National Institute for Health and Clinical Excellence

Economic analysis of interventions to improve the use of smoking cessation interventions in disadvantaged populations

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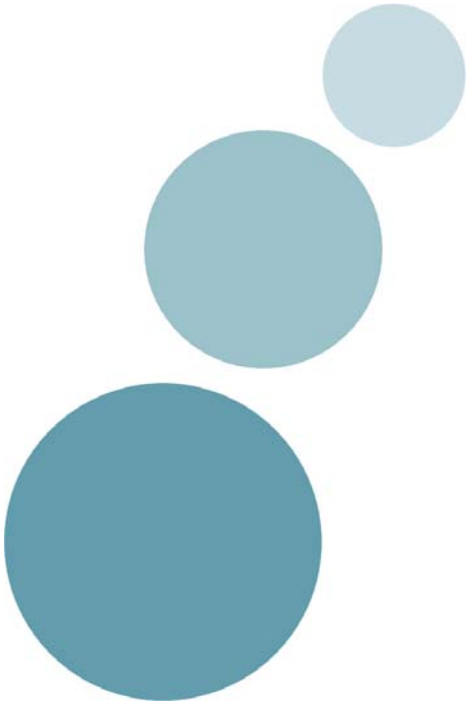

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1.0 Executive summary

Introduction

The National Institute for Health and Clinical Excellence (NICE) has been asked by the Department of Health to develop 'guidance for reducing health inequalities in the short, medium and long term'. Specifically, the guidance will focus on interventions that reduce the rates of premature death in the most disadvantaged with particular reference to proactive case finding, retention and improving access to services. In particular, the focus of this guidance is on interventions that identify disadvantaged groups in need of statins and smoking cessation interventions, that improve disadvantaged groups' use of statins and smoking cessation interventions, and that improve the retention of disadvantaged groups within statins and smoking cessation interventions.

The economic analysis takes as its starting point the evidence on effectiveness of interventions to improve the reach, use and retention of smoking cessation interventions and statins identified by Bath University (Bauld et al, 2007) and the University of Cardiff (Turley et al, 2007). The effectiveness evidence identified was of two types: studies that measured the effectiveness of interventions for disadvantaged groups; and studies that measured the effectiveness of interventions for the general population. It was decided that two types of economic analysis would be run. First, an analysis of the cost per QALY gained of interventions targeted at disadvantaged groups. Second, an analysis of the cost per QALY gained of interventions targeted at the general population, as well as an analysis of how the costs and effects of the interventions could vary when applied to disadvantaged groups without causing the cost per QALY gained estimate to exceed £30,000.

As each of these analyses was undertaken for smoking cessation interventions and statins interventions, The Matrix Knowledge Group produced four sets of economic analysis to inform the development of NICE guidance in this area:

1. An economic analysis of interventions to improve the reach, use and retention of ***statins*** interventions in ***disadvantaged groups***.
2. An economic analysis of interventions to improve the reach, use and retention of ***statins*** interventions in the ***general population***.
3. An economic analysis of interventions to improve the reach, use and retention of ***smoking cessation*** interventions in ***disadvantaged groups***.
4. An economic analysis of interventions to improve the reach, use and retention of ***smoking cessation*** interventions in the ***general population***.

This report presents the economic analysis of interventions to improve the reach, use and retention of smoking cessation interventions in disadvantaged groups.

Method

The following steps are undertaken to estimate the cost per QALY gained associated with interventions to improve the reach, use and retention of smoking cessation interventions among disadvantaged groups:

1. Effect studies identified in the review undertaken by Bath University (Bauld et al, 2007) were included if they measured the impact of interventions on disadvantaged groups.
2. Cost and effect data was extracted from the effect studies.
3. Economic models were constructed to transform this cost and effect data into estimates of the cost per QALY gained from interventions.

Findings

From the effectiveness review, 13 studies of interventions to improve the reach, use and retention of smoking cessation interventions among disadvantaged groups were identified and included in the economic analysis. The following interventions were included in the economic analysis: social marketing interventions; recruitment to smoking cessation interventions at pediatric units; using NHSSSS to identify and reach; improving access to smoking cessation interventions through pharmacist-based interventions and workplace interventions; incentives through the prescription of free NRT; and brief interventions and telephone support for pregnant women.

The disadvantaged groups targeted by the interventions include BME groups (including a number of interventions targeted towards African America smokers and an intervention targeted at the Turkish community), smokers living in deprived and disadvantaged areas, pregnant women and manual workers.

The cost per QALY gained for these interventions is as follows:

1. Client-centred social marketing interventions have a mean cost per QALY gained (excluding public sector costs saved) of £7,632. The cost per QALY gained (including public sector costs saved) was calculated for one example of a social marketing intervention. This has a cost per QALY gained (including public sector costs of £2,476.
2. Interventions to identify and reach smokings in disadvantaged groups (including NHSSSS and recruitment at a pediactric unit) have a mean cost per QALY gained (excluding public sector costs saved) of £485.
3. Interventions to improve the reach of smoking cessation interventions among disadvantaged groups have a meancost per QALY gained (excluding public sector costs saved) of £166. One example of a pharmacist-based intervention has a cost per QALY gained (including public sector costs saved) of £8,501.
4. One example of an incentive-based intervention (free NRT) had a cost per QALY gained (excluding public sector costs saved) of £586.
5. Interventions to reduce smoking among pregnant women have a mean cost per QALY of £1,370.

The analysis is subject to a number of caveats, including limitations in the quality of the effect studies, unit costs calculated from intervention descriptions within effect studies, and an assumed zero percent relapse rate. Thus, while these caveats means that the figures above should not be taken as accurate estimates of the cost per QALY gained associated with these interventions, the sensitivity analysis suggests that the conclusion that the interventions have a cost per QALY gained of less than a £20,000 - £30,000 threshold is not sensitive to any of the above caveats.

Discussion

The estimate of the cost per QALY gained by interventions to increase the reach, use and retention of smoking cessation interventions amongst disadvantaged groups suggests that these interventions are cost effective. The cost per QALY gained for the interventions modelled range from £136 (workplace intervention) to £14,103 (social marketing). While some of the assumptions necessary within the models mean that these figures should not be taken as accurate estimates of the cost per QALY of the interventions, the sensitivity analysis suggests that, despite the modelling caveats, all the interventions are cost-effective when compared against the cost-effectiveness threshold traditionally employed by NICE (£20,000 - £30,000).

As with any modelling exercise, the cost per QALY estimates produced are subject to caveats. However, sensitivity analysis suggests that the findings are not sensitive to these caveats.

Cost per QALY gained (excluding public sector costs saved) estimates for a number of the above intervention when targeted the general population were also produced by The Matrix Knowledge Group using the same methodology (Matrix Evidence, 2007):

- The cost per QALY gained of social marketing when targeted at the general population was £42.
- The cost per QALY gained of pharmacist-based interventions when targeted at the general population was £229 - £533.
- The cost per QALY gained of free NRT when targeted at the general population was £29 - £1,038.

Comparing these ICERs with those for the interventions when there are targeted at disadvantaged groups suggests that the cost-effectiveness of pharmacist-based interventions and free NRT is comparable for disadvantaged groups and the general population. However, the social marketing seems to be more cost-effective for the general population.

While the above analysis measures the impact of the interventions on health outcomes, as the target population for these interventions belong to disadvantaged groups, their impact is both to increase health outcomes and reduce health inequalities. One way to account for this is to adjust the £30,000 per QALY threshold against which interventions are assessed to include the value of reducing health inequalities. Work by Professor Dolan and colleagues suggest that

interventions that reduces health inequalities should be assessed against a cost-effectiveness threshold of £120,000.

However, further work by Dolan and Tsuchiya (forthcoming, b) using the same data suggests that the equity weights would change if the health inequalities are perceived to be the responsibility of the individual. For instance, if the poorer health of smokers is entirely their responsibility, the weight given to a smoker relative to a non-smoker is about one half. All else equal, this would suggest that the cost-effectiveness threshold be reduced to for smokers £15,000. Assuming that these two sets of weights are independent of one another, it would suggest that benefits to smokers in the lowest social class are weighted about twice as highly as benefits to non-smokers in the highest social class (i.e. a threshold of £60,000 per QALY). As the equity-weights cost-effectiveness threshold is greater than the traditional NICE threshold of £30,000, this adjustment would reinforce the conclusion that the above interventions would be cost-effective for a disadvantaged population. However, assuming that the weights can be added together in this way is a rather heroic assumption given the current state of knowledge and it is certainly not one that we would wish to defend. Professor Dolan will be presenting fresh empirical evidence, from much larger samples, shortly.

2.0 Introduction

The National Institute for Health and Clinical Excellence (NICE) has been asked by the Department of Health to develop 'guidance for reducing health inequalities in the short, medium and long term', on interventions that reduce the rates of premature death in the most disadvantaged with particular reference to proactive case finding, retention and improving access to services. The focus of this guidance is on interventions that identify disadvantaged groups in need of statins and smoking cessation interventions, that improve disadvantaged groups' use of statins and smoking cessation interventions, and that improve the retention of disadvantaged groups within statins and smoking cessation interventions.

The economic analysis takes as its starting point the evidence on effectiveness of interventions to improve the reach, use and retention of smoking cessation interventions and statins identified by Bath University (Bauld et al, 2007) and the University of Cardiff (Turley et al, 2007). The effectiveness evidence identified was of two types: studies that measured the effectiveness of interventions for disadvantaged groups; and studies that measured the effectiveness of interventions for the general population. It was decided that two types of economic analysis would be run. First, an analysis of the cost per QALY gained of interventions targeted at disadvantaged groups. Second, an analysis of the cost per QALY gained of interventions targeted at the general population, as well as an analysis of how the costs and effects of the interventions could vary when applied to disadvantaged groups without causing the cost per QALY gained estimate to exceed £30,000.

As each of these analyses was undertaken for smoking cessation interventions and statins interventions, The Matrix Knowledge Group produced four sets of economic analysis to inform the development of NICE guidance in this area:

5. An economic analysis of interventions to improve the reach, use and retention of ***statins*** interventions in ***disadvantaged groups***.
6. An economic analysis of interventions to improve the reach, use and retention of ***statins*** interventions in the ***general population***.
7. An economic analysis of interventions to improve the reach, use and retention of ***smoking cessation*** interventions in ***disadvantaged groups***.
8. An economic analysis of interventions to improve the reach, use and retention of ***smoking cessation*** interventions in the ***general population***.

This report presents the economic analysis of interventions to improve the reach, use and retention of smoking cessation interventions in disadvantaged groups.

The remainder of this section outlines the need for guidance in this policy area and the precise scope of the review. Section 3.0 outlines the methods employed in the economic analysis. Section 4.0 outlines the results of the analysis, and section 5.0 draws conclusions from the analysis.

2.1 The need for guidance: background and policy context

In common with most industrialised countries, smoking rates in the UK are not evenly distributed across the population but are considerably higher amongst less affluent groups. Smoking rates in 2006 were estimated to be 32% for men and 30% for women in routine and manual occupations, compared with 20% for men and 17% for women in managerial and professional groups (ONS, 2006a).

These differences in smoking rates have serious implications for inequalities in health. Amongst men, smoking is responsible for over half of the excess risk of premature death between the highest and lowest socio-economic groups (Jha et al, 2006). The most recent analysis by ONS of causes of death in England and Wales argues that smoking plays a key role in the relationship between deprivation and mortality (Romeri et al, 2006). It is for these reasons that addressing smoking-related inequalities in health has become a policy priority in the UK.

Targets have been established in all parts of the UK to reduce smoking rates and address inequalities in health. In England, the key targets are, by 2010 to (Department of Health 1998, 2000):

- Reduce by at least 10% the gap in infant mortality between routine and manual groups and the population as a whole.
- Reduce by at least 10% the gap in life expectancy between the fifth of areas with the lowest life expectancy and the population as a whole.
- Reduce adult smoking prevalence in routine and manual groups to 26% or less.
- Reduce in the fifth of areas with the worst health and deprivation indicators and the population as a whole the gap in cardiovascular disease (CVD) and cancer by 40% and 6% respectively.

Following the publication of the 1998 White Paper, *Smoking Kills* (Department of Health, 1998), smoking cessation services, now known as NHS stop smoking services, were established in the UK. They were initially set up in more deprived areas of England (Health Action Zones) in 1999 and rolled out to the rest of the country from 2000 (Adams et al, 2000). NHS stop smoking services now exist in all parts of the UK and provide free at the point of use access to behavioural support from a trained adviser in a range of settings (one to one or group) plus access to appropriate pharmacotherapies which are free on prescription. NHS stop smoking services were intended to target particular groups (pregnant women, young people and disadvantaged groups) from their inception (Pound et al, 2005).

2.2 Scope of the modelling exercise

The interventions and participants included in the modelling exercise were driven by the evidence provided by the smoking cessation review (Bauld et al, 2007). These were undertaken in correspondence with the parameters set out for the review, and include:

- ***Participants:***
    - Including: adults aged 16 years and over who smoke, in particular pregnant women, disadvantaged groups and manual workers.
    - Including: disadvantaged groups will be defined as individuals with mental health problems; people who are institutionalised including those serving a custodial sentence; some black and minority ethnic groups; homeless people; people on low incomes; lone parents and poor families; and people on benefits and living in public housing.
    - Excluding: people aged 16 years and over who do not smoke.

- ***Interventions***:
    - Including: NHS interventions aimed at finding and then supporting people aged 16 years and over who smoke. These activities will cover both primary and secondary prevention.
    - Including: NHS interventions aimed at providing – and improving access to – services for people aged 16 years and over who smoke. These activities will cover both primary and secondary prevention.
    - Excluding: interventions and activities not aimed at reducing and/or eliminating premature death from smoking related causes of premature death.
    - Excluding: interventions and activities aimed at reducing and/or eliminating infant mortality.
    - Excluding: the wider determinants of health inequalities such as macro level policies aimed at tackling poverty and economic disadvantage.

- ***Comparators****.* Interventions will be examined, where possible, against relevant comparators and/or no intervention.

The economic model diverges from the effectiveness review in the outcomes of interest. The review identified studies with the following ***outcomes***:

- How services identify and reach people aged 16 years and over who smoke, in particular pregnant women, disadvantaged groups and manual workers.
- Service use, accessibility and availability among people aged 16 years and over who smoke, in particular pregnant women, disadvantaged groups and manual workers.

The economic model extrapolates from these outcomes to, where possible, estimate the cost per Quality Adjusted Life Year (QALY) associated with the intervention. Further detail on the method employed to undertake this extrapolation is available in section 3.0.

3.0 Method

The following three steps are undertaken to estimate the cost per QALY gained associated with interventions to improve the reach, use and retention of smoking cessation interventions among disadvantaged groups:

1. Effect studies identified in the review undertaken by Bath University (Bauld et al, 2007) were included if they measured the impact of interventions on disadvantaged groups.
2. Cost and effect data was extracted from the effect studies.
3. Economic models were constructed to transform these cost and effect data into estimate of the cost per QALY gained from interventions.

The remainder of this section provides more detail on each of these steps.

3.1 Selection of effect studies for modelling

The economic model is built on the evidence employed by the review team at Bath University to concluded about the effectiveness of interventions (Bauld et al, 2007). The effectiveness studies had to fulfil two criteria before they were included in the economic model:

1. Studies had to measure effect for a disadvantaged group. A number of the effect studies measured the impact of interventions to improve the reach, use and retention of smoking cessation interventions for the general population. These studies were excluded from the model presented in this report. Economic models for these studies are presented in Matrix Evidence (2007)..
2. Studies had to measure reach, use or retention. Studies that did not provide a measure of reach, use or retention were excluded from the modelling. For instance, a number of studies identified participants perceptions of the barriers to accessing smoking cessation interventions or practitioners perceptions of the effect of interventions.

Once the criteria were applied, data on 13 interventions were included in the economic analysis. Appendix one summarises the studies that were included and excluded, and the reasons for any exclusions.

3.2 Extraction of data from effect studies

Data on the cost and effect of the intervention were extracted from the studies included in the modelling:

1. Effect data. Where a choice of effect data was available, the effect ‘closest to quit’ was selected. As the objective of the economic analysis was to estimate the cost per QALY gained associated with the interventions, and the QALY gains achieved by the interventions are most likely due to their impact on the probability that participants quit

smoking, the economic analysis estimated the cost per QALY gained for the interventions as a result of their impact on quit rates. Therefore, while the aim of an intervention may be to increase calls to "quitline" among disadvantaged groups, the QALY gained associated with this intervention results not just from calling quitline, but from the impact that this call subsequently has on quit rates. In this instance, if the study reported the impact of the intervention on both the chance that a participant calls quitline, as well as the chance that a participant quits smoking, the latter data was extracted. The economic analysis then converted the chance of quitting smoking into an estimate of QALY gains. However, if the study only reported the impact of the intervention on the chance that a participant calls quitline, this data was extracted and the economic analysis extrapolated from calling quitline to QALY gains.

2. Cost data[1]. A number of the studies reported the cost of implementing the intervention. Where this was the case, implementation costs were extracted from the study. Where this was not the case, a description of the resources employed by the intervention was constructed from the intervention description in the study, and standard UK-based unit costs[2] applied to this resource use to estimate the cost of the intervention. All intervention costs are presented at 2007 prices.

Appendix two summarises the cost and effect data extracted from the studies, any assumptions necessary to calculate resource use from intervention descriptions, as well as the unit cost data used to transform resource use into cost estimates.

Assessment of the quality of the effectiveness studies employed in the economic analysis were taken from the effectiveness review undertaken by Bath University which identified the studies (Bauld et al, 2007).

3.3 Economic models

Models were built to transform the effect and resource use measurements taken from the effectiveness studies into estimates of the cost per QALY gained associated with the interventions. As a number of different types of effect measures were extracted from the studies, a number of models had to be built. Each model assumes that the ultimate objective of each intervention is to stop participants smoking.

This section summarises the structure of the models built to transform each of the following outcome measures into estimates of cost per QALY gained:

[1] The model assumes that those participants who receive the intervention but who would have experienced a positive outcome even in the absence of the intervention still incur the cost of the intervention. For instance, if an effect study suggests that some participants would have accessed NRT even if they had not participated in a motivational interview with their GP, we assume that the GP delivers the same intervention to this group as to those who only access NRT having received the intervention, as well as to those who do not access NRT with or without the intervention. An alternative approach would have been to assume that participants who would have achieved a positive outcome in the absence of the intervention incur none of the intervention costs. In reality it is likely that these participants incur some intervention costs but less than other participants. The approach adopted will cause the model to overestimate the cost per QALY gained associated with the intervention.

[2] Further detail on the source of unit cost data is available in appendix two

1. Proportion of participants who quit smoking.
2. Proportion of participants who complete NRT with counselling.
3. Proportion of eligible smokers who call the Cancer Information Service.
4. Proportion of eligible smokers using NHS smoking cessation services.

Appendix three summarises which model is employed for each effect study.

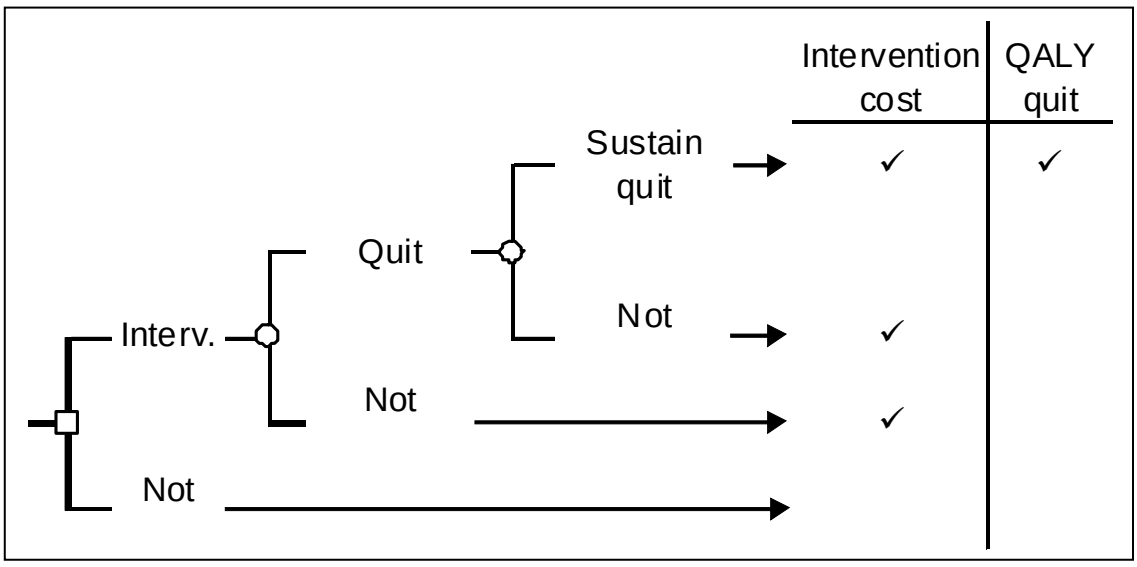
3.3.1 Model 1: smoking cessation

Data on the proportion of the targeted population who quit smoking as a result of an intervention were extracted from a number of studies. Figure one summarises the hypothesised pathways post quit and the cost and benefits associated with each pathway included in the economic model.

The following probabilities that participants follow a particular pathway were employed in the model:

1. ***Quit***: The probability that a participant quits smoking as a result of the intervention was drawn from the effect studies.
2. ***Sustain quit***: The probability that a participant who quits smoking does not relapse is assumed to be 100%. The sensitivity of the conclusions of the analysis to this assumption was tested.

Figure 1: Economic model of interventions that improve quit rates



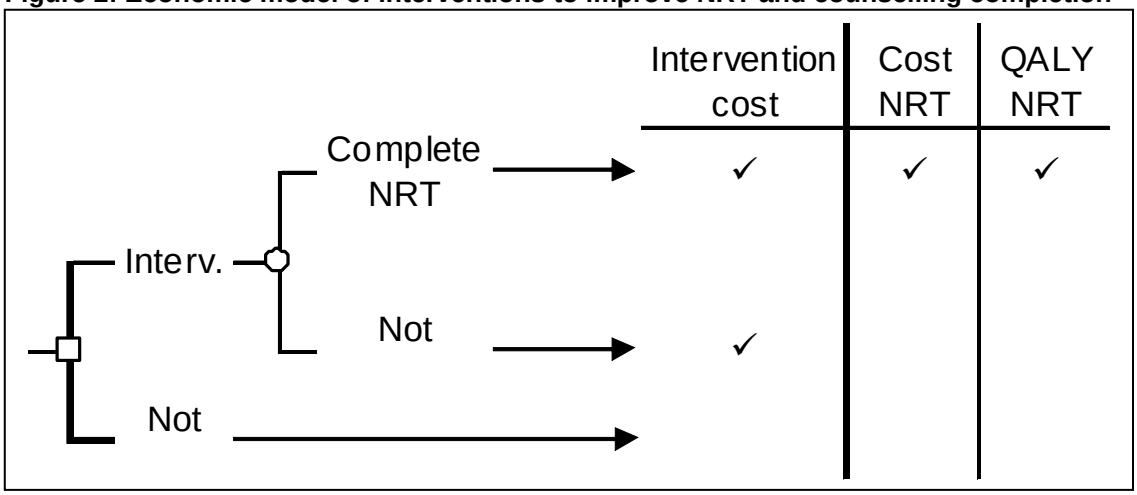
The costs and values attached to these pathways were as follows:

1. ***Intervention costs***: Intervention costs were extracted from the individual effect studies (see appendix two for more detail).
2. ***QALY gained associated with quitting***: A review was undertaken to identify estimates of the benefits of quit. Individual study interventions and populations were matched to the data identified through this review to determine the most appropriate benefit data in each instance. Further detail of this review and matching exercise are available in section 3.4.

3.3.2 Model 2: completion of NRT and counselling

Data on the proportion participants who complete NRT with counselling were extracted from a number of effect studies. Figure two summarises the hypothesised pathways post completion of NRT and the cost and benefits associated with each pathway included in the model.

Figure 2: Economic model of interventions to improve NRT and counselling completion



The probability that a participant completes NRT and counselling as a result of the intervention was drawn from the effect studies.

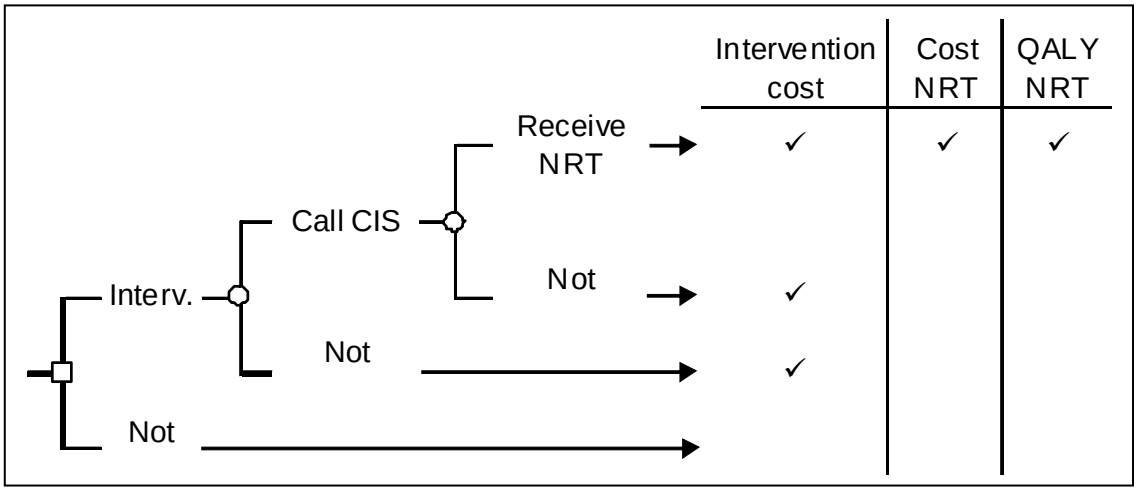
The costs and values attached to these pathways were as follows:

1. ***Intervention costs***: Intervention costs were extracted from the individual effect studies (see appendix two for more detail). As no data on completion was available from the study, it was assumed that there is no cost associated with those who do not complete the NRT with counselling.
2. ***Costs and QALY gained associated with NRT with counselling***: A review was undertaken to identify the costs and benefits associated with NRT with counselling. Individual study interventions and populations were matched to the data identified through this review to determine the most appropriate cost and benefit data in each instance. Further detail of this review and matching exercise are available in section 3.4.

3.3.3 Model 3: calls to the Cancer Information Service

Data on the proportion of eligible smokers calling the Cancer Information Service (CIS) were extracted from a number of studies. Figure three summarises the hypothesised pathways post call, and the cost and benefits associated with each pathway included in the model.

Figure 3: Economic model of interventions to increase calls to the Cancer Information Services



The following probabilities that participants follow a particular pathway were employed in the model:

1. ***Calls to CIS***: The probability that a participant calls the CIS was drawn from the effect studies.
2. ***Receive NRT with counselling***: The probability that a participant who calls the CIS receives NRT with counselling is assumed to be 100%. The sensitivity of the conclusions of the analysis to this assumption was tested.

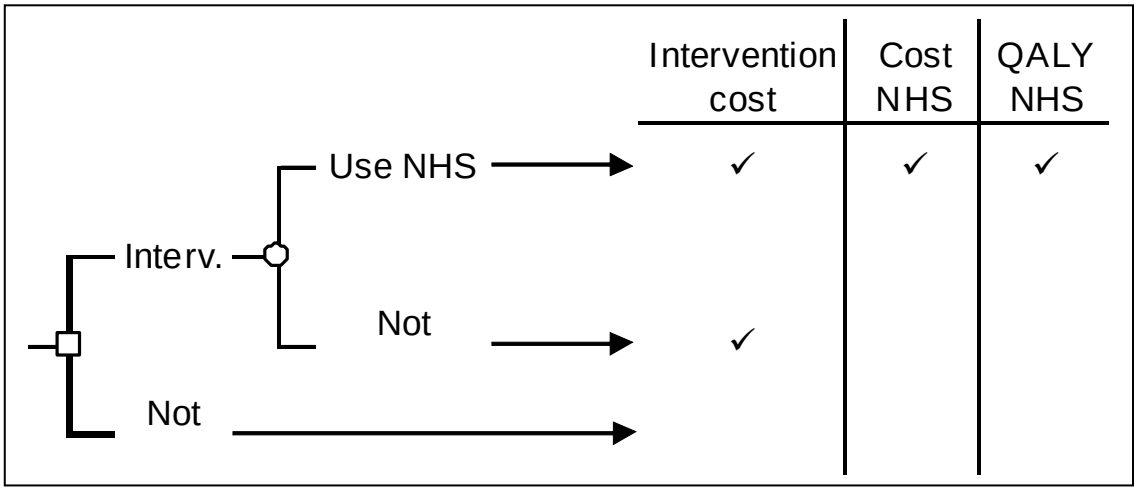
The costs and values attached to these pathways were as follows:

1. ***Intervention costs***: Intervention costs were extracted from the individual effect studies (see appendix two for more detail).
2. ***Costs and QALY gained associated with NRT with counselling***: see section 3.3.2.

3.3.4 Model 4: use of NHS smoking cessation services

Data on the proportion of eligible smokers using NHS stop smoking services (NHSSSS) was extracted from one study. Figure four summarises the hypothesised pathways post NHSSSS use, and the cost and benefits associated with each pathway included in the model.

Figure 4: Economic model of interventions to increase use of NHSSSS



The probability that a participant use NHSSSS was drawn from the effect studies.

The costs and values attached to these pathways were as follows:

1. ***Intervention costs***: Intervention costs were extracted from the individual effect studies (see appendix two for more detail).
2. ***Costs and QALY gained associated with NHSSSS***: A review was undertaken to identify the costs and benefits associated with NHSSS. Further detail of this review and matching exercise are available in section 3.4.

Hypothetical example of the calculation of cost per QALY for interventions to improve the use of smoking cessation services

An intervention involves a GP delivering a motivational interview aimed at improving the use of NRT. From the effectiveness study we know that the GP spends 20 mins on the motivational interview and that the intervention causes 50% of participants to use NRT when only 25% would have done so in the absence of the GP-based intervention. A review of other studies tells us that 20 minutes of GP time costs £50, and that NRT costs £500 and results in a gain of 2 QALYs as a result of reduced smoking.

Costs: As every participant receives the intervention, the average GP cost per participant is £50 (100% * £50). As 25% of participants now use NRT when they would not have done so previously, the average NRT cost per participant is £125 (25% * £500). Thus, the overall average cost of the intervention per participant is £175 (£50 + £125).

Benefit: As 25% of participants now use NRT when they would not have done so previously, the average benefit per participant is 0.5 QALYs (25% * 2 QALYs).

Cost per QALY gained: combining the estimates of the cost and benefit of the interventions, we can say that the cost per QALY gained of the GP-based intervention is £350 (£175 / 0.5

QALYs).

3.4 Review of economic data on quits and cessation interventions

A review was undertaken to identify estimates of the costs and QALY gains associated with NRT with counselling and NHSSSS for smokers and the QALY gains associated with quitting smoking. The review focused on existing NICE Health Technology Appraisals (Woolacott, 2001; Flack et al, 2006a; Flack et al, 2006b; Flack et al, 2006c; Flack et al, 2006d; Parrott and Godfrey; Fry-Smith et al, 2006; Parrott et al, 2006; and Wang et al, 2006). The results of the review were as follows:

1. 55 ICERs for counselling with additional interventions were collected.
2. 42 estimates of the benefit of quitting smoking were collected.
3. 3 ICERs for NHSSSS were collected

Selection of smoking cessation ICERs for use in the models

The following data was extracted to allow the appropriate ICERs to be incorporated into the model:

1. The nature of the intervention.
2. The counterfactual against which its cost-effectiveness is measured.
3. The age, gender and level of smoking of the study population.
4. Details of the method employed to calculate the ICER: source of effect data, models employed, length of follow-up, discount rate and perspective employed.

Appendices four and five summarises the smoking cessation ICER data collected for the analysis.

The following criteria were used to determine which ICERs to employ in the models:

1. Where different types of ICERs were available, ICERs were chosen for the models by applying the following hierarchy: (i) cost per QALY gained, including avoided public sector costs; (ii) cost per QALY gained, excluding avoided public sector costs; (iii) cost per life year gained, including avoided public sector costs; and (iv) cost per life year gained, excluding avoided public sector costs.
2. A ‘do nothing’ counterfactual was adopted.
3. Where possible the gender and age of the ICER study population and the effect study population were matched.

If the above matching process identified more than one ICER, the average of those ICERs meeting the criteria was employed in the model.

Selection of benefit of quit data for use in the models

Two types of measures of the benefits of quit were identified in the literature: Life Years Gained and Quality Adjusted Life Years (QALYs). In order to correspond with the NICE reference case, QALYs were preferred. The most appropriate QALY estimate was then selected based upon the population within the effect study. Appendices six and seven summarises the benefit of quit data collected for the analysis.

Appendix eight and nine summarises the value of a quit and ICER data included in the model of each effect study.

3.5 Output from the model

As a result of the approach to extracting and modelling effect data from the studies outlined above, the economic analysis reports only the cost per QALY gained associated with each intervention. It does not report on the separate probabilities along the pathway between the interventions and quitting smoking. For instance, if the objective of an intervention is to improve uptake of NRT, the QALY gained associated with the intervention is contingent upon the following probabilities: the probability that participants complete the intervention; the probability that participants access and complete NRT as a result of the intervention; the probability that completing NRT results in quitting smoking; and the probability that quitters do not relapse.

However, while the analysis does not report on these probabilities explicitly, all these probabilities are implicit in the economic analysis. For instance, the economic analysis of a study that reports the probability that participants complete NRT as a result of GP screening for smoking status may employ the following two pieces of data: the probability that participants complete NRT extracted from the effect study; and the QALY gained associated with completing NRT identified through the literature review. While the results only report the cost per QALY gained associated with the intervention, implicit in these two pieces of data is the probabilities along the pathway outlined above. For example, the probability that NRT leads to quitting smoking and the probability that quitters do not relapse are implicit in the estimate of the QALY gained associated with completing NRT.

3.6 Sensitivity analysis

Sensitivity analysis was undertaken to test the impact of the following caveats on the results of the economic analysis:

1. Effect size: two questions were raised about the accuracy of the effect data extracted from the studies. First, while the sample of studies modelled includes a number of good quality RCTs, it also includes a number of poor quality observational studies. The potentially poor measurement of the counterfactual means that there is a possibility that

the model overestimates the effect and cost-effectiveness of the intervention. Second, 7 of the 13 of the studies are non-UK-based, raising questions about the transferability of the effect data to the UK context.

2. Relapse rates: Where the model extrapolated from an estimate of the proportion of participants quitting smoking to an estimate of the cost per QALY gained form the intervention, it was assumed that none of the quitters relapsed. This assumption is likely to result in an underestimate of the cost per QALY gained for an intervention.
3. Intervention costs: In the majority of cases, the estimates of the cost of the interventions were based on descriptions of the interventions within the effectiveness studies. It is likely that these estimates therefore exclude some of the costs of the intervention, resulting in an overestimation of the cost-effectiveness of the intervention.

More detail on the sensitivity analysis conducted is available in appendix 10.

4.0 Findings

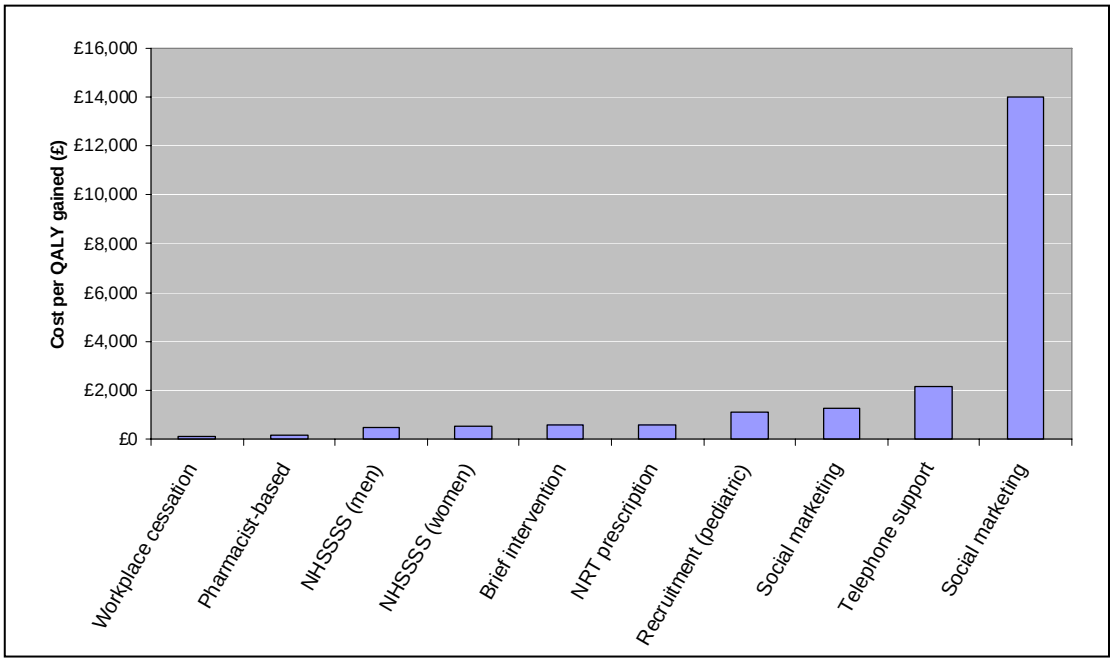
From the effectiveness review, 13 studies of interventions to improve the reach, use and retention of smoking cessation interventions among disadvantaged groups were identified and included in the economic analysis. The following interventions were included in the economic analysis: social marketing interventions; recruitment to smoking cessation interventions at pediatric units; using NHSSSS to identify and reach; improving access to smoking cessation interventions through pharmacist-based interventions and workplace interventions; incentives through the prescription of free NRT; and brief interventions and telephone support for pregnant women.

The disadvantaged groups targeted by the interventions include BME groups (including a number of interventions targeted towards African America smokers and an intervention targeted at the Turkish community), smokers living in deprived and disadvantaged areas, pregnant women and manual workers.

Cost per QALY gained (excluding future public sector costs saved)

The available literature on the ICERs associated with the effects identified in the studies meant that the economic analysis produced estimates of cost per QALY gained (excluding savings in future public sector costs) for 10 of the 13 interventions. Figure five shows the cost per QALY gained for these interventions. It demonstrates that all the interventions for which cost per QALY gained estimates are available have ICERs lower than the £30,000 threshold traditionally implied by NICE decisions. All but one of the interventions had a cost per QALY gained in the range of c£150 to c£2,000.

Figure 5: The cost per QALY gained for interventions to improve the reach, use and retention of smoking cessation in disadvantaged groups.



Cost per QALY gained (including future public sector costs saved).

The available literature on the ICERs associated with the effects identified in the studies meant that the economic analysis produced estimates of cost per QALY gained (including savings in future public sector costs) for two interventions. First, the cost per QALY gained (including public sector costs saved) for a social marketing intervention was estimated at £2,476. Second, the cost per QALY gained (including public sector costs saved) for a pharmacist-based intervention was estimated at £8,501.Again, these ICERs are lower than the £30,000 threshold traditionally implied by NICE decisions.

Cost per Life Year Gained

The ICERs available in the literature meant that the result of the economic analysis for one intervention was an estimate of the cost per life year gained (including public sector cost saved). The cost per life year gained (including public sector cost saved) for an intervention to increase use of NHSSSS was £1,283.

Variation in ICER by intervention types

The interventions included in the analysis can be divided into the following types:

1. Client-centred social marketing interventions have a cost per QALY gained (excluding public sector costs saved) ranging from £1,251 to £14,013. The cost per QALY gained (including public sector costs saved) was calculated for one example of a social marketing intervention. This has a cost per QALY gained (including public sector costs of £2,476.
2. Interventions to identify and reach smokings in disadvantaged groups, including NHSSSS and recruitment at a pediactric unit) had a cost per QALY gained (excluding public sector costs saved) ranging from £460 to £1,126.
3. Interventions to improve the reach of smoking cessation interventions among disadvantaged groups had a cost per QALY gained (excluding public sector costs saved) ranging from £136 for a workplace intervention to £195 for a pharmacist-based intervention. One example of a pharmacist-based intervention has a cost per QALY gained (including public sector costs saved) of £8,501.
4. One example of an incentive-based intervention (free NRT) had a cost per QALY gained (excluding public sector costs saved) of £586.
5. Interventions to reduce smoking among pregnant women had a cost per QALY gained ranging from £574 (for a brief intervention) to £2,165 (for proactive telephone support).

Sensitivity analysis

Figure six provides a more detailed summary of the result of the economic modelling. This serves to highlight two important caveats to the analysis:

1. Methods quality. While the sample of studies modelled includes a number of good quality RCTs, it also includes a number of poor quality observational studies. In these instances, there are a number of concerns over the quality of the effect data employed in the model. The potentially poor measurement of the counterfactual means that there is a possibility that the model overestimates the effect and cost-effectiveness of the intervention.
2. Location. 7 of the 13 of the studies are non-UK-based, raising questions about the transferability of the data to the UK context.

A number of other caveats should also be noted. These include:

1. Relapse rates: Where the model extrapolated from an estimate of the proportion of participants quitting smoking to an estimate of the cost per QALY gained form the intervention, it was assumed that none of the quitters relapsed. This assumption is likely to result in an underestimate of the cost per QALY gained for an intervention.
2. Intervention costs: In the majority of cases, the estimates of the cost of the interventions were based on descriptions of the interventions within the effectiveness studies. It is likely that these estimates therefore exclude some of the costs of the intervention, resulting in an overestimation of the cost-effectiveness of the intervention.

Appendix ten shows the results of a sensitivity analysis performed to test the impact of these caveats to the analysis. This demonstrates that the conclusion that the interventions are cost-effective is not sensitive to the above caveats.

Relapse rates. Most interventions required relapse rates c95% before their cost per QALY gained estimates rose above the £30,000 threshold. This compared with a 75% relapse rate between 4 weeks to 52 weeks post intervention for the NHS Stop Smoking Services (Ferguson et al, 2005). Ferguson et al (2005) also report that most relapses occur in the first six months. The shortest follow-up period over which quit was measured amongst the studies included in the model was one month (2 studies), and a number of studies measured quit over periods of twelve and eighteen months.

The one intervention for which the above conclusion may not apply is the social marketing intervention evaluated by Steven's et al (2002), which only requires a relapse rate of c55% before its cost per QALY gained rises above £30,000. However, as the follow-up period for this study is 12 months, during which time most relapse would have already occurred, it is likely that 55% could be an overestimate of any relapse after the point of measurement of the effect. Therefore, the conclusion that this intervention is cost-effective is also unlikely to be sensitive to the relapse rate included in the model.

Intervention cost. Intervention costs would have to be increased by at least c100% before the cost per QALY gained estimate passes above the £30,000 per QALY threshold, that most interventions require intervention cost to be increased by more than 1000% before the cost per QALY estimate passes above the £30,000 per QALY threshold. It is therefore reasonable to

conclude that the results of the analysis are not sensitive to any inaccuracies in the estimate of intervention costs.

Effect size. The effect size would have to be reduced by at least c55% before the cost per QALY gained estimate passes above the £30,000 per QALY threshold, and that most interventions require the effect size to be reduced by c95% before the cost per QALY estimate passes above the £30,000 per QALY threshold.

The key methodological challenge faced by the studies measuring the effect of the intervention was the lack of a measure of the counterfactual, or the effect that would have occurred in the absence of the intervention. The average quit rate identified in the studies is 15.6%. Most of the analysis implicit assumes that 0% of participants would have quit in the absence of the intervention. The sensitivity analysis suggests that this spontaneous quit rate would have to be increased to c14.8% before the conclusion that the interventions are cost-effective would be reversed. This compared with a spontaneous quit rate of 1% adopted in the PREVENT model (Akehurst and Piercy, 1994)[3]

Thus, while the above figures should not be taken as accurate estimates of the cost per QALY gained associated with the interventions, the sensitivity analysis suggests that we can be confident in the conclusion that the interventions have a cost per QALY gained estimate lower than the £20,000 - £30,000 threshold traditionally employed by NICE.

[3] Reported in Woolacott (2003)

Figure 6: Estimate ICERs (2007 prices)

Intervention type	Intervention	Study	Method (quit follow-up period)	Method quality	Location	Population	Cost pp	£/QALY gained	£/QALY gained (incl. public sector costs saved)	£/LYG gained (incl. public sector costs saved)
Client-centred approaches	Social marketing	Boyd et al 1998	RCT	+	non-UK	African Americans	£0.31		£2,476	
	Social marketing	Schorling 1997	Ecological study (18m follow-up)	+	non-UK	African Americans	£86	£1,251		
	Social marketing	Stevens et al, 2002	Observational study (12m follow-up)	-	UK	Turkish	£825	£14,013		
Identifying & reaching	Recruitment at pediatric unit	Curry et al 2003	RCT (12m follow-up)	+	non-UK	Low income, BME	£155	£1,126		
	NHSSSS	Chesterman et al, 2005	Observational study	++	UK	Disadvantaged area	£196			£1,283
	NHSSSS (men)	Lowey et al, 2003	Observational study (1m follow-up)	++	UK	Deprived area	£196	£460		
	NHSSSS (women)	Lowey et al, 2004	Observational study (1m follow-up)	++	UK	Deprived area	£196	£510		
Improving access	Pharmacist-based	Bauld et al, 2006	Observational study (1m follow-up)	++	UK	Deprived area	£151	£195		
	Pharmacist-based	Doescher et al 2002	Pilot	+	non-UK	Low income	£310		£8,501	
	Workplace intervention	Barbeau et al 2006	Cohort Study (follow-up post 4m intervention)	+	non-UK	Apprentice iron workers.	£52	£136		

Intervention type	Intervention	Study	Method (quit follow-up period)	Method quality	Location	Population	Cost pp	£/QALY gained	£/QALY gained (incl. public sector costs saved)	£/LYG gained (incl. public sector costs saved)
Incentive Schemes	NRT prescription	Copeland et al, 2005	Cohort Study (3m follow-up)	+	UK	Deprived area.	£230	£586		
Pregnancy	Brief intervention	Dornelas et al 2006	RCT(follow-up at end pregnancy)	++	non-UK	Low income pregnant women	£211	£574		
	Proactive telephone support	Solomon 2000	RCT (follow-up at end pregnancy)	-	non-UK	Pregnant women	£140	£2,165		

5.0 Discussion

This report assess the cost-effectiveness of the following interventions targeted at disadvantaged: social marketing interventions; recruitment to smoking cessation interventions at pediatric units; using NHSSSS to identify and reach; improving access to smoking cessation interventions through pharmacist-based interventions and workplace interventions; incentives through the prescription of free NRT; and brief interventions and telephone support for pregnant women.

The disadvantaged groups targeted by the interventions include BME groups (including a number of interventions targeted towards African America smokers and an intervention targeted at the Turkish community), smokers living in deprived and disadvantaged areas, pregnant women and manual workers.

The cost per QALY gained for these intervention is as follows:

6. Client-centred social marketing interventions have a mean cost per QALY gained (excluding public sector costs saved) of £7,632. The cost per QALY gained (including public sector costs saved) was calculated for one example of a social marketing intervention. This has a cost per QALY gained (including public sector costs of £2,476.
7. Interventions to identify and reach smokings in disadvantaged groups (including NHSSSS and recruitment at a pediactric unit) have a mean cost per QALY gained (excluding public sector costs saved) of £485.
8. Interventions to improve the reach of smoking cessation interventions among disadvantaged groups have a meancost per QALY gained (excluding public sector costs saved) of £166. One example of a pharmacist-based intervention has a cost per QALY gained (including public sector costs saved) of £8,501.
9. One example of an incentive-based intervention (free NRT) had a cost per QALY gained (excluding public sector costs saved) of £586.
10. Interventions to reduce smoking among pregnant women have a mean cost per QALY of £1,370.

Cost per QALY gained (excluding public sector costs saved) estimates for a number of the above intervention when targeted the general population were also produced by The Matrix Knowledge Group using the same methodology (Matrix Evidence, 2007):

- The cost per QALY gained of social marketing when targeted at the general population was £42.
- The cost per QALY gained of pharmacist-based interventions when targeted at the general population was £229 - £533.
- The cost per QALY gained of free NRT when targeted at the general population was £29 - £1,038.

Comparing these ICERs with those for the interventions when there are targeted at disadvantaged groups suggests that the cost-effectiveness of pharmacist-based interventions

and free NRT is comparable for disadvantaged groups and the general population. However, the social marketing seems to be more cost-effective for the general population.

As with any modelling exercise, the cost per QALY estimates produced are subject to some uncertainty. The caveats to the analysis can be divided into two types. First, those assumptions that cause the analysis to overestimate the cost per QALY gained associated with the intervention. As the estimates of cost per QALY gained emerging from the model are lower than the NICE threshold, these caveats will not change the conclusion of the analysis. Second, those assumptions that cause the analysis to underestimate the cost per QALY gained associated with the intervention. In particular, the analysis is subject to the following caveats:

1. Some of the models employed assume that participants who quit smoking as a result of the interventions do not relapse and start smoking again.
2. Limitations in the quality of the research designs employed in the effectiveness studies are likely to result in an overestimation of the effectiveness of some of the interventions.
3. It is possible that the cost of the intervention is underestimated, as these estimates are derived from intervention descriptions provided in the effect study papers.

However, sensitivity analysis suggests that the findings are not sensitive to these caveats. For instance, most interventions required relapse rates c95% before their cost per QALY gained estimates rose above the £30,000 threshold. This compared with a 75% relapse rate between 4 weeks to 52 weeks post intervention for the NHS Stop Smoking Services (Ferguson et al, 2005). Ferguson et al (2005) also report that most relapses occur in the first six months. The shortest follow-up period over which quit was measured amongst the studies included in the model was one month (2 studies), and a number of studies measured quit over periods of twelve and eighteen months.

Thus, while the above figures should not be taken as accurate estimates of the cost per QALY gained associated with the interventions, the sensitivity analysis suggests that we can be confident in the conclusion that the interventions have a cost per QALY gained estimate lower than the £20,000 - £30,000 threshold traditionally employed by NICE.

While the above analysis measures the impact of the interventions on health outcomes, as the target population for these interventions belong to disadvantaged groups, their impact is both to increase health outcomes and reduce health inequalities. One way to account for this is to adjust the £30,000 per QALY threshold against which interventions are assessed to include the value of reducing health inequalities. Professor Dolan and colleagues are engaged in on-going research into public preferences over various efficiency-equity trade-offs in health. In one small study of 66 respondents, Dolan and Tsuchiya (forthcoming, a) have estimated the weight given to a unit health gain to the lowest social class compared to a unit health gain for the highest social class. When differences in health are expressed in terms of life expectancy, the average respondent weights a marginal gain in life expectancy to the lowest social class about seven times more highly than the same gain to the highest social class. When differences are expressed in terms of rates of limiting long-term illness, the corresponding weight is four. The

lower of these estimates would suggest that an intervention that reduces health inequalities should be assessed against a cost-effectiveness threshold of £120,000.

However, further work by Dolan and Tsuchiya (forthcoming, b) using the same data suggests that the equity weights would change if the health inequalities are perceived to be the responsibility of the individual. For instance, if the poorer health of smokers is entirely their responsibility, the weight given to a smoker relative to a non-smoker is about one half. All else equal, this would suggest that the cost-effectiveness threshold be reduced to for smokers £15,000. Assuming that these two sets of weights are independent of one another, it would suggest that benefits to smokers in the lowest social class are weighted about twice as highly as benefits to non-smokers in the highest social class (i.e. a threshold of £60,000 per QALY). However, assuming that the weights can be added together in this way is a rather heroic assumption given the current state of knowledge and it is certainly not one that we would wish to defend. Professor Dolan will be presenting fresh empirical evidence, from much larger samples, shortly.

However, even at this lower cost-effectiveness threshold, most of the intervention would be considered cost-effective. The only intervention considered non-cost-effective at this lower ICER is one of the social marketing interventions (Stevens et al, 2002).

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7.0 Appendix 1: Effect review studies included and excluded from the model

Study	Included/excluded
An et al 2006	Excluded - not disadvantaged group
Bains et al 1998	Excluded - not disadvantaged group
Barbeau et al 2006	Included
Bauer et al 2006	Excluded - not disadvantaged group
Bauld et al 2006	Included
Bentz et al 2006	Excluded - not disadvantaged group
Blenkinsopp et al 2003	Excluded - not disadvantaged group
Boyd et al 1998	Included
Campbell et al 1998	Excluded - not disadvantaged group
Carr & Ebbert 2007	Excluded - not disadvantaged group
Chesterman et al 2005	Included
Curry et al 2003	Included
Doescher et al 2002	Included
Dornelas et a 2006	Included
Hall et al 2003	Excluded - not disadvantaged group
Hall et al 2007	Excluded - not disadvantaged group
Harding et al 2004	Excluded - not disadvantaged group
Haviland et al 2004	Excluded - not report relevant outcome data
Hennrikus et al 2002	Excluded - not disadvantaged group
Lazev et al 2004	Excluded - not disadvantaged group
Lowey et al 2003	Included
Lowry et al 2004	Excluded - not report relevant outcome data
McDaniel et al 2005	Excluded - not report relevant outcome data
McLean et al 2006	Excluded - not report relevant outcome data
Milch et al 2004	Excluded - not disadvantaged group
Murray et al 2007	Excluded - not disadvantaged group
Needleman et al 2006	Excluded - not disadvantaged group
Okuyemi et al 2007	Excluded - not report relevant outcome data
Owens & Springett 2007	Excluded - not disadvantaged group
Perry et al 2005	Excluded - not disadvantaged group
Prochaska et al 2001	Excluded - not disadvantaged group
Ritchie et al 2007	Excluded - not report relevant outcome data
Roddy et al 2006	Excluded - not report relevant outcome data
Schorling et al 1997	Included
Solomon et al 2000	Included
Springett et al 2007	Excluded - not disadvantaged group
Stevens et al 2002	Included
Tappin et al 2000	Excluded - not report relevant outcome data
Ussher et al 2004	Excluded - not report relevant outcome data
Ussher et al 2006	Excluded - not report relevant outcome data
Vidrine et al 2006	Excluded - not disadvantaged group

Study	Included/excluded
Wiltshire et al 2003	Excluded - not report relevant outcome data

8.0 Appendix 2: data extraction tables

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Barbeau et al, 2006	Union-based smoking cessation for apprentice iron workers	£51.60	Before Intervention: Quit: 0%; After intervention: Quit:19.4%	Incremental costing includes: ➢ Provision of toxics and education module by an industrial hygienist. Article states that training lasted 16 hours, assumes 1 day consists of 8 hours. ➢ Tobacco cessation group provided by a state certified tobacco treatment specialist. Assumes each session ran for one hour, making a total of 8 hours (1 day) for the programme. Assumes that a state certified tobacco treatment specialist is equivalent to a community nurse. ➢ NRT ➢ Screening of interested participants by group facilitators for contraindications to NRT to determine the appropriate dosage and to distribute an informational packet. Assumes screening lasted 20 minutes and that group facilitators equivalent to a social work assistant. ➢ An informational packet. Assumed equivalent to a booklet. ➢ Posters containing information on quitting smoking placed in the union hall and program classroom. Assumed to have a negligible incremental cost. ➢ Articles on smoking cessation placed within the union journal. Assumed to have a negligible incremental cost. ➢ DIY quit kit for participants. Assume equivalent to a booklet. ➢ Incentives – lunch and entry into a prize raffle. Assumed to have a negligible incremental cost. Costs: ➢ Community nurse: £74.38 per hour - Source: Netten & Curtis (2006) ➢ Social work assistant £22.73 per hour - Source: Netten & Curtis (2006)

				➢ Programme training costs: £550 per day - Source: Barbeau et al (2006) ➢ NRT: £20.51 - Source: Information Centre (2007) ➢ Booklet: £5.95 - Source: MIDIRS (2007)

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Bauld et al, 2006	Group support + NRT	£151.06	4 week cessation rate. (1) Treatment for high deprivation (1st quintile on IMD): 39.4 (n=241); treatment for low deprivation (5th quintile, IMD): 55.8%. (2) Treatment for high deprivation (socio econ score 6): 37.8% (n=37), treatment for low deprivation (socio econ score 1): 68.8% (n=48)	Incremental costing includes: ➢ 7 group support sessions. Article states each session attended by 15 participants. Assumes each session lasts 2 hours and that each session is led by the equivalent of a GP nurse. ➢ NRT. Median use 6 weeks taken from article. ➢ Bupropion. Median use 0 weeks taken from article. Costs: ➢ GP Nurse: £29.96 per hour - Source: Netten & Curtis (2006) ➢ NRT: £20.51 per week - Source: Information Centre (2007)

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Boyd et al, 1998	Communications campaign to increase use of cancer	£0.31	Participation (number of calls from african american smokers per 10,000 african american	Incremental costing includes: ➢ Production and pre-testing of six radio advertisements encouraging smokers to call the CIS for three different radio programming formats. ➢ Production and pre-testing of one TV spot.

	information service		smokers in the population): Treatment: 17.97; control 0.21	➢ Production and pre-testing a radio spot for general programming formats. ➢ Production of campaign media spots and outreach print materials by an advertising company. ➢ Development of the content for the advertisement through reviews. ➢ Development of the content for the advertisement through focus groups. Total media costs of $174,265 (1998) stated within the article. ➢ Second round of four focus groups to determine which messages and images were most effective. ➢ Provision of advice and feedback to revise the storyboards and audiotapes for final production by an expert review panel, consisting of 10 nationally recognized health communications specialists. ➢ Radio (3,364 ads) and Television (208 ads) advertising for 10 weeks in two waves. ➢ Station PSA gatekeepers asked to play the ads during periods when quitting smoking was expected to be salient. ➢ Quit Today outreach component (video tape of 12 minutes, with 1 video issued per 1000 African American residents). Assumes a unit cost of £5. ➢ Outreach packets. Assumes equivalent to a booklet. Costs: ➢ Total media costs of $174,265 (1998) stated within the article. ➢ Booklet: £5.95 - Source: MIDIRS (2007)

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Chesterman et al, 2005	Effectiveness of smoking cessation services in	£195.99	Use of NHS smoking cessation services: High need (first quintile - most deprived areas as	Costs: ➢ Average cost for NHS Smoking cessation services: £195.99 per participant - Source: Stapleton et al (2001), quoted in Flack et al (2006).

	disadvantaged areas aimed at increasing access to treatment services		measured using IMD): 32.3%; Medium need: 19%; Low need (fifth quintile): 9%	

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Copeland et al, 2005	GP prescribed NRT patches	£230.98	Quit: Before Treatment: 0%; After Treatment: 20%; N=120	Incremental costing includes: ➢ GP consult. ➢ NRT. Assumes 10 weeks of NRT prescribed. Costs: ➢ GP consult: £25.83 per consult - Source: Netten & Curtis (2006) ➢ NRT: £20.51 - Source: Information Centre (2007)

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Curry et al, 2003	A motivational message, a guide to quitting smoking, and a 10 min motivational	£154.66	Quit: Treatment (N=156):14%, Counterfactual (N=147): 7%; Adjusted OR: 2.77, 95% CI: 1.24 - 6.60,	Incremental costing includes: ➢ Informing all women accompanying children to paediatric care visits about the smoking cessation programme through handouts and face to face interactions. Assumes the invitation is equivalent in cost to a single issue leaflet. ➢ 13 minute motivational interviews conducted by a nurse or an interventionist. Assumes nurse and interventionist to be equivalent to a GP nurse.

	interview with a nurse or study interventionist			➢ Telephone counselling manual. Assume equivalent to a booklet. ➢ 3 outreach telephone counselling calls from the nurse or interventionist who conducted the motivational interview. Assumes nurse and interventionist to be equivalent to a GP nurse and conducted for 13 minutes (same length as the motivational interview). ➢ 5 minutes of Clinician's time with each participant. Assumes equivalent to half the cost of a GP consult (10 minutes in length on average). ➢ 15 minutes Clinician training. Costs based on wage cost for clinician plus programme training costs. Assumes clinician equivalent to a GP, one clinician per 50 participants, and that 15 minutes training is equivalent in cost to 1.5 GP consults (average length 10 minutes). ➢ Self-help manuals. Assume equivalent to a booklet. ➢ 8 hours nurse and interventionist training. Costs based on wage cost for nurses and interventionists plus programme training costs. Assumes nurse and interventionists equivalent to a GP nurse and one nurse or interventionist per 20 participants. ➢ Comprehensive intervention manual for the project. Assume equivalent to a booklet. ➢ Intervention folder providing a suggested script for clinicians to talk with women. Assumed to have a negligible incremental cost. ➢ Incentive – token gift, eg a fridge magnet. Assumed to have a negligible incremental cost. Costs: ➢ GP consult: £25.83 per consult - Source: Netten & Curtis (2006) ➢ GP Nurse: £29.96 per hour - Source: Netten & Curtis (2006) ➢ Programme training costs: £550 per day - Source: Barbeau et al (2006) ➢ Booklet: £5.95 - Source: MIDIRS (2007) ➢ Single issue leaflet: £2.95 - Source: MIDIRS (2007)

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Doescher et al, 2002	NRT and pharmacist tobacco cessation counselling	£310	0.5% of eligible smokers completed 5 sessions of NRT and counselling	Incremental costing includes: ➢ Mailing an announcement advertising the benefit to potentially eligible enrolees. Assume equivalent in cost to a single issue leaflet. ➢ Flyers advertising the pilot program in the clinic waiting and examination rooms. Assume negligible incremental cost. ➢ Adding a reminder to enrolees' medical records prompting providers to prescribe the new benefit. Assume negligible incremental cost. ➢ One hour pharmacist initial assessment + motivational counselling. ➢ Pharmacist training. Costs based on wage cost for clinician plus programme training costs. ➢ Pharmacist counselling. Mean number of sessions was 2 and the average length was 15 minutes. ➢ NRT. Average length of treatment was 36 days. ➢ Pharmacist fee for filling NRT prescription. Mean number of prescriptions was 2. Costs: ➢ Pharmacist: £48.41 per hour - Source: Netten & Curtis (2006) ➢ Pharmacist fee for filling NRT prescription: $15 (2002) = £14.48 (2007) - Source: Doescher (2002) ➢ Programme training costs: £550 per day - Source: Barbeau et al (2006) ➢ Single issue leaflet: £2.95 - Source: MIDIRS (2007) ➢ NRT: £20.51 - Source: Information Centre (2007

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Donelas et al, 2006	Paediatric-based smoking cessation intervention	£210.16	Quit: Treatment (N=53): 28.3%, Counterfactual (N=52): 9.6%	Incremental costing includes: ➢ Treatment manual. Assumed equivalent to a booklet. ➢ 40 hours of training for 2 mental health counsellors. Costing includes cost of psychologist giving training. ➢ 90 minutes counselling by mental health worker. ➢ 90 minutes telephone counselling by mental health worker. Assumes negligible premium for working via telephone. ➢ 30 minutes of clerical staff issuing follow-up reminders. Assume clerical staff equivalent to co-ordinators costed within the article. Costs: ➢ GP Nurse: £29.96 per hour - Source: Netten & Curtis (2006) ➢ Mental health counsellor: £30 per hour – Donelas et al (2006) ➢ Psychologist: £30 per hour – Donelas et al (2006) ➢ Co-ordinator: £18 per hour – Donelas et al (2006) ➢ Booklet: £5.95 - Source: MIDIRS (2007)

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Lowey et al, 2007	NHS Smoking cessation services	£195.99	% of those who access service and quit: (i) men least deprived quintile 23.7%, (ii) men most deprived quintile 21.7%, (iii) women least deprived quintile 25.4%, (iv) women most deprived quintile 19.6%,	Costs: ➢ Average cost for NHS Smoking cessation services: £195.99 per participant - Source: Stapleton et al (2001), quoted in Flack et al (2006).

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Schorling et al, 1997	Church-based smoking cessation interventions	£85.94	18m quit: Treatment (N=344): 9.4%, Control (N=304)=5.9%	Incremental costing includes: ➢ Church co-ordinator devotes 50% of her time. Assumes the church co-ordinator is equivalent to a social work team leader and that 50 hrs were spent by the co-ordinator. ➢ One-on-one counselling by advisors with advice and follow-up. Assumes 40 minutes of counselling per smoker and that the advisor is equivalent to a social work assistant. ➢ 8 hours training for 2 advisors. Costs based on wage cost for both advisors plus the £550 cost for the training course taken from article. Assumes advisors equivalent to social work assistants. ➢ Self help materials designed by project staff. Assumes one set of materials per participant and that materials equivalent to a booklet. ➢ Design of project by coalition members (volunteers + lay person + clergy). Assumes no public sector cost would be incurred ➢ Distribution of smoking cessation devotional booklets. Assumes booklet distributed per participant and equivalent to a booklet. ➢ Annual county wide smoking cessation contest. Assumes equivalent to the average cost of a smoking cessation contest ➢ County-wide Gospel Quit Nights + dissemination of information on smoking cessation programs every 6 months. Assumes equivalent in cost to half the fee for a smoking cessation contest. ➢ Annual educational contests in the school (poster contest + essay contest). Assumes equivalent in cost to half the fee for a smoking cessation contest. Costs: ➢ Social work team leader: £43.39 per hour - Source: Netten & Curtis (2006)

				➢ Social work assistant £22.73 per hour - Source: Netten & Curtis (2006) ➢ Average cost of an annual county wide smoking cessation contest. £16,043 ($23,857 - 1995) - Source: Shipley et al (1995) ➢ Booklet: £5.95 - Source: MIDIRS (2007)

Author and Year	**Intervention**	**Incremental Cost per participant (2007)**	**Effect Data**	**Comment**
Soloman et al, 2000	Health professional advice plus proactive telephone peer support for pregnant women v just advice	£140.21		Incremental costing includes: ➢ Training of the woman ex-smoker peer support worker (8 hrs). Costs based on wage cost for clinician plus programme training costs. Assumes peer support worker equivalent to a social work assistant, and one peer support worker per 10 participants. ➢ 10 minutes per week of telephone peer support by a peer support worker. Assumes peer support worker equivalent to a social work assistant and that weekly calls are made for 12 weeks. Costs: ➢ Social work assistant £22.73 per hour - Source: Netten & Curtis (2006) ➢ Programme training costs: £550 per day - Source: Barbeau et al (2006)

Author and Year	Intervention	Incremental Cost per participant (2007)	Effect Data	Comment
Stevens et al, 2002	Mass media anti-smoking campaign (10 min play, a poster campaign, a media campaign, and a series of purpose-designed leaflets)	£33.00	Quitt: 3%; 95% CI: 0-6%; N=303	Incremental costing includes: ➢ Salary costs. Taken from article - £23,365 ➢ Other labour costs. Taken from article - £26,520 ➢ Non pay costs. Taken from article - £23,034 ➢ Total direct costs. Taken from article - £49,554 ➢ Overheads. Taken from article - £7,433

9.0 Appendix three: summary of models employed with each effect study

Study	Economic model applied
Barbeau et al 2006	Intervention to increase Quit
Bauld et al 2006	Intervention to increase Quit
Boyd et al 1998	Intervention to increase calls to CIS
Chesterman et al 2005	Intervention to increase use of NHSSSS
Copeland et al 2005	Intervention to increase Quit
Curry et al 2003	Intervention to increase Quit
Doescher et al 2002	Intervention to increase completion of NRT and Counselling
Dornelas et al 2006	Intervention to increase Quit
Lowey et al 2003	Intervention to increase Quit
Schorling et al 1997	Intervention to increase Quit
Solomon 2000	Intervention to increase Quit
Stevens et al 2002	Intervention to increase Quit

10.0 Appendix 4: ICER: Smoking Cessation: Counselling with another intervention

Source	Treatment	Counterfactual	Population: other	Method	ICER
Parrott and Godfrey/ Flack et al (2006)	Intensive counselling + bupropion	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £5721. £/LYG (included avoided health treatment costs): £2964
Parrott and Godfrey/ Flack et al (2006)	Intensive counselling + NRT	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £4627. £/LYG (included avoided health treatment costs): £4274
Parrott and Godfrey/ Flack et al (2006)	Telephone counselling	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £758. £/LYG (included avoided health treatment costs): £965
Parrott and Godfrey/ Flack et al (2006)	GP minimal counselling + NRT	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £965. £/LYG (included avoided health treatment costs): £1241
Parrott and Godfrey/ Flack et al (2006)	Intensive counselling + bupropion	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £2344. £/LYG (included avoided health treatment costs): £2964. £/LYG: £5928.
Parrott and Godfrey/ Flack et al (2006)	Intensive counselling + NRT	Usual care	Population attending GP	Public perspective, base year 2006	£/QALY (included avoided health treatment costs): £3377. £/LYG (included avoided health treatment costs): £4274.£/LYG: £7237

Source	Treatment	Counterfactual	Population: other	Method	ICER
Godfrey et al (2005)	NHS smoking cessation services	Do nothing	Population accessing the English smoking cessation services	Public perspective, base year 2006	£/LYG: £773.£/LYG (included avoided health treatment cost): £495
Fry-Smith et al (2006)	Counselling + NRT	Do nothing	Counselling + NRT	Public perspective, base year 2006	£/Quit attempt.£103.08
Fry-Smith et al (2006)	Counselling + Bupropion	Do nothing	Counselling + Bupropion	Public perspective, base year 2006	£/Quit attempt:£103.66
Fry-Smith et al (2006)	Counselling + NRT + Bupropion	Do nothing	Counselling + NRT + Bupropion	Public perspective, base year 2006	£/Quit attempt: £171.49
Flack et al (2006)	Bupropion (150mg/day) + less intensive counselling	Do nothing	Workplace	Public perspective, Base year 2006	£/per person: £88.£/1 year quit: £702.
Flack et al (2006)	Bupropion (150mg/day) + more intensive counselling	Do nothing	Workplace	Public perspective, Base year 2006	£/per person: £145. £/1yr Quit: £711
Flack et al (2006)	Bupropion (300mg/day) + less intensive counselling	Do nothing	Workplace	Public perspective, Base year 2006	£/per person: £54. £/1 yr Quit: £1047
Flack et al (2006)	Bupropion (300mg/day) + more intensive counselling	Do nothing	Workplace	Public perspective, Base year 2006	£/per person: £210. £/1 year Quit: 1275
Flack et al (2006)	Intensive counselling +	Brief GP advice	GP	Public perspective, Base year 2006	£/life time quitter: £2232.

Source	Treatment	Counterfactual	Population: other	Method	ICER
	NRT				
Flack et al (2006)	Intensive counselling + bupropion	Brief GP advice	GP	Public perspective, Base year 2006	£/life time quitter: £1426.
Flack et al (2006)	Intensive counselling + NRT + buproprion	Brief GP advice	GP	Public perspective, Base year 2006	£/life time quitter: £1987.
Fry-Smith et al (2006)	Counselling + NRT	Counselling	Assuming 1 LYS for every quit		£/lifetime quitter: 2001. £/LYG:2001
Fry-Smith et al (2006)	Counselling + NRT	Counselling	Assuming 2 LYS for every quit		£/LYG:£1000.
Fry-Smith et al (2006)	Counselling + NRT	Counselling	Assuming 3 LYS for every quit		£/LYG: £667
Fry-Smith et al (2006)	Counselling + Bupropion	Counselling	Assuming 1 LYS for every quit		£/lifetime quitter: £1278. £/LYG: £1278
Fry-Smith et al (2006)	Counselling + Bupropion	Counselling	Assuming 2 LYS for every quit		£/LYG:£639
Fry-Smith et al (2006)	Counselling + Bupropion	Counselling	Assuming 3 LYS for every quit		£/LYG:£426
Fry-Smith et al (2006)	Counselling + NRT + Bupropion	Counselling	Assuming 1 LYS for every quit		£/lifetime quitter: £1781. £/LYG: £1780
Fry-Smith et al (2006)	Counselling + NRT + Bupropion	Counselling	Assuming 2 LYS for every quit		£/LYG:£890
Fry-Smith et al (2006)	Counselling + NRT + Bupropion	Counselling	Assuming 3 LYS for every quit		£/LYG: 594
Parrott and Godfrey	GP counselling and nicotine gum	Do nothing	GP	Pubic perspective	£/1 yr quit:£296.£/LYG: £613

Source	Treatment	Counterfactual	Population: other	Method	ICER
(1994)					
Parrott and Godfrey (1994)	GP counselling + NRT or bupropion	Do nothing	GP, Men One pack a day smokers.	Pubic perspective	£/LYG: £2645
Parrott and Godfrey (1994)	GP counselling + NRT or bupropion	Do nothing	GP, Women, One pack a day smokers	Pubic perspective	£/LYG: £3786.
Parrott and Godfrey (1994)	GP counselling + instructional materials + two follow-up phone calls	Do nothing	GP, Pregnant women	Pubic perspective	£/LYG: £1447.
Flack et al (2006)	Minimal counselling + transdermal nicotine	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit: £3984.£/QALY: £2019. £/LYG: £2727
Flack et al (2006)	Brief counselling + transdermal nicotine	Do nothing	18+, willing to make a quit attempt. LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£3513. Incremental £/QALY:£1780.£/LYG:£2405.
Flack et al (2006)	Full counselling + transdermal nicotine	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£2279.Incremental £/QALY:£1155.£/LYG:£1561
Flack et al (2006)	Individual intensive counselling +	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97;	Public perspective, Base year 2006	£Quit:£2410.Incremental£/QALY:£1222.£/LYG:£1653

Source	Treatment	Counterfactual	Population: other	Method	ICER
	transdermal nicotine		relapse rate 45%, 3% DR		
Flack et al (2006)	Group intensive counselling + transdermal nicotine	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£1939:Incremental£/QALY:£983 . £/LYG: £1327.
Flack et al (2006)	Minimal counselling + nicotine gum	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£7524.Incremental£/QALY:£381 3. £/LYG:£5151
Flack et al (2006)	Brief counselling + nicotine gum	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£6171.Incremental£/QALY:£312 7. £/LYG: £4224.
Flack et al (2006)	Full counselling + nicotine gum	Do nothing	18+, willing to make a quit attempt. LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£3557. Incremental £/QALY:£1803. £/LYG:£2435.
Flack et al (2006)	Individual intensive counselling + nicotine gum	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£/Quit:£3700. Incremental £/QALY:£1875. £/LYG:£2532
Flack et al (2006)	Group intensive counselling + nicotine gumtion	Do nothing	18+, willing to make a quit attempt, LYS/quitter: 1.46; QALY/quitter: 1.97; relapse rate 45%, 3% DR	Public perspective, Base year 2006	£Quit:£3019. Incremental £QALY:£1530. £/LYG: £2066.
Parrott and Godfrey	GP counselling + nicotine patch	GP brief advice	Men 25-29, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2,378.45

Source	Treatment	Counterfactual	Population: other	Method	ICER
(2004)					
Parrott and Godfrey	GP counselling + nicotine patch	GP brief advice	Men 30-34, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2,217.95
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men, 35-39, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£ 2,164.86
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men 40-44, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2,204.74
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men 45-49, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:2,303.48
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men, 50-54, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY: £2,624.52.
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men, 55-59, Assuming 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£ 3,117.47
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men, 60-64, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY: £3974.66.
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Men 65-69, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£5398.57
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 25-29, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£3091.76

Source	Treatment	Counterfactual	Population: other	Method	ICER
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 30-34, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2761.22
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 35-39, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2582.93
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 40-44 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2460.16
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 45-49, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2426
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 50-54, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2,529.88
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 55-59, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2529.08
Parrott and Godfrey (2004)	GP counselling + nicotine patch	GP brief advice	Women, 60-64, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2679.47
Parrott and Godfrey (2004)	Intensive counselling + bupropion	GP brief advice	Women, 65-69, 35% relapse rate	Public perspective, Base year 2006	Incremental£/QALY:£2917.62

11.0 Appendix 5: ICER: Smoking Cessation: NHSSSS

Source	Treatment	Counterfactual	Population: other	Method	ICER
Flack et al 2005	English smoking cessation services	Do nothing		Public sector perspective, base year 2006	£/LYG: £773. £/LYG (included avoided health treatment cost): £638
Flack et al 2006	NHS smoking cessation services	Do nothing	35-44	Assume 60-65% of 4 week abstinence relapse by 12 month, and 35% of 12m quitters relapse at some point in their lifetime, Public sector perspective, base year 2006	£/LYG: £773
Flack et al (2006)	NHS smoking cessation services	Do nothing	45-54	Assume 60-65% of 4 week abstinence relapse by 12 month, and 35% of 12m quitters relapse at some point in their lifetime, public sector perspective, base year 2006	£/LYG: 766

12.0 Appendix 6: Value of a quit per quitter (Life Years Gained)

Author	Data	LYG
Woolacott et al 2003	PREVENT MODEL, 0% relapse rate, spontaneous quit rate 1%	0.28
Woolacott et al 2003	PREVENT MODEL, 0% relapse rate, spontaneous quit rate 1%	0.33
Woolacott et al 2003	HECOS model (similar to PREVENT), no discount, follow up: 20 years	0.4
Woolacott et al 2003	Using life expectancy data from a number of sources, relapse rate of 45%, LYS per lifetime quitter for men, 65-69 yr old	0.47
Woolacott et al 2003	PREVENT MODEL, 0% relapse rate, spontaneous quit rate 1%	0.49
Woolacott et al 2003	PREVENT MODEL, 0% relapse rate, spontaneous quit rate 1%, discount rate 6%	0.5
Woolacott et al 2003	American Cancer Society 25-state Cancer Prevention Study, 55-69 yr, women	0.55
Woolacott et al 2003	American Cancer Society 25-state Cancer Prevention Study, 35-44 yr, women	0.57
Woolacott et al 2003	American Cancer Society 25-state Cancer Prevention Study, 45-54 yr, women	0.64
Woolacott et al 2003	US-based life expectancy data, relapse rate of 10%, 4% discount rate, women 35-44 yrs:	0.7
Woolacott et al 2003	US study estimate LYS per 12m quitter	0.8
Woolacott et al 2003	American Cancer Society 25-state Cancer Prevention Study, 55-69 yr, men	0.82
Woolacott et al 2003	PREVENT model and a discount rate of 1.5%	0.99
Woolacott et al 2003	American Cancer Society 25-state Cancer Prevention Study, 35-44 yr, men	1.03
Woolacott et al 2003	40 yr follow-up, quit 55-64 yr old, low risk smokers	1.08
Woolacott et al	American Cancer Society 25-state Cancer Prevention Study, 45-54 yr, men	1.09

2003		
Woolacott et al 2003	US-based life expectancy data, relapse rate of 10%, 4% discount rate, women 45-54 yrs:	1.1
Woolacott et al 2003	Life expectancy data from a number of sources, relapse rate of 45%, LYS per lifetime quitter for men, 25-29 yr old	1.31
Woolacott et al 2003	Life expectancy data from a number of sources, relapse rate of 45%, LYS per lifetime quitter for women, 65-69 yr old	1.41
Woolacott et al 2003	Life expectancy data from a number of sources, relapse rate of 45%, LYS per lifetime quitter for women, 25-29 yr old	1.43
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project	1.46
Woolacott et al 2003	Life expectancy data, relapse rate of 10%, 4% discount rate, men 35-44 yrs:	1.5
Woolacott et al 2003	PREVENT model and a discount rate of 0%	1.54
Woolacott et al 2003	40 yr follow-up, quit 45-54 yr old, low risk smokers	1.55
Woolacott et al 2003	40 yr follow-up, quit <35 yr old, low risk smokers	1.69
Woolacott et al 2003	40 yr follow-up, quit 35-44 yr old, low risk smokers	1.94
Woolacott et al 2003	PREVENT MODEL, 0% relapse rate, spontaneous quit rate 1%, 0% discount rate	2
Woolacott et al 2003	Life expectancy data, relapse rate of 10%, 4% discount rate, men 45-54 yrs:	2
Woolacott et al 2003	Life expectancy data, relapse rate of 10%, 4% discount rate, women >55yrs yrs	2.1
Woolacott et al 2003	Life expectancy data, relapse rate of 10%, 4% discount rate, men >55 yrs	2.4

13.0 Appendix 7: Value of a quit per quitter(Quality Adjusted Life Years)

Author	Data	QALY
Woolacott et al 2003	results of the Healthy People 2000 Years of Healthy Life research project: QALYs/12m quitter	0.45
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project, assuming lifetime relapse of 35% (QALYs/lifetime quitter)	0.69
Woolacott et al 2003	40 yr follow-up, quit 55-64 yr old, low risk smokers	0.99
Woolacott et al 2003	QALYs/12m quitter	1.08
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project: QALYs/12m quitter	1.29
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project: QALYs/12m quitter	1.55
Woolacott et al 2003	QALYs/long-term quitter	1.97
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project, assuming lifetime relapse of 35% (QALYs/lifetime quitter)	1.98
Woolacott et al 2003	40 yr follow-up, quit 45-54 yr old, low risk smokers	2.14
Woolacott et al 2003	40 yr follow-up, quit <35 yr old, low risk smokers	2.22
Woolacott et al 2003	Results of the Healthy People 2000 Years of Healthy Life research project, assuming lifetime relapse of 35% (QALYs/lifetime quitter)	2.38
Woolacott et al 2003	40 yr follow-up, quit 35-44 yr old, low risk smokers	2.58

14.0 Appendix 8: Selection of value of quit for inclusion in model

Author	Year	Population characteristics	ICER (quality grades in parentheses if given in source document)
Barbeau et al	2006	Before after study of a smoking cessation programme for iron workers; Gender: Male; Age: 30 +; Quit: 4 weeks	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Bauld et al	2006	Observational Study of smoking cessation services; Gender: Males and Females; Age: 21-80; 4 weeks.	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Copeland et al	2005	Gender: Males and Females; Age mean: 47 (men), 44 (females)	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Curry et al	2003	Smoking cessation programme for women; Age, mean: 34	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Dornelas et al	2006	Smoking outcomes for pregnant women.	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Lowey et al	2003	Gender: Males, Age: 18>65	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Schorling et al	1997	Gender: Males and Females; Age: 18->65	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Solomon	2000	Pregnant women	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)
Stevens et al	2002	Age: 15 - 65+; Gender: Males and Females;	Low risk smokers; <35: 2.22 QALY; 35-44: 2.58; 45-54: 2.14; 55-64: 0.99; Source: Woolacott (2003)

15.0 Appendix 9: Selection of ICERs for inclusion in model

Author	Year	Population characteristics	ICER (quality grades in parentheses if given in source document)
Boyd et al	1998	Age: <20 - 60+; Gender: Males and Females	(1) Treatment: GP counselling +NRT, Control: Usual Care: £965/(QALY+pub£) (++); (2) Treatment: Intensive Counselling + NRT, Control: £3,377 (QALY+pub£) (++); Source: Parrott and Godfrey
Chesterman et al	2005	Smokers	£638 per LGY (including public sector costs saved). Source: Flack et al 2006c
Doescher et al	2002	Treatment: Pharmacist counselling + NRT, Control: Usual care; Gender: Males and Females; Age, mean: 43	(1) GP counselling + NRT: £965 (£/QALY + pub£) (++); (2) Intensive counselling + NRT £3377 (£/ QALY+pub£) (++); Source: Parrott and Godfrey (2005)

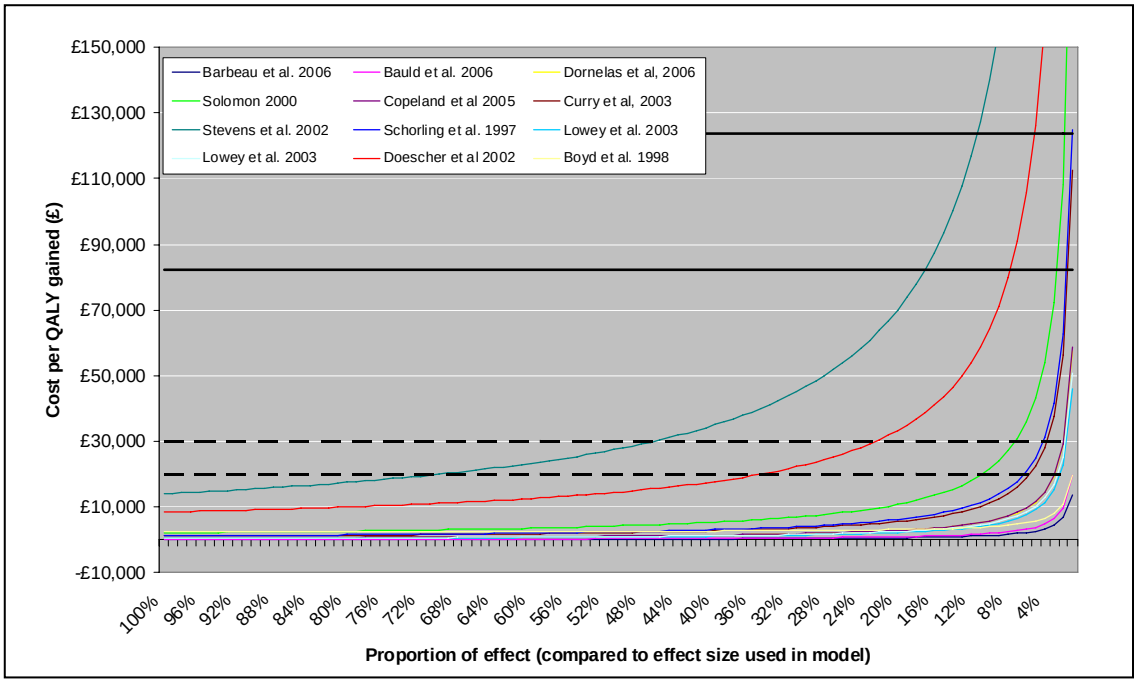
16.0 Appendix 10: Sensitivity analysis

This appendix shows the results of a sensitivity analysis undertaken to test the impact of the caveats to the analysis discussed in section 4.0. The analysis is undertaken for both the estimates of cost-effectiveness calculated as cost per QALY gained, and those calculated as cost per QALY gained including public sector costs saved.

16.1 Testing the impact of intervention effect

Figure 7 tests the impact of intervention effect size on the estimate of the cost per QALY gained from the intervention. It demonstrates that the effect size would have to be reduced by at least c55% before the cost per QALY gained estimate passes above the £30,000 per QALY threshold, and that most interventions require the effect size to be reduced by c95% before the cost per QALY estimate passes above the £30,000 per QALY threshold.

Figure 7: Sensitivity analysis of effect estimates (with NICE cost-effectiveness thresholds and equity-weighted cost-effectiveness thresholds).

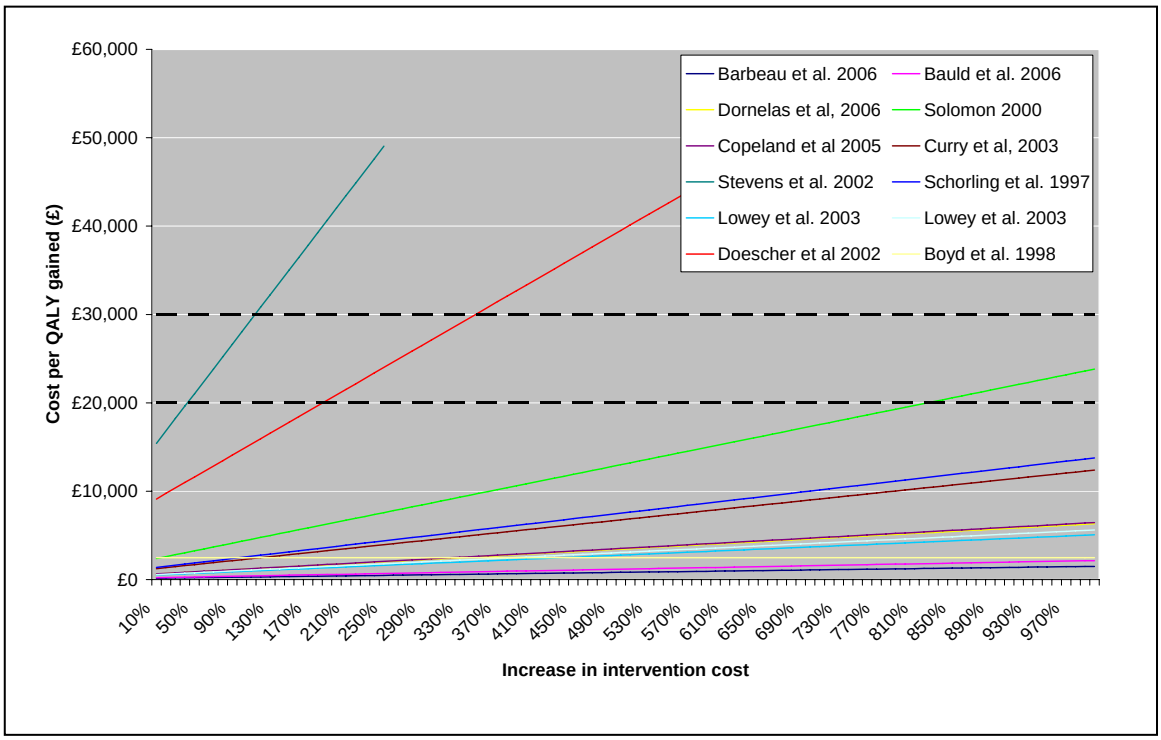


16.2 Testing the impact of intervention cost

Figure 8 tests the impact of intervention cost on the estimate of the cost per QALY gained from the intervention. It demonstrates that intervention costs would have to be increased by at least c50% before the cost per QALY gained estimate passes above the £30,000 per QALY

threshold, and that most interventions require intervention cost to be increased by more than 1000% before the cost per QALY estimate passes above the £30,000 per QALY threshold.

Figure 8: Sensitivity analysis of intervention cost estimates.



16.3 Testing the impact of relapse rates

Figure 9 tests the impact on estimates of cost per QALY gained of the assumption that none of participants who quit smoking as a result of this intervention relapse and start smoking again. It demonstrates that relapse rates would have to be at least c55% before before the cost per QALY gained estimate passes above the £30,000 per QALY threshold, and that most interventions require relapse rates to increase to c95% before the cost per QALY estimate passes above the £30,000 per QALY threshold.

Figure 9: Sensitivity analysis of relapse rates