance document then links back to the evidence which informed the committee's decisions. It is within the evidence reviews and the guidance documents that these links between the action and the effect exist. All that is needed is the bringing together of these elements within one document.

5.3.1.3 Identifying a performance indicator

For certain pieces of guidance the provision of a key performance indicator can easily be provided to a decision-maker, for example a reduction in the number of employees who smoke. This then enables the decision-maker to progressively monitor the success of their investment. Due to the very nature of the area that we work within, proxy indicators are frequently available. At present, our guidance and costing tools do not make explicit the proxies that could be used as performance indicators. However as this information is captured in the reviews of effectiveness it would be a relatively straightforward process to include suggestions in future business cases developed by NICE.

5.3.1.4 Stating the risk of not investing

Within the costing reports and the public health need and practice section of the guidance we outline the preventable burden of disease (of the 'condition') and the associated costs to the NHS and/or wider public sector. We also state in business cases, such as smoking cessation in the workplace and long-term sickness what these issues are likely to be costing an employer. This works well when making the case to a decision-maker who works within the sectors highlighted. However, what we need ensure is that we align the risk of not investing so that it chimes with the decision-makers we are trying to influence who do not have any obvious risk.

5.3.1.5 Aligning the proposal with the organisations strategic goals

One of the key elements is the alignment of any proposal with the decision maker's /organisational strategic goal. Failure to do this, especially in time of limited resources, may result in a decision-maker choosing not to invest. When developing the recommendations within CPHE we come from the point of view of who is best placed to intervene and do not often consider why that person would be motivated to intervene.

The recent alcohol guidance recommended that in addition to the health service, professionals within the criminal justice system, social services and other public services should screen and deliver brief interventions. However, the costing report focussed on the introduction of screening and brief interventions within primary care. In addition, the public health need and practice and consideration sections (which are not in the QRG) do not themselves provide a solid rationale as to why sectors outside of health should invest. It is almost assumed that they will commission these interventions because it is the 'right thing to do'.

Precise rationales have been provided for certain pieces of public health guidance. The implementation of the smoking in the workplace guidance and long-term sickness guidance would all have saved the health service money. However, the case put to the funder (the employer) was that by implementing these interventions they could reduce absenteeism and therefore improve their bottom line. The business case was targeted and spoke to the decision-maker we wished to engage with. They were excellent examples of tailoring the proposal to realise the outcome desired.

Although we do not know how the guidance was received in these other sectors, it seems reasonable to assume that in times of restricted resources, interventions that were not deemed to be core business were not invested in. There may be cases where savings across the public sector formed part of an organisation's strategic goal. However, when faced with tight budgets, decision makers may first look at their own costs and discount those outside of their sector (Trueman 2001; Byford and Raftery 1998).

5.3.2 Considerations

In order to determine what changes are needed to develop a business case we need to know the take up rates of our recommendations. Despite the absence of this knowledge it is clear that a business case provides a rationale for investment that would only strengthen the case for the implementation of our recommendations.

To date the business cases that have been produced have been targeted at employers and the financial savings that they can realise. However, it may be appropriate to develop several different business cases for single pieces of guidance. To give an example, the potential for this was highlighted at the IDeA workshop. A situation was described where a private sector representative went away following a council meeting on domestic violence and convinced his company to invest in this area. His motivation was not to reduce health and social service costs, but to reduce absenteeism in his female employees.

In this situation NICE could develop several business cases. For employers of women, particularly those at risk of domestic violence, the business case is reduced absenteeism and thus reduced operating costs. For those working in social care, the case could be built around ultimately reducing their workload by taking these cases out of the system. In the health sector it could be built around reduced mental health care costs in the future.

All of the scenarios outlined above have an ultimate goal of reducing costs. However, the development of a business case need not be restricted to realising cost savings. For example, the recently published NHS White Paper proposes an allocation formula for the ring fenced public health funds which will include a new 'health premium' designed to promote action to improve population-wide health and reduce health inequalities. Thus, a business case could be built around the strategic aim of reducing health inequalities.

For example, an organisation working in the social housing sector, which is linked to the local authority, may be reluctant to implement smoking cessation guidance as the financial savings will accrue primarily within the health sector. However, it is well known that smoking rates are a major contributor to health inequalities. Smoking is also a significant cause of house fires. Therefore if the business case for

implementing the guidance was presented to the housing association as a means of contributing towards the local authority's goal of reducing health inequalities and reducing the costs of dealing with house fires, it may result in a different response and an investment in smoking cessation services.

Much of the information that is needed to produce a business case exists amongst the different documents produced by NICE. It is possible therefore to bring these elements together in order to produce a business case. There are of course instances where the data is sparse and as a result it may not be possible to provide a detailed proposal. Key to providing a solid proposal is the justification of why an organisation should invest in an area. It should not be assumed that because it costs society money and people suffer ill health that sectors will invest in order to 'help out'.

In an environment of tightening budgets we need to justify in all instances, including the health sector, how intervening in an area is in line with the strategic goals of the organisation. As highlighted above it may not be necessary to show a financial return. However, it is necessary to show a clear link between implementing the recommendations and the realisation of the organisation's strategic goals.

It should be noted that in those situations where people are already implementing interventions to achieve the outcome of interest, it is only necessary to convince them that what is recommended is more efficient (Trueman 2001). However, they may routinely need to justify ongoing investment in an area. In these situations it would be prudent for a supporting business case to be provided.

5.3.3 Conclusions

The development of a business case(s) has so far been undertaken on an ad hoc basis and usually when the main audience for the guidance is an employer. The development of a business case for every piece of public health guidance is likely to have significant process and resource implications for both CPHE and the costing team. For example, it will require the identification and collation of additional information as well as the development of new documents which would ideally be developed in consultation with the end users. Therefore it is necessary to assess whether it is feasible prior to implementing any of the changes highlighted below

(see section 6). However, the development of a business case should be an integral part of CPHE's work, particularly in an environment of decreasing budgets.

5.4 *Informing local decisions*

The overall aim of the cost impact project – to better inform local decision making – was addressed primarily through the workshops and interviews with commissioners and decision-makers and the review and testing of existing methods and tools. That said, the analysis of NICE's current methods for public health also made an important contribution.

5.4.1 Current situation

As noted earlier, the limitations of using CUAs to assess the cost effectiveness of public health interventions are well documented: these include the QALY, perspective, time horizon, discounting, health inequalities and equity. Comparators and lack of knowledge about current practice, paucity and quality of data and the complex nature of such interventions were also noted for the serious challenges they pose for economic evaluation. Perhaps not surprisingly the recent reviews of the literature on economic evaluations of public health interventions found that relatively few studies applied a CUA (27% of studies in the review by Drummond et al. 2007 and 14% in the review by McDaid and Needle 2006). These findings are consistent with the workshops and interviews with commissioners and decision-makers and the review of existing ROI methods and tools which found a wide range of criteria and ROI methods in use for supporting local decision-making.

Taken together, the analyses showed that commissioners and decision-makers require a range of different information relating to public health interventions including the direct, indirect and tangible costs and benefits, regardless of sector, presented over the short-, medium- and long-time horizon and which, as far as possible, are quantified and reported in a disaggregated format. The provision of outcomes in natural units and indicators of value for money in the short-term (for example reduction in bed days) was also considered to be very important in the current economic.

As noted by other authors, the information required for decision-making may be

better tackled by undertaking a cost consequence analysis (CCA). Not only would this help to address the narrow focus of the current approach (that is, CUA), it would also provide the necessary data for calculating a range of ROI metrics. As we saw from the review of literature and research conducted by Matrix, a range of ROI metrics are in use and decision-makers do not appear to favour one method over all others. On a cautionary note, there was an indication that the metrics may not be that well understood. In addition, care will need to be taken in deciding which metric(s) to use as the research indicated that the different methods for assessing ROI could give rise to different decisions.

It is important to note that CCA is not without its limitations. One of the main weaknesses concerns its lack of transparency (McCabe and Dixon, 2000). In arriving at a decision, McCabe and Dixon note that the decision-maker has to *implicitly* weigh all the different impacts and relate these to the costs, and then decide which interventions represent the best value. In addition, the values that drive the decision will be the decision-maker's values which may or may not reflect the values that society would wish to be used. Interestingly, the ranking exercise with commissioners and decision-makers revealed considerable variations in the importance placed upon the different criteria both between individuals within a sector as well as across sectors.

The review identified a number of tools that take into account of a variety of information (criteria). Although the tools varied in their complexity – for example in terms of the number of criteria included, the method of weighting the criteria and the method for combining the criteria – the vast majority were examples of multi-criteria decision analysis (MCDA). As noted earlier, MCDA techniques aim to provide rational and transparent approaches to decision-making. While MCDA appears to be a promising way forwards, further consideration of its strengths and weaknesses for decision-making and prioritising interventions is required. For example, issues such as which factors should be included in the analysis, the weighting of the factors, how the factors should be combined and how to avoid double counting need to be explored.

5.4.2 Conclusion

Returning to the original aim of better supporting local decisions about investment in public health, it is clear from the research that decision makers prefer to draw on a range of criteria when making investment decisions. It appears that our current methods are insufficient for this purpose and additional methods and metrics will need to be introduced.

The results of the interviews with commissioners and decision makers showed that the majority were reluctant to base their decisions on cost effectiveness alone. The ranking exercise revealed considerable variations in the importance placed upon different criteria by different decision-makers both within and across sectors. There is little evidence on how decision-makers trade off different criteria.

MCDA could be an important tool towards achieving a more rational priority setting process. There are various approaches to MCDA and these are mainly characterised by the criteria included in the MCDA and the methods used for measuring and weighting the criteria. Further work is required to assess its strengths and weaknesses. As cautioned by others, we endorse the notion that MCDA should not be seen as a formulaic approach to priority setting, but rather as an aid to decision-making.

6 Overall conclusions and recommendations

As we have seen through detailed analysis and consideration, the objectives of this paper have a bearing on NICE's methodology for assessing cost effectiveness, how we present cost-effectiveness evidence to our committees, how we link cost-effectiveness analysis and cost impact, and the development of a tool to support local decision making. While the preceding section discussed the findings in relation to the overall aim and discrete objectives, the section below considers the impact of the findings on the processes of the CPHE and costing teams and sets out a number of key recommendations.

6.1 *Key recommendations*

Recommendation 1 To support the work of NICE committees and the cost impact team, undertake cost–consequence analysis (CCA) to capture the impact of public health interventions on different sectors. This should be carried out in a way that makes most sense for each sector.

Recommendation 2 To support the work of NICE committees and ensure baseline comparability across the UK healthcare sector and other NICE programmes, continue cost–utility analyses of public health interventions using quality-adjusted life years.

Recommendation 3 To support the cost impact team and meet the needs of different decision-makers and commissioners, extend the analyses of time horizons to include periods of 1–3 years and use sensitivity analysis to assess different discount rates.

Recommendation 4 To fulfil the needs of different commissioners and decision-makers, calculate a range of return on investments including net present values.

Recommendation 5 To ensure that the prioritisation of CPHE public health referrals are informed by criteria which recognise the importance of a strategic, comprehensive and integrated approach to public health. In addition, the topic selection panel that determines which topics are referred to NICE should specify

which elements of this approach would be the subject of effectiveness and cost-effectiveness analyses and return on investment considerations.

Recommendation 6 To build the evidence base for investing in public health interventions, NICE should develop a database of evidence of effectiveness and cost effectiveness. Interventions which seek to achieve the same outcome (for example, smoking cessation) should be grouped together within the database.

Recommendation 7 To support local decision making, NICE should explore other tools including methods for ranking and prioritising interventions. Examples include multi-criteria decision analyses and programme budgeting marginal analysis.

Recommendation 8 NICE should initiate cross-government discussions to establish thresholds that determine the cost effectiveness of public health interventions from the perspectives of the public sector and wider society.

6.2 *Method for assessing cost effectiveness*

6.2.1 CUA-CCA

The main method adopted by NICE for assessing cost effectiveness is CUA. Given the need to ensure baseline comparability across the UK healthcare sector and across NICE's programmes (that is technology appraisals and clinical guidelines) we propose that the cost per QALY continues to be one of the main methods. However, given the considerable challenges of applying this method to the evaluation of public health interventions, we propose it be supplemented with additional measures, in particular CCA and CBA. This proposal is consistent with the findings of several reviews of the different types of economic evaluation employed in published studies. It also captures the types of information used by decision-makers as the basis for resource allocations.

The CCA will enable a number of cost-effectiveness measures to be calculated including a CUA, CBA, LYG and so on. Within a CCA approach, a table can be used to present estimates of the intervention's impact on lifetime resource use and costs and health- and non-health outcomes and externalities for an individual or group. Presenting the impact of an intervention on multiple outcomes in a disaggregated

format will help the local decision-maker (or commissioner) to select the components most relevant to their perspective. It will also provide the NICE committees with an overall view of the stakeholders who stand to incur costs and accrue benefits arising from the intervention under consideration and support the work of the costing team.

It is clear that the consideration of cost effectiveness is an important part of the decision-making process for both NICE committees in deciding what to recommend and for local decision-makers in deciding what to invest in. However, views differ on how this criterion should be expressed. As noted earlier, the main method used by NICE is cost-utility analysis which expresses the benefits of an intervention in terms of quality-adjusted life years. However, the review of published literature and the workshops with commissioners and decision-makers suggests little use and little understanding of this metric.

A CBA, typically using net present values, was one of the main alternatives identified for assessing cost effectiveness. It is also the main method used in some sectors, for example, the Department for Transport advises the use of NPV in the assessment of transport interventions. By monetarising the [health] benefits of an intervention and weighing them against the expected costs, a CBA more closely mirrors the objective of assessing cost impact. By contrast, cost/QALY gives a measure of the cost of health gain.

While not solving the challenges associated with applying CUA and the current CPHE reference case to public health, we propose CPHE makes its impact explicit/transparent through introducing a number of sensitivity analyses in the process and supplementing CUAs with CCAs and with other measures of cost effectiveness such as NPVs.

6.2.2 QALY

With its focus on quality of life in terms of health we recognise the need to consider other measures for capturing the wider benefits associated with public health interventions. Measures of subjective wellbeing are one such example and attempt to offer a more direct and accurate way of assessing how health states impact on the lives of those most affected by different health conditions (Dolan 2009). These measures are one of the elements to be considered in phase 2 of the cost impact

work.

It is important to note that the QALY provides an indication of the health benefits for the 'patient' (or individual). Consideration needs to be given to if, and how, the health benefits to others (for example the carers) can be taken into account alongside (that is added to) the benefits to the individual recipient of the intervention. This aspect is particularly pertinent in economic analyses which take a broader perspective than just the NHS/PSS (see below).

6.2.3 Discounting

In the case of discounting, currently an annual rate of 3.5% is applied to costs and benefits and an annual rate of 1.5% for health benefits and 3.5% for costs applied in a sensitivity analysis. We recommend that the differential rate be reported alongside the uniform rate in the CUA as standard practice. We also recommend CPHE explores the impact of a range of other rates including a zero rate for years one through to five to provide consistency with the approach adopted by the costing team and a discount rate which declines over time. Collection of these data may also help inform the debate about the discount rates used in economic evaluations. They might also encourage investment in health interventions where benefits take time to accrue (Severens and Milne 2004).

6.2.4 Time horizon

The time horizon is chosen to ensure all important costs and effects are captured and in public health, in most cases, this has been a lifetime horizon. This is in striking contrast to the commissioning cycle which is undertaken on a yearly basis. Even under World Class Commissioning where commissioners are encouraged to consider investment over a longer period of time (approximately 5 years) it is still considerably less than the time horizon adopted for CE analyses. We therefore propose that our cost-effectiveness analyses routinely report disaggregated costs and benefits as well as CEAs/CUAs over the following standard time horizons: 1 year, 3 years, 5 years, 10 years, 20 years, and lifetime.

6.2.5 Perspective

Currently, NICE recommends that a public sector perspective is adopted in order to capture the multidimensional nature of public health interventions which accrue benefits and incur costs by a multiplicity of organisations across multiple sectors.

However, in the absence of a generic measure of benefit that applies across all sectors and a threshold which applies across all sectors, it is difficult to judge the cost effectiveness of such interventions. In addition, our current approach to adopting a public sector perspective has resulted in the production of cost-effectiveness estimates which are limited in the extent to which they can be compared.

For the purposes of ensuring baseline comparability, we recommend that public health interventions are assessed from the perspective of the NHS/PSS perspective as well as the public sector and for both to be reported as standard practice. The former will allow direct comparisons to be made with QALYs as the key measure of success.

In addition, with the new commissioning framework and the introduction and location of ring-fenced budgets for public health within local authorities we believe it makes sense to assess specific payer perspectives (Byford et al. 2003). This will also help with the development of the business case for different audiences. In addition, we also recognise the importance of a societal perspective and the need to include all potential health and non-health effects (including productivity analysis), both positive and negative, as well as all costs (Jonsson 2009).

Given that the sectors impacted by individual interventions are likely to differ we agree with the importance placed by Claxton and colleagues (2007) on identifying the costs and benefits from the perspective of all 'stakeholders' necessary to deliver the intervention. We also note there will be examples where the costs and benefits fall on different sectors as was the case with guidance on school-based interventions to improve social and emotional well being. In this example, the education sector incurred the costs but the health sector was the main beneficiary.

In keeping with our current methodology, a broader societal perspective will continue to be adopted but only where necessary (for example in guidance on how to help people back to work after sickness absence, the benefits of any increased production resulting from their earlier return to work were taken into account).

Comparators and current practice

We propose some assessment of current practice be undertaken in order to have suitable comparators, primarily through additional research which could include consultation with, or inclusion of, practitioners on the committees. An assessment of current practice could be carried out up front in the guidance development process – perhaps as part of scoping work or as part of the topic referral process. This would also assist any subsequent cost-impact assessment. This benefit will, however, depend on being able to quantify current practice with regard to the specific intervention under consideration.

6.2.6 Additional challenges

A number of other challenges were noted in section 2.4.1 including individual and population approaches, health inequalities, equity and efficiency, wider benefits, and thresholds relating to inter-sectoral costs and benefits. Many of these constitute important methodological developments which have been the subject of much research and debate already. It is beyond the current resources of CPHE to undertake primary research on these issues, but they are mentioned here as an acknowledgement of their importance.

It is also our view that a number of the issues noted in section 2.4.1 relate to the criteria that are considered important for prioritising investment in public health interventions such as national and local priorities, health inequalities, equity and efficiency. As such we believe these types of criteria are best captured in the tools that are developed to support local decision making.

Paucity and quality of data

To address the paucity and quality of data, NICE should continue to encourage research councils to fund research on the cost effectiveness of public health interventions. In addition, where submissions are made to research only the efficacy of interventions, the research councils should encourage, or even require, applicants to include an evaluation of the cost effectiveness of the intervention. Budgets permitting, evidence on the potential differential impact of interventions on subgroups of the population should be collected.

Health inequalities, efficiency and equity

Attempts to resolve the dilemma of tackling health inequalities and maximising health gain have focussed primarily on the application of equity weights. The research literature indicates these may be applied either after estimating the cost per QALY or incorporated directly into the cost-effectiveness analysis. The former could include raising the threshold at which interventions are considered cost effective for different sub groups of the population (Wailoo, Tsuchiya and McCabe 2007).

Because economic evaluation is founded on the principle of opportunity cost, Wailoo and colleagues state that care must be taken to ensure the benefits foregone by some groups are captured as well as the additional costs associated with any intervention for the intended recipients. They also argue that, within a limited budget, equity weights must be neutral across the population to which the budget applies: “Therefore the incorporation of weights into decision analysis must be prepared to apply weights which downgrade the health benefits in some populations as well as upgrade them in others.” Wailoo and colleagues identify a number of technical issues which they conclude need to be addressed in order for equity weights to be incorporated in economic evaluation.

According to the inverse care law, the availability of good medical care tends to vary inversely with the need for the population served (Tudor Hart 1971). So it could be argued that greater investment is needed in services that target those groups who most need them. Irrespective of the methods deployed to address this issue, it is important to ensure that the information and support provided is consistent in quality

across the population and that interventions are provided where they are most needed.

In 2005, NICE and the Department of Health agreed to co-fund two research projects to investigate the social value of a QALY. Both of these finished in 2008. The reports of the projects are available as follows:

- The relative societal value of health gains to different beneficiaries (Dolan)
www.haps.bham.ac.uk/publichealth/methodology/projects/RM03_JH11_PD.shtml
- What is the value to society of a QALY? (Donaldson)
www.haps.bham.ac.uk/publichealth/methodology/projects/RM03_JH12_CD.shtml

At present, CPHE does not have the resources to undertake primary methodological research in this area. However, our endeavours to increase the quality and quantity of research, particularly on the differential impact of interventions on sub groups of the population, should help to contribute to this important issue.

6.2.7 Recommendations for CPHE methods

In summary, we propose the following changes to the methods deployed by CPHE:

- Undertake cost-consequence analysis (CCA) prior to CUA, CBA, CEAs.
- Time horizon: 1 year, 3 years, 5 years, 10 years, 20 years, lifetime.
- Annual discount rate: 3.5% costs and benefits; use sensitivity analyses to assess the impacts of a range of other discount rates including 1.5% benefits and 3.5%, decreasing the discount rate over time; zero discount rate for years one through to five.
- Perspective: NHS/PSS as well as public/multi-sector as standard; adopt societal perspective where necessary.
- Sensitivity analyses (one-way, multi-way, probabilistic) should continue to be undertaken to test whether different assumptions lead to different conclusions regarding cost effectiveness. The description of the

justifications for parameter ranges should be sufficient to allow meaningful comparisons to be drawn from the sensitivity analyses.

- The assessment of effectiveness and cost effectiveness should continue to focus on interventions and which are defined in section 4 of the NICE scopes for each piece of guidance.
- Extend health economic models in order to provide estimates of events avoided and savings over different time periods to enable better estimation of cost impact.
- Ensure sufficient time is made available for modelling recommended interventions, especially if the current process of selecting interventions to be modelled occurs after completion of the review of evidence and committee decisions regarding which interventions to model.
- Where appropriate, incremental analyses of interventions should be undertaken. Currently, CPHE recommendations include groups of interventions which are similar in type and seek to influence the same outcome such as brief interventions for smoking cessation. They also include groups of interventions which differ in type but seek to influence the same outcome such as mass media campaigns, fiscal measures and behavioural and pharmacological interventions for smoking cessation. Differences in the methods for assessing the cost effectiveness of these interventions and differences in comparators (for example 'do nothing', usual care, best practice) has meant that these interventions have not been assessed to determine the optimal intervention. Ideally additional analyses would be undertaken to enable these different interventions to be ranked according to their effectiveness on the basis of securing maximum effect.
- Collate data during the assessment of effectiveness and cost effectiveness to support the assessment of cost impact assessment and to provide data for relevant criteria (including rankings) in the multi criteria decision analysis.

- Clarify and systematise what is assessed in a cost-effectiveness analysis (that is efficacy- and effectiveness-based interventions).
- Undertake further research on ROIs across different topics and conduct more assessments of the views of decision-makers in order to progress work on MCDA.
- Undertake further investigation of the application of programme budgeting and marginal analysis.
- Create database of monetarised benefits and costs (for all sectors which incur costs and/or accrue benefits).
- Undertake assessments of current practice and costs. Consider the feasibility of assessing the benefits of current practice.
- Initiate exploratory discussions with relevant government departments regarding the value of outcomes arising from public health interventions and possible thresholds for determining cost effectiveness.
- Explore ‘universal’ measures of benefit such as measures of subjective wellbeing.
- Assess the feasibility of assessing the incremental cost-effectiveness of interventions which seek to achieve the same outcomes (for example different approaches to reducing problem drinking).
- Explore the feasibility of assess the effectiveness and cost effectiveness of a sample of facilitating recommendations.
- Ensure as a minimum, interventions are described according to the factors set out in the table 21 below.

Table 21 Intervention description

Who	Whose health specifically are you targeting?	For example children aged 10 to 16 years old; South Asian adults aged 25 to 40 years old
What	What are the health	For example encourage abstinence,

	outcomes? (What are you trying to do?)	condom use
	What kind of intervention do you want to be delivered?	For example information provision, advice, education, walking schemes, pharmacotherapy
	What interim outcomes are you hoping to achieve through the intervention (What modifying factors are you trying to change?)	For example knowledge, the availability of services
How	Which organisation(s) should provide the intervention? This should be as focussed as possible	For example NHS, local authority, Criminal Justice
	Where should the organisation deliver the intervention? This should be done for each organisation	For example primary care, A&E, young offender institutes
	Who specifically should deliver the intervention?	For example GP, practice nurse, probation officer
	How should it be delivered?	For example one to one advice, small media (leaflets), groups
	How long should the intervention take	For example 5 to 15 minutes, five 1 hour sessions
	How often should it be given	For example once a week
	Over what period	For example over 4 months

Source: Ellis, Morgan, Owen and Jones (unpublished)

6.3 Cost effectiveness and developing recommendations and guidance

According to our current methods, NICE's committees assess cost effectiveness prior to, and independently of, the assessment of cost impact and resource

allocation. The rationale for this is that interventions of similar cost effectiveness can have vastly different cost impact. This can happen, for example, when there is a substantial difference in the size of the population to whom the interventions apply. Due to variation that exists at the local level we therefore recommend the current distinction between the assessment of cost effectiveness which informs committee decision-making and the assessment of resource allocation which is the domain of commissioners' remains.

In earlier sections we drew attention to the multiple influences that are brought to bear in the local decision-making process. In order to provide a rational and transparent approach to decision-making we suggested these influences might be best captured through the use of multiple criteria decision analysis. In the context of developing recommendations, we are mindful that a number of influences or factors used by local decision makers may overlap with those considered by our committees. An example being the extent to which an intervention tackles health inequalities. Explicit identification of influencing factors during the review process should be helpful to both committee members and local decision-makers.

Additional recommendations are set out below:

- Ensure NICE public health advisory committees decide and state which specific sectors, organisations within those sectors, and personnel within those organisations are best placed to take action with rationale.
- The sector(s) which will incur the costs and realise the benefits should be clearly stated so that cross-sector discussion is encouraged and interventions that incur costs in one sector, but deliver benefits elsewhere are subject to the same consideration and scrutiny as interventions that only impact on one sector.
- Improve the specificity of recommendations to facilitate the assessment of costs.
- We need to be specific as to what sector and who within that sector is best placed to deliver the intervention.

- Provide more detail on the specific facilitating factors for each intervention. [Recommending the provision of ‘adequate’ services, the ‘training’ of staff, and ‘linking with relevant partners’ can have a fundamental impact on the overall costs of implementing the recommendations and any associated benefits.]
- We also proposed that facilitating recommendations should be captured in the form of a paragraph that would be included in the guidance template. The section would acknowledge that certain things need to be in place to facilitate the effective delivery of an intervention such as training or partnership working. Where appropriate the section would refer to CPHE cross cutting guidance for example behaviour change and community engagement.
- Resources permitting, pilot studies should be undertaken to determine the feasibility of assessing the effectiveness and cost effectiveness of facilitating recommendations.
- In the process of undertaking the CCA, where the data allows the CCA should quantify, or at least describe qualitatively, the impact of the intervention on criteria that are considered by our committees [and commissioners] for example health inequalities, population eligible, burden of disease [affordability].
- Explore the feasibility of introducing a new section in the guidance template that encapsulates the issues typically addressed by facilitating recommendations such as training, partnership working, and so on.
- Explore other ways of writing guidance documents and recommendations to ensure that the interventions being recommended are clearly identified.
- Strengthen the link between recommendations/actions and the associated interventions which have been shown to be cost effective.
- The classification of types of recommendations and actions is still under way. A broad brush [pragmatic] analysis has identified an initial set of categories but further refinements may be possible and desirable.

- Ensure the outputs from the topic selection process reflect a strategic, comprehensive, integrated approach to key public health issues. They should specify the elements within the comprehensive approach, in particular those that would be the subject of effectiveness- and cost-effectiveness analyses. This will have the added advantage of focusing attention on interventions at the topic selection stage rather than following the review of evidence.
- The results of the cost-effectiveness analyses could be used by local decision-makers to inform a further stage concerned with prioritising interventions. For example, the results of the cost-effectiveness analyses undertaken by CPHE could be combined with a variety of other criteria by local decision-makers to determine local priorities.

6.4 *Recommended changes to costing and CPHE*

- Improve measurement and quantification of costs and benefits in the short-, medium- and long-term.
- Test working definitions of short, medium and long timeframes with commissioners and decision-makers and ensure the results are applied consistently in future assessments.
- The limitations of cost-impact assessments that focus on a short- to medium-term timeframe should be clearly stated, so that it does not disadvantage those interventions that might have a larger return on investment in the longer term.
- The sector(s) which will incur costs and/or realise benefits should be clearly stated so that cross-sector discussion is encouraged and interventions that incur costs in one sector, but deliver benefits elsewhere are subject to the same consideration and scrutiny as interventions that impact on one sector only.
- Explore the usefulness of providing information on costs and savings beyond 5 years for the initial objective of assisting with financial planning.

- Assess whether there is a need to provide commissioners and decision-makers with information and support regarding cost effectiveness and cost impact.
- Raise awareness and actively support the use of NICE costing tools amongst decision-makers and commissioners.
- Improve the availability of relevant data on [baseline] current practice to support assessment of cost impact.
- Provide more clarity when describing interventions to remove some of the uncertainty regarding what to cost.
- Explore methods for forecasting the impact of implementing NICE recommendations on current practice.
- Develop a standard template for recording costs and benefits with reference to the timeframe over which they accrue.
- Explore the feasibility of adapting health economic models to provide estimates of events avoided and savings over different time periods which will enable better estimation of cost impact.

6.5 *Developing the business case*

- When developing the recommendations the committees would need to develop a rationale as to why each of the groups they are asking to take action should implement the recommendations. This rationale needs to link the intervention with the strategic goals of that group. This could take the form of a higher level recommendation/justification that sits above the more detailed recommendations on what actions should be taken.
- Once draft recommendations are developed the costing team should work with the CPHE team to source the data and develop individual business cases.
- Review a sample of the previous pieces of guidance and determine whether it would have been possible to provide each of the organisations asked to take action with a proposal that would have linked with their strategic goals.

- Where it might have been possible, review the supporting documents to see whether the data that are available would aid the development of a more detailed business case.
- Develop a detailed business case on a sample of cost-effective interventions taken from CPHE guidance documents and present to practitioners within the relevant sectors to see if the arguments would convince them to invest.
- Assess the additional time and resources required by the CPHE and costing team to develop and produce a business case including time required to consult with intended audiences and redraft if necessary.
- The business cases should to be consulted upon at the same time as the guidance.
- Assess the forthcoming public health White Paper to identify whether there are 'societal strategic goals' that relate to the groups we ask to intervene. Ensure these goals are linked to the topics as appropriate and captured in the corresponding evidence reviews.
- In the future develop a specific document which states the business case and provides the reader with all the information required.

6.6 *Multi-criteria decision analytic tool*

The overall aim of the cost impact project was to develop NICE's approaches to better inform local decisions about disinvestment and support the business case for investment in public health. The development of a tool to support local decision makers was not one of the objectives of this first phase of work. However, the research with decision makers and review of current methods for assessing returns on investment identified MCDA as a tool that could enable local decision makers to consider different courses of action when there are multiple (and often conflicting) criteria by which choices can be made and there are trade-offs associated with different choices.

The research presented earlier demonstrated that preferences differ from decision maker to decision maker and so the outcome will depend on who is making the decision and what their goals and preferences are. The potential to trade-off

between different criteria has been regarded by some as a weakness of MCDAs. However, we see this as a strength because rather than relying on an ad-hoc or historical-based approach to choosing which interventions to invest in, the aim of the MCDA is to highlight the criteria and derive a way to come to a decision in a transparent process. The means by which different criteria are weighted and combined will be a crucial element of taking this work forwards. This approach will also enable decisions to be made on criteria that are weighted to reflect local priorities

“Since MCDA involves a certain element of subjectiveness, the morals and ethics of the researcher implementing MCDA play a significant part in the accuracy and fairness of MCDA's conclusions. The ethical point is very important when one is making a decision that seriously impacts on other people, as opposed to a personal decision.”

There are many MCDA methods in use today, a few of the examples used in health care were highlighted in the work undertaken by Matrix. For instance in collaboration with Health England, Matrix Knowledge Group developed a ‘proof of concept’ tool to support prioritising public health interventions on the basis of cost effectiveness and value for money.

We envisage the development of a tool which allows commissioners to interrogate interventions in different ways. For example, decision makers wishing to commission on the basis of specific topics could access a version of the tool which organises the criteria by intervention type – be it smoking cessation, physical activity, alcohol misuse, and others (as is the case with the Matrix proof of concept). For those who wish to commission interventions to tackle particular diseases (for example reduction of CVD) the criteria could be organised by disease type. In both cases the aim of the tool would be to identify the potential impact of different courses of action. In taking this forward consideration would need to be given to whether the answer would be different depending on whether the tool was commissioned by disease area rather than by intervention type.

Conclusion

NICE's public health committees will continue to use cost–utility analysis or cost–benefit analysis to determine whether an intervention represents good value for money. However, the results of the analyses suggest a number of changes could be made to improve our current approach.

Many of the recommendations concern data that already are, or could be, collected in the early stages when assessing cost effectiveness. These data, such as the timing of the costs and benefits that arise, will support the cost impact team as well as local decision-makers and commissioners.

Based on findings from the workshops and analysis, NICE is proposing a new, three-step approach to determine the benefits and returns on investment generated by public health interventions. It should enable decision-makers to consider the short-, medium- and long-term financial consequences (including likely savings) of implementing such interventions. At the same time, it should also allow them to take into account a range of other criteria including national and local priorities.

1. A cost–consequence analysis (CCA): all the key costs and consequences would be displayed in a comparable, disaggregated form. Outcomes would be measured in 'natural' units. This would enable a 'fine grained' assessment of the intervention. It would also provide data for calculating a variety of return on investment metrics, including the cost–utility analysis in step two below.
2. A cost–utility analysis (CUA): the outcomes would be expressed in one measure that combines information on life expectancy and health-related quality of life (quality-adjusted life years (QALYs)). The cost–utility analysis would allow comparisons across different programmes, for example, prevention and treatment. (In the health sector, which has an agreed 'cost-effectiveness threshold', a cost–utility analysis indicates whether an intervention represents good value for money.) Note: cost–utility analyses are not always appropriate for a public health intervention and other methods, such as cost–benefit analysis, may be used.

3. The information gathered in steps one and two would be available to local decision-makers for them to combine with implementation costs and other details, such as eligible population size and the outcome of an assessment of local need. The resulting analysis would help them to decide which interventions are priorities.

Each step should also capture the timing of the costs and benefits – and the sectors affected.

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Appendix B Summary of costing and commissioning tools produced to support public health guidance

Publication date	Type of guidance	Guidance number	Short title	Estimated recurrent cost (£000)	Supporting materials produced
Mar-06	Public health interventions	PHI001	Brief interventions and referral for smoking cessation	5,420	Costing report and costing template. A commissioning guide has also been produced aimed at smoking cessation prior to elective surgery
Mar-06	Public health interventions	PHI002	Four interventions to increase physical activity	11,790	Costing report and costing template
Feb-07	Public health interventions	PHI003	Interventions to prevent sexually transmitted infections including HIV and to reduce under 18 conceptions	Assess locally	Costing report and costing template – to facilitate local estimation although we are not able to quantify the national cost estimate
Mar-07	Public health interventions	PHI004	Interventions to reduce substance misuse among vulnerable young people	Low cost	Costing report and costing template
Apr-07	Public health interventions	PHI005	Workplace smoking	Cost saving	Costing report and costing template for PCTs and smoking cessation service providers. Also web-based business case tool for employers
Oct-07	Public health programme	PH006	Knowledge, attitude and behaviour change	Low cost	Costing statement
Nov-07	Public health interventions	PH007	Alcohol and schools	Assess locally	Costing statement
Jan-08	Public health programme	PH008	Physical activity and environment	Cost neutral	Costing report
Feb-08	Public health programme	PH009	Community engagement	Low cost	Costing statement

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Publication date	Type of guidance	Guidance number	Short title	Estimated recurrent cost (£000)	Supporting materials produced
Feb-08	Public health programme	PH010	Smoking cessation	Low cost	Costing report and costing template – to facilitate local estimation not able to estimate nationally. A commissioning guide has also been produced aimed at smoking cessation prior to elective surgery
Mar-08	Public health programme	PH011	Maternal and child nutrition	Assess locally	Costing statement. A commissioning guide has also been produced at commissioning peer support programmes

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Mar-08	Public health interventions	PH012	Mental wellbeing of children in primary school education	Low cost – assess locally	Costing statement
May-08	Public health interventions	PH013	Workplace physical activity	Cost neutral	Business case for employers – not able to estimate nationally
Jul-08	Public health interventions	PH014	Prevention of smoking by children and young people	Low cost	Costing statement
Sep-08	Public health interventions	PH15	Identifying and supporting people most at risk of dying prematurely	Assess locally	Costing statement
Oct-08	Public health interventions	PH016	Mental health and older people	Assess locally	Costing report
Jan-09	Public healthprogramme	PH17	Promotion of physical activity in children	Low cost	Costing statement
Feb-09	Public health interventions	PH18	Needle exchange	Assess locally	Costing report and costing template – to facilitate local estimation not able to estimate nationally. A commissioning guide has also been produced that includes a benchmarking and commissioning tool
Mar-09	Public healthprogramme	PH19	Management of long term sickness and incapacity	Assess locally	Costing report and business case for employers – not able to estimate nationally
Sep-09	Public health interventions	PH20	Promoting young people's social and emotional wellbeing in secondary education	Assess locally	Costing statement

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Sep-09	Public health interventions	PH21	Reducing differences in the uptake of immunisations	Low cost	Costing statement and costing template to facilitate local estimation, not able to estimate nationally
Nov-09	Public health interventions	PH22	Promoting mental wellbeing at work	Cost saving to business' per 1000 employees c-£250,000	Business case for employers – not able to estimate nationally
Feb-10	Public health interventions	PH23	School-based interventions to prevent smoking	Cost saving	Costing template (which includes commentary that would normally be in the report) aimed at both local authorities, PCTs and schools.

Appendix C Results including physical activity model (extract from Matrix 2011)

Data on the short-term cost savings were not available for the physical activity model. Consequently, the results of this model are not comparable with the results produced by the other 10 interventions presented in this report. Considering that the physical activity intervention is of interest to policy-makers it has been included in a separate analysis. In order to compare the physical activity model to other interventions, this appendix reports all interventions without their short-term costs impact. This made inclusion of mental health models (two depression interventions) impossible as these interventions are modelling only for 3 years and do not include long-term effects. Table 21 shows the result of this comparison. Table 22 converts the result of this analysis into rankings. The methodology for calculation the metrics rankings is the same as described in section 3 of the report.

Figure 12 shows the cumulative cost savings and health gains generated by brief interventions delivered in GP surgeries to improve uptake of physical activity, and the corresponding cost per QALY gained and NPV.

Table 21 ROI for nine public health interventions based on different metrics (excluding short term cost impacts)

	Intervention	NPV/Cost	Cost/QALY	NPV (including HC cost)	NPV (including HC cost and H gain)	NPV (including HC cost, H gain and LR productivity gain)	B:C (including HC cost)	B:C ratio (including HC cost and H gain)	B:C ratio (including HC cost, H gain and lifetime productivity gain)	Cost per death avoided	Cost per LY saved
1	Nicotine replacement therapy to reduce smoking	-42%	£1,819	£(25)	£246	£342	0.58	5.23	6.89	£12,752	£2,602
2	School based group education to reduce population levels of obesity	-43%	£2,173	£(10)	£85	£146	0.57	4.49	7.02	£45,680	£6,621
3	Brief interventions delivered in GP surgeries to reduce problem drinking	30%	£(445)	£31	£1,445	£3,063	1.30	14.56	29.75	£(11,955)	£(2,572)
4	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	20%	£(415)	£2	£108	£146	1.20	10.89	14.34	£(2,912)	£(594)
5	Smoking cessation – pharmacist vs. normal care	70%	£(1,019)	£86	£1,772	£2,372	1.70	15.39	20.26	£(7,143)	£(1,457)
6	Smoking cessation – social marketing campaign (disadvantaged population)	8%	£(177)	£3	£293	£397	1.08	9.76	12.85	£(1,244)	£(254)

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7	Alcohol screening and brief intervention in A&E setting	-34%	£993	£(13)	£253	£558	0.66	7.45	15.22	£26,653	£5,734
8	Alcohol screening and brief intervention when patient registers with GP practice	-64%	£3,489	£(16)	£76	£182	0.36	4.03	8.24	£93,639	£20,145
9	Brief interventions delivered in GP surgeries to improve uptake of physical activity	1025%	£(1,905)	£322	£322	£1,009	11.25	11.25	33.09	£(32,764)	£(4,207)

Table 21 ROI for nine public health interventions based on different metrics (excluding short term costs impact) cont.

	Intervention	Lifetime productivity gain	Net health care cost savings	Health care cost saving/intervention cost	QALY	Population reached	Reach	Avoidable burden of disease	Inequality Score	HELP affordability score
1	Nicotine replacement therapy to reduce smoking	£96	£(25)	58%	0.014	5,478,512	12.82%	74,041	1.47	2.00
2	School based group education to reduce population levels of obesity	£62	£(10)	57%	0.005	1,642,447	3.59%	7,806	1.00	3.00
3	Brief interventions delivered in GP surgeries to reduce problem drinking	£1,618	£31	130%	0.071	6,777,628	15.86%	479,000	1.78	2.00
4	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	£38	£2	120%	0.005	8,195,546	19.18%	43,471	1.55	3.00
5	Smoking cessation – pharmacist versus normal care	£600	£86	170%	0.084	5,622,526	13.16%	473,902	1.55	2.00
6	Smoking cessation – social marketing campaign	£103	£3	108%	0.015	3,517,081	8.23%	51,111	-	2.00

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	(disadvantaged population)									
7	Alcohol screening and brief intervention in A&E setting	£305	£(13)	66%	0.013	1,130,641	2.65%	15,049	1.78	3.00
8	Alcohol screening and brief intervention when patient registers with GP practice	£106	£(16)	36%	0.005	531,874	1.24%	2,462	1.78	3.00
9	Brief interventions delivered in GP surgeries to improve uptake of physical activity	£687	£322	1125%	0.169	14,422,759	33.75%	2,438,894	1.00	2.00

Table 22 Intervention ranking by metric for nine interventions (long-run effects only)

	Intervention	NPV/cost	Cost/QA LY	NPV (including HC cost)	NPV (including HC cost and H gain)	NPV (including HC cost, H gain and LR productivity gain)	B:C (including HC cost)	B:C ratio (including HC cost and H gain)	B:C ratio (including HC cost, H gain and lifetime Productivity gain)	Cost per death avoided	Cost per LY saved
1	Nicotine replacement therapy to reduce smoking	7	5	9	6	6	7	7	9	6	6
2	School based group education to reduce population levels of obesity	8	9	6	8	8	8	8	8	8	7
3	Brief interventions delivered in GP surgeries to reduce	3	8	3	2	1	3	2	2	4	1

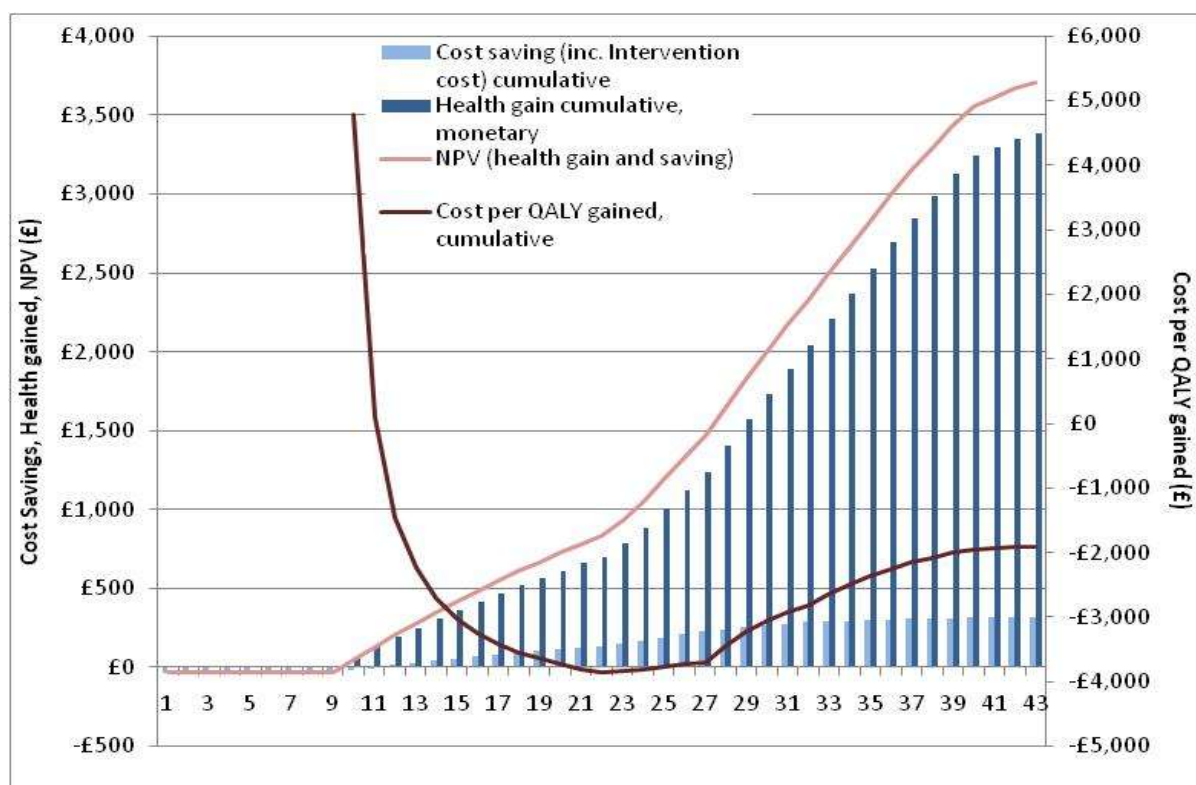
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	problem drinking										
4	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	4	3	5	7	9	4	4	5	2	3
5	Smoking cessation – pharmacist versus normal care	2	1	2	1	2	2	1	3	3	4
6	Smoking cessation – social marketing campaign (disadvantaged population)	5	2	4	4	5	5	5	6	1	2
7	Alcohol screening and brief intervention in A&E setting	6	4	7	5	4	6	6	4	7	8
8	Alcohol screening and brief intervention when patient registers with GP practice	9	6	8	9	7	9	9	7	9	9
9	Brief interventions delivered in GP surgeries to improve uptake of physical activity	1	7	1	3	3	1	3	1	5	5

Table 22 Intervention ranking by metric for nine interventions (long-run effects only) cont.

	Intervention	Lifetime product ivity gain	Net health care cost savin gs	Health care cost saving/interv ention cost	Reach	Avoidabl e burden of disease	Inequality Score	HELP affordability score
1	Nicotine replacement therapy to reduce smoking	7	9	7	6	5	6	5
2	School based group education to reduce population levels of obesity	8	6	8	7	8	7	1
3	Brief interventions delivered in GP surgeries to reduce problem drinking	1	3	3	4	2	1	5
4	Five minutes of GP opportunistic advice to smokers presenting at GP surgeries	9	5	4	3	6	4	1
5	Smoking cessation – pharmacist versus normal care	3	2	2	5	3	4	5
6	Smoking cessation – social marketing campaign (disadvantaged population)	6	4	5	1	4	-	5
7	Alcohol screening and brief intervention in A&E setting	4	7	6	8	7	1	1
8	Alcohol screening and brief intervention during when patient registers with GP practice	5	8	9	9	9	1	1
9	Brief interventions delivered in GP surgeries to improve uptake of physical activity	2	1	1	2	1	7	5

Figure 12 The timing of costs and benefits of brief interventions delivered in GP surgeries to improve uptake of physical activity



Appendix D Reach calculation

INTERVENTION Description	Reach	Definition	Source
Nicotine replacement therapy comprises GP advice and prescriptions (baseline visit plus six prescriptions spread over approximately 12 weeks) and drug provision	12.82%	Adult smokers who would like to quit as a percentage of the population aged 15 and above in England	Healthcare Commission 2007; Office for National Statistics 2009
A full year of day care support (2 days per week) for caregivers to reduce symptoms of depression compared to no day care support	3.25%	Depressed carers as a percentage of the population aged 15 and above in England	Keeley and Clarke 2003; NICE 2006; Secta 2004
A school-based intervention to reduce obesity in youth of middle-school age	3.59%	Females 11 to 16 years old as a percentage of the population aged 11 and above in England	Office for National Statistics 2009
Physician advice in general practice regarding problem drinking.	15.86%	Adults attending routine general practice appointments and drinking above threshold limits as a percentage of the population aged 15 and above in England	LJMU 2008; Healthcare Commission 2008
Brief interventions delivered in GP surgeries to improve uptake of physical activity	33.75%	Individuals 40 to 64 years old visiting a GP as a percentage of the population aged 15 and above in England	Office for National Statistics 2009; Healthcare Commission 2008

Interventions from other sources

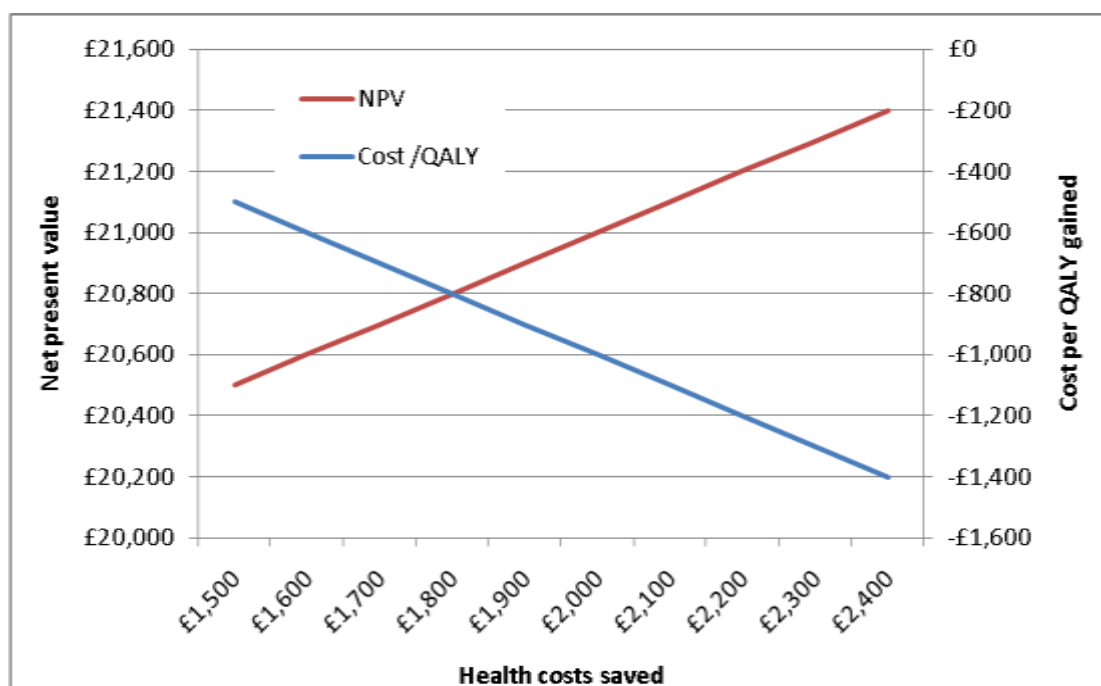
INTERVENTION Description	% of population who have condition	Source/notes	% of population in setting	Source/notes
Five minutes of GP opportunistic advice to smokers presenting at GP surgeries, compared to no advice or usual care	22.30%	Health England Survey (2007) – adults who smoke. Value used in Health England project	86.0%	Health England project – GP practice visits in the last 12 months
Pharmacist attends 3 hour training workshop. Post workshop pharmacists provide counselling (30 minutes) and information leaflet to smokers. Also includes follow up which lasts 315 minutes	22.30%	Health England Survey (2007) – adults who smoke. Value used in Health England project	59%	Broadman et al (2005) – 59% of surveyed people have visited a community pharmacist for a prescription in the last month
Intervention targeted to <u>disadvantaged</u> : Mass media anti-smoking campaign which consists of a 10 minute play, poster campaign, a media campaign, and a series of purpose designed leaflets	34.15%	Health England Survey (2007) – adults in occupational grade D and E who smoke. Value used in Health England project	24%	Smoking toolkit study: www.smokinginengland.info/ . Total population survey = 41069, Social class grades D and E = 9,899. % of population in grades D/E = $9899/41069 = 24.10\%$

INTERVENTION Description	% of population who have condition	Source/notes	% of population in setting	Source/notes
The patient is screened with FAST3 test when next attending a major A&E department, single specialty A&E department, walk-in centre or minor injuries unit. The brief intervention (BI) is offered as a separate appointment on a day subsequent to the screening. The BI is assumed to be delivered by an alcohol specialist nurse for a duration of 24.9 minutes	18.44%	Health England project – adults who are harmful drinkers	14.3%	NICE (2009) – The average attendance at A&E for potentially alcohol related injuries for harmful drinkers, weighted by sex and age, adjusted for take up of 30%
Screening with AUDIT test and a brief intervention is simultaneously initiated when a patient registers with a new practice. A practice nurse provides the screening and brief intervention. The brief intervention lasts 24.9 minutes	18.44%	Health England project – adults who are harmful drinkers	6.7%	NICE (2009) – The average attendance at GP registration for harmful drinkers, weighted by sex and age
Detection of depression through a one-off screening, plus treatment, of retirees presenting at primary medical care providers, compared to detection of depression through usual care	1.73%	Health England project – depression prevalence in 65–74 year olds	86.0%	Health England project – GP visits in the last 12 months

Appendix E Ranking interventions based on cost per QALY gained (extract from Matrix 2011)

Interventions that generate health care cost savings that exceed the cost of the intervention will have a negative cost per QALY gained. How should these interventions be ranked? The answer to this question is that it depends on the types of benefits generated by the intervention. Figure 9.16.1 shows how the net present value (NPV) and the cost per QALY gained varies for an intervention that generates net cost savings as the level of health costs saved varies. As expected, when the health cost savings increase the NPV of the intervention improves. Furthermore, again as expected, when the health cost savings increase the cost per QALY gained decreases (is more negative). Based on conventional interpretations of CUA metrics, the lower the cost per QALY gain the more efficient the intervention.

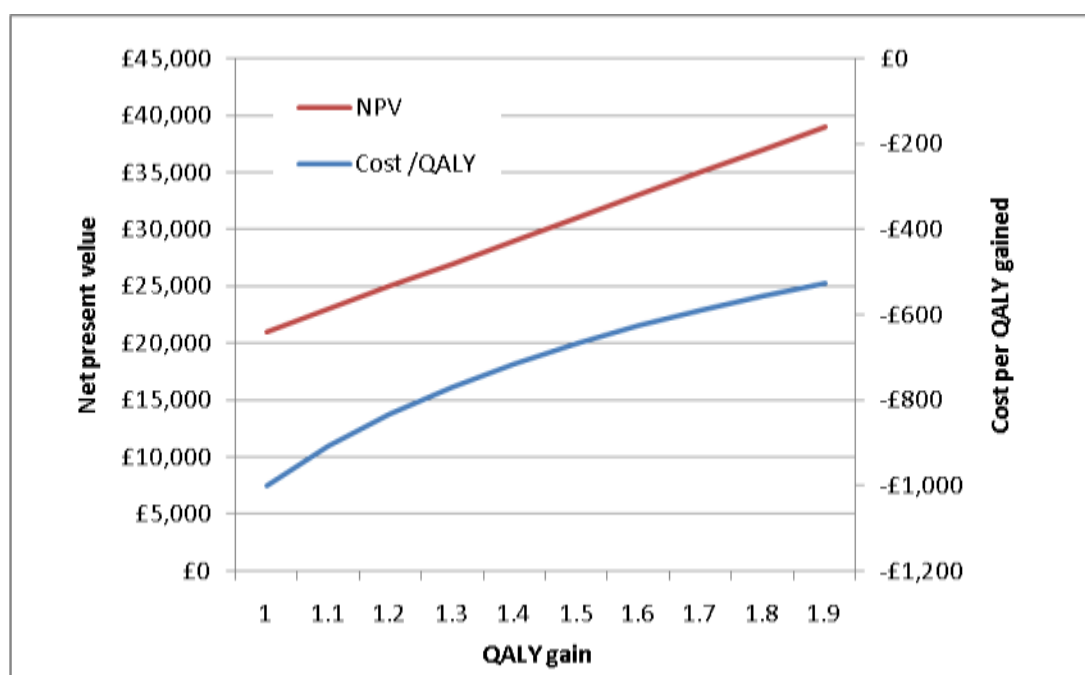
Figure 9.16.1 Variations in the ROI of an intervention that is net cost saving with varying health cost saved (source: Matrix 2011)



A different trend is observed, however, when the QALYs generated by the intervention are varied. Figure 9.16.2 shows how the net present value (NPV) and the cost per QALY gained varies for an intervention that generates net cost savings as the level of QALYs gained varies. Once again, as expected, when the QALYs gained increase the NPV of the intervention improves. However, in this instance, as

the QALYs gained increase the cost per QALY gained increases (is less negative). If the intervention is assessed based on conventional interpretations of CUA metrics – that the lower the cost per QALY gain the more efficient the intervention is, an increase in the QALYs gained – all other things being held constant – would result in the conclusion that the intervention was getting less efficient.

Figure 9.16.2 Variation in the ROI of an intervention that is net cost saving with varying QALYs gained. (source: Matrix 2011)



The conclusion from this exercise is that comparisons of interventions that generate negative cost per QALYs saved cannot be undertaken on the conventional basis that the lower the cost per QALY gained the more efficient is the intervention. Instead, comparison of interventions requires an understanding of how the benefits of the interventions are generated – how do the interventions compare on the individual components of the cost per QALY gained metric?

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