November 2021: NICE guidelines PH45 (June 2013) and PH48 (November 2013) have been updated and replaced by NG209. The recommendations labelled [2013] or [2013, amended 2021] in the updated guideline were based on these evidence reviews. See www.nice.org.uk/guidance/NG209 for all the current recommendations and evidence reviews.

National Institute for Health and Clinical Excellence

Economic analysis of smoking cessation in secondary care

Revised final report

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Declaration of authors' competing interests

No authors have competing interests.

List of abreviations

CEAC	Cost-effectiveness acceptability curve
COPD	Chronic obstructive pulmonary disease
ETS	Environmental Tobacco Smoke
ICER	Incremental cost effectiveness ratio
LBW	Low birth weight
MI	Myocardial infarction
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
ONS	Office for National Statistics
PDG	Programme Development Group
QALY	Quality adjusted life year
UK	United Kingdom
WTP	Willingness to pay

Contents

1.0 Executive summary

The National Institute for Health and Clinical Excellence (NICE) has been requested by the Department of Health to develop two pieces of complementary guidance:

- Smoking cessation in secondary care: acute and maternity services.
- Smoking cessation in secondary care: mental health services.

These guidance documents will address smoke-free policies and smoking cessation, focusing on all patients and service users (including family, carers, visitors and staff) in hospitals and other acute or maternity care settings, mental health care settings, outpatient clinics, community outreach and rural units, as well as intensive services in psychiatric units and secure hospitals.

This document reports the economic analysis carried out by Matrix. In line with the remit of the effectiveness and cost-effectiveness reviews supporting this guidance, the primary research questions for the economic analysis were:

- **Question 1:** How cost-effective are ***smoking cessation interventions***?
- **Question 2**: How cost-effective are ***interventions for temporary abstinence***?
- **Question 3:** How cost-effective are current approaches used by secondary care staff for ***identifying and referring patients*** to stop smoking services?
- **Question 4:** What approaches are cost-effective to encourage health professionals to ***record patients' smoking status*** and refer smokers to stop smoking services?
- **Question 5:** How cost-effective are strategies and interventions for ensuring ***compliance with smoke-free legislation*** and local smoke-free policies in secondary care settings?

The study was designed with the purpose of estimating both the short and long-term economic impacts of smoking cessation. The economic analysis involved comparing the costs of the interventions with their impact on health related quality of life, health care costs, and productivity. The analysis covered the following causes of improvements in health related quality of life, health care costs, and productivity:

- ***Secondary care specific impacts of smoking***: change in recovery and the likelihood of complications associated with secondary care, generally felt in the short-term (≤ 12 months).
- ***General impacts of smoking***: long-term smoking related diseases, which by definition are similar across population groups.

Given the variety of populations and settings included in the scope of this study, Matrix adopted a case study approach. The following case studies were selected:

- Maternity services: pregnant women receiving smoking cessation interventions at different stages throughout pathway.

- Mental health services: inpatients with common mental health problems treated in hospital (although no interventions covering this group were identified in the effectiveness reviews).
- Mental health services: patients with severe and enduring mental health problems treated in the community or in hospital.
- Acute services: patients in elective surgery (preoperative interventions).
- Acute services: patients treated for chronic obstructive pulmonary disease (COPD).
- Acute services: patients with cardiac conditions.

Interventions targeted at populations not included in the six case studies were also modelled. The only difference was that for these populations only the general long-term impacts associated with smoking cessation were included in the model, and no particular secondary care specific impacts were considered. This was the case for interventions targeted at general patients, interventions for people with common mental health problems treated in the community, interventions for staff, and smoke-free policies.

In response to the specific questions addressed by this study, the conclusions from the economic analysis are:

- ***Smoking cessation interventions***. Interventions are cost-effective across populations with different conditions – including pregnant women, patients presenting at secondary care with COPD and cardiac conditions, pre-operative patients, general patients, and hospital employees. The same conclusion applies to interventions for individuals with common mental health problems, such as post-traumatic stress disorder (PTSD). In the case of individuals with severe mental health problems, specifically schizophrenia, the interventions showed an effect in the short-term but no impact was observed on 12 month smoking rates. Despite these limitations, we estimated potential cost savings in antipsychotics and demonstrated that if 1 in 10 patients were successful in quitting smoking for a year, the interventions would be cost-effective.
- ***Interventions for temporary abstinence***. No interventions aimed at temporary abstinence were identified by the effectiveness reviews. However, the results from smoking cessation interventions suggests that, even relatively short periods of abstinence – for example, during pregnancy or in preparation for surgery – have the potential to generate benefits that outweigh the costs of the interventions.
- ***Approaches to identify and refer patients to stop smoking services***. Despite limited evidence with regards this type of interventions, based on one intervention delivered to patients with schizophrenia it is estimated that this type of interventions has the potential to be beneficial. However more research should be undertaken to arrive at conclusive results.
- ***Approaches to encourage professional to record patients' smoking status and refer smokers to stop smoking services.*** No interventions were identified by the effectiveness reviews. However, as with other types of interventions for which little or no evidence was identified, it is possible that these interventions would generate sufficient benefits to outweigh their costs.

- ***Strategies and interventions for ensuring compliance with smoke-free legislation and local smoke-free policies***. No interventions for ensuring compliance with smoke-free legislation were identified by the effectiveness reviews. However, relevant to the indoor smoke-free legislation current in the UK, it is estimated that the implementation of a total indoor and outdoor smoking ban would generate benefits that largely outweigh its costs.

For the majority of interventions and population groups, the conclusion from the economic model – i.e. that the interventions are cost-effective and thus value for money – holds not only when the lifetime benefits of smoking cessation are considered, but also when a more short-term perspective is adopted. This means that for many interventions the costs required to deliver them are smaller than the benefits that the interventions would generate within the first three years of implementation. This type of information can help health commissioners maximise the returns of their investment decisions – or, in the current climate of budget cuts, prevent disinvestment in interventions and populations that have the potential to generate health benefits and cost savings that are larger than the costs of implementing such interventions. Adding to the short-term and long-term health care cost savings, high productivity cost savings generated by the interventions also help making the case for investment decisions. For example, for preoperative patients, smoking cessation generates cost savings up to £4,800 per patient over lifetime (£800 being health care cost savings and the remaining £4,000 representing productivity savings).

As with any modelling exercise, the results are subject to uncertainty and numerous assumptions. However, given that the ICERs generally fall well below the £30,000 threshold (and the interventions are even cheaper and more effective than their comparators), it is unlikely that the conclusions are sensitive to those assumptions. In fact, the sensitivity analysis showed that most interventions remain cost-effective even when the costs and effects of the interventions are randomly varied.

Moreover, the benefits associated with smoking cessation captured in our analysis are limited to a number of health outcomes and only health care cost and productivity cost savings have been considered. Improvements in these and other health outcomes associated with smoking cessation are also likely to lead to reduced use of social care resources and savings in individuals costs – such as direct health care payments and transport costs.

2.0 Introduction

The National Institute for Health and Clinical Excellence (NICE) has been requested by the Department of Health to develop two pieces of complementary guidance:

- Smoking cessation in secondary care: acute and maternity services.
- Smoking cessation in secondary care: mental health services.

These guidance documents will address smoke-free policies and smoking cessation, focusing on all patients and service users (including family, carers, visitors and staff) in hospitals and other acute or maternity care settings, mental health care settings, outpatient clinics, community outreach and rural units, as well as intensive services in psychiatric units and secure hospitals.

To support this guidance NICE commissioned an economic analysis and eight literature reviews:

- Review of the effects of nicotine in secondary care.
- Effectiveness review on smoking cessation strategies in acute and maternity care services.
- Barriers and facilitators review on smoking cessation strategies in acute and maternity care services.
- Effectiveness review on smoking cessation strategies in mental health services.
- Barriers and facilitators review on smoking cessation strategies in mental health services.
- Effectiveness review on smoke-free secondary care settings.
- Barriers and facilitators review on smoke-free secondary care settings.
- Cost-effectiveness review on acute, maternity, mental health and smoke-free secondary care settings.

This document reports the economic analysis carried out by Matrix. In line with the remit of the effectiveness and cost-effectiveness reviews supporting this guidance, the primary research questions for the economic analysis were:

- **Question 1:** How cost-effective are ***smoking cessation interventions*** in helping people who are receiving emergency care, planned specialist medical care or surgery, and maternity or mental health services provided in hospitals, maternity units, outpatient clinics and the community, their family members and visitors, and staff, volunteers or contractors caring for them?
- **Question 2**: How cost-effective are ***interventions for temporary abstinence*** in helping people who are receiving emergency care, planned specialist medical care or surgery, and maternity or mental health services provided in hospitals, maternity units, outpatient clinics and the community, their family members and visitors, and staff, volunteers or contractors caring for them?
- **Question 3:** How cost-effective are current approaches used by secondary care staff for ***identifying and referring patients*** admitted to acute, maternity or mental health

secondary care services, or their family members and visitors, to stop smoking services?

- **Question 4:** What approaches are cost-effective to encourage health professionals to ***record smoking status*** for patients admitted to acute, maternity or mental health services and refer smokers to stop smoking services?
- **Question 5:** How cost-effective are strategies and interventions for ensuring ***compliance with smoke-free legislation*** and local smoke-free policies in secondary care settings?

The remainder of this document is organised as follows. Section 3 presents an overview of the approach designed to answer the research questions. Section 4 presents the interventions modelled. The model built to estimate the cost effectiveness of those interventions is described in Section 5. Section 6 presents the results of the analysis. The final section discusses the findings.

3.0 General approach

The harmful health effects of smoking are well-known. Many studies have established the economic impact of long-term smoking related diseases. Despite the existence of epidemiological evidence, the short-term health effects of smoking are less well covered in the health economics literature. This study was designed with the purpose of filling this gap in the evidence and estimating both the short and long-term economic impacts of interventions changing smoking behaviour.

All interventions, whether aimed at temporary abstinence or smoking cessation, targeted at patients or staff, were evaluated in terms of their effectiveness in reducing smoking rates. The economic analysis involved comparing the costs and effects of the interventions. The effects were expressed in terms of quit rates, and subsequently converted into changes in health related quality of life, health care costs, and productivity. The analysis covered the following causes of improvements in health related quality of life, health care costs, and productivity:

- ***Secondary care specific impacts of smoking***: change in recovery and the likelihood of complications associated with secondary care, generally felt in the short-term (≤ 12 months).
- ***General impacts of smoking***: long-term smoking related diseases, which are similar across population groups.

Given the variety of populations and settings included in the scope of this study, Matrix adopted a case study approach. The key driver of the need to adopt a case study approach was the variation in the secondary care specific impacts of smoking cessation across populations and conditions.

A case study was defined as a setting-population group in which smoking cessation generates qualitatively different benefits than in other setting-population groups. Based on an initial review of the evidence, contributions from the Program Development Group (PDG) members, and discussions with the NICE team, the following case studies were selected:

- Maternity services: pregnant women receiving smoking cessation interventions at different stage throughout pathway.
- Mental health services: inpatients with common mental health problems[1].
- Mental health services: patients with severe and enduring mental health problems[2] treating in the community or in hospital.
- Acute services: patients in elective surgery (preoperative interventions).
- Acute services: patients treated for chronic obstructive pulmonary disease (COPD).

[1] Common mental health problems include conditions such as anxiety, depression, phobias, obsessive compulsive, panic disorders, neurosis, and post-traumatic disorder (NICE Common mental health disorders: Identification and pathways to care; NHS London Health Observatory, North East Public Health Observatory). Although this setting-population group was selected as a case study, the effectiveness reviews did not identify any studies of interventions targeted at inpatients with common mental health problems.

[2] Severe and enduring mental health problems include conditions such as psychotic disorders (including schizophrenia) and bipolar affective disorder (manic depression) (NHS London Health Observatory).

- Acute services: patients with cardiac conditions.

Interventions targeted at populations not included in the six case studies were also modelled. The only difference was that for these populations only the general long-term impacts associated with smoking cessation were included in the model, and no particular secondary care specific impacts were considered. This was the case for interventions targeted at general patients, interventions for people with common mental health problems treated in the community, interventions for staff, and smoke-free policies.

4.0 Interventions

The interventions modelled were drawn from four systematic reviews of the evidence covering:

- Interventions delivered in maternity services.
- Interventions delivered in acute services.
- Interventions delivered in mental health services.
- Smoke-free policies.

These four reviews included a large number of studies and interventions. Most of the evidence found referred to smoking cessation interventions and interventions for ensuring compliance with smoke-free legislation. Very little evidence was found in relation to interventions for temporary abstinence and approaches used by secondary care staff for identifying and referring patients. However, whenever available – conditional on the intervention selection process described below – these interventions were modelled. We analysed more than 230 interventions and selected 26 to be modelled. In the next section we describe the method employed to select those interventions and Section 4.2 provides details on these interventions, including their effect and cost of delivery.

4.1 Selection of interventions

The process for selecting interventions to be modelled included two steps. First, we looked at types of interventions and excluded those for which the evidence statements provided by the effectiveness review teams were not moderate or strong – i.e. we only considered intervention types for which there was moderate or strong evidence of a positive effect.

The second step consisted of selecting the best available evidence within each type of intervention. In order to do so, we selected interventions that were part of an evidence statement that was moderate or strong and for which:

- A significant positive effect was found.
- The quality of the study – assessed by the effectiveness review teams – was moderate [+] or high [++] quality.
- The effect was not considered an outlier within its category (only relevant for maternity).

The method described above was applied to the reviews in maternity, acute and mental health services. In the case of smoke-free interventions, due to the nature of the outcomes reported by these interventions and given that the UK already has an indoor smoke-free policy, we adopted a slightly different approach:

- Many of the studies reported compliance with smoke-free policies in terms of air quality (e.g. individuals' perceived or actual exposure to environmental tobacco smoke, ETS). These were considered not suitable for modelling as the relationship between ETS and long-term diseases is quite different from that for first hand smoking.

- Of the studies reporting compliance with smoke-free policies in terms of observed smoking among patients, none of them found a significant positive effect – i.e. no significant changes in patients' smoking rates were observed.
- Of the studies reporting compliance with smoke-free policies in terms of observed smoking among staff, we selected the intervention that was considered most relevant to current UK legislation – Gadomski et al (2010), which compares a total (indoor and outdoor) smoke-free policy against an indoor smoke-free policy.

4.2 Effect and cost of the interventions

Tables 1 to 9 provide details on the interventions, including their effect and cost of delivery, and the comparators (although, it happened frequently that for the comparators no details were provided beyond the designation of usual/normal care). The studies compared a variety of interventions, for example:

- High intensity behavioural support vs. usual care or brief advice.
- High intensity behavioural support vs. low intensity behavioural support.
- Pharmacological vs. behavioural support.
- Pharmacological plus behavioural support vs. usual care or brief advice.
- Pharmacological plus behavioural support vs. behavioural support.

Where:

- Behavioural interventions are ones that aim to change patients' behaviour through counselling or therapy. High intensity indicates that patients received extensive contact with staff and supplemental material to help quit and were followed up for at least 4 weeks. Low intensity interventions involved lower levels of contact with clinical staff and minimal if any follow up. Brief advice is a single contact with or without take-away written or other materials.
- Pharmacological interventions use nicotine replacement drugs or drugs designed to help reduce the dependence on nicotine such as bupropion or varenicline.

The effect of the interventions was calculated as the incremental smoking cessation rate in the intervention compared to the comparator. We report 12-month quit rates as well as short-term (<12 month) quit rates.[3] Whenever studies did not report either short-term or 12-month quit rate, these were estimated based on the evidence reported by the other studies for the same population group. For example, in the case of maternity services, for the interventions that only reported 8-month quit rates, the 12-month quit rate was calculated based on the average relapse rates between months 8 and 12 observed in the other interventions for pregnant women. Due to the limited number of interventions within each population group it was not possible to make this adjustment by intervention type (e.g. behavioural, pharmacological, etc).

[3] Except in the smoke-free policy (Gadomski et al, 2010) for which effect is based on self-reported smoking rates, all quit rates are validated, or confirmed, by biochemical tests. These tests included measurement of carbon monoxide in expired breath and cotinine in saliva, blood, and urine.

Both cessation rates and incremental cessation rates vary significantly depending on whether the patient is given a pharmacological intervention, behavioural support, incentives or a mixture of the three, as well as which patient group they fall into. The incremental quitting rates range from 4.8% to 31% in the maternity interventions, with the best results coming from incentive payments linked to biochemically verified cessation.

Smoking cessation interventions for mental health patients were some of the most intensive interventions; all included pharmacological treatment and counselling. Drug regimes for mental health were more intensive and involved regimes of multiple drugs. Short term incremental rates for PTSD patients were between 8% and 11%, while for schizophrenia the rates ranged between 10% and 37%. However, 12-month quit rates were only positive for PTSD patients (4%-9%) with evidence of no impact at 12 months for patients with schizophrenia.

One of the interventions (Steinberg et al, 2004) was a high intensity behavioural therapy programme for motivating outpatient smokers with schizophrenia or schizoaffective disorders for referral to stop smoking services. The study demonstrated that at one month post therapy session, a higher proportion of participants sought treatment at the stop smoking service in the motivational interviewing group (32.3%) compared to brief intervention (0%), with associated costs of £36 and £5, respectively. In order to model the benefits of this referral intervention, it was assumed that for individuals seeking treatment, smoking cessation rates would on average achieve the levels of effectiveness observed by smoking cessation interventions for individuals with schizophrenia (as reported by George et al, 2008; George et al, 2002; and Evins et al, 2007). When taking this evidence into account it was estimated that the effect for Steinberg et al (2004) on quit rates would be 22% for the intervention compared to 2% for the counterfactual, with associated costs of £123 and £5.

Acute inpatients given pharmacological interventions performed better when supported by behavioural support with cessation rates varying from 14% to 31% compared to 7% and 21% in the behavioural support only group.

Compared to an indoor smoke-free policy, a total (indoor and outdoor) smoke-free policy combining environmental changes and pharmacological support generated a reduction in smoking rates among staff. No significant impact on smoking behaviour was observed among patients. One year before the implementation of the ban employee the smoking rate was 14.3% whilst one year after implementation of the ban the smoking rate had reduced to 9.4%. Based on these values a smoking cessation rate of 34% was calculated.[4] The study was a before-after evaluation; therefore it is difficult to assess what would have happened in the absence of the intervention. To address this limitation, it was assumed that 2% of employees (background cessation rate) would have quit in the absence of the ban. Therefore an incremental cessation rate of 32% was used in the analysis.

The cost of the interventions to the public sector was estimated as the incremental cost per person. Incremental cost is defined as the cost of the intervention less the cost for the

[4] Calculated as 100% - (9.4% x 100% / 14.3%) = 34%

comparator, as defined in the effect studies. Costs were calculated by estimating the unit costs per patient for each intervention, except in two cases where the costs needed to be determined by estimating the complete costs of the intervention and then divided by the number of patients due to data restrictions.

The method of costing from the individual and then aggregating up is the preferable method for capturing cost variability. Costs were calculated as if the intervention was being undertaken in the UK and used the most up to date data available for NHS staff and resources from Personal Social Services Research Unit (PSSRU).

All costs were updated to 2011. Where costs were available but not in British pounds, they were converted at the current market exchange rate. Where costs were historical and not in British pounds they were converted to pounds at the historical rates and then uplifted. Historic rates were taken from the Federal Reserve website[5].

The costs of monitoring breath, blood or urine tests were included in the total costs of the intervention if they were used for calculating any dependent incentives such as vouchers, or if routine testing used as an incentive in itself. The tests were excluded if they were being solely used to monitor the effectiveness of the intervention for the purpose of research only. Costs of laboratory tests were taken from the UCLH Provider-to-Provider tariffs 2011-12.

The incremental costs per person range between £9.95 and £420, with the top end dominated by incentive payments and combined counselling and pharmacological interventions. Additional calculation details are specified in Tables A1.1 to A1.8 in Appendix 1.

[5] (http://www.federalreserve.gov/releases/h10/hist/).

Table 1. Effect and cost of the interventions modelled – Maternity services: Pregnant women

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Maternity services - Pregnant women	Hartmann et al (1996)	USA	**Intervention: High intensity behavioural** Prenatal patients were given self-help materials and were encouraged to set goals towards quitting at each visit. If patients set quit dates then were contacted by smoking cessation counsellors. Smoking status verified by a CO breath test Short-term effect (quit rate): 20% 12-month effect (quit rate): 13%	**Counterfactual: Low intensity behavioural** Controls were assessed and encouraged to quit and were revisited 3 times during the study. If control patients requested quit help they were given it. Short-term effect (quit rate): 10% 12-month effect (quit rate): 3%	Short term: 10% 12-month: 10%	£21
Maternity services - Pregnant women	Walsh (1997)	Australia	**Intervention: High intensity behavioural** Patients were given brief advice by a doctor, shown a smoking cessation videotape, given 10 minutes counselling by a midwife and given a self-help manual and four packets of chewing gum (not nicotine gum). Patients were also entered into a lottery where they had a chance to win one of four $75 prizes. If patients had social support they were also invited to join the programme. Short-term effect (quit rate): 13% 12-month effect (quit rate): 10%	**Counterfactual: Low intensity behavioural** Advice from both doctor and nurse plus a smoking cessation booklet Short-term effect (quit rate): 6% 12-month effect (quit rate): 1%	Short term: 7% 12-month: 9%	£4

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Maternity services - Pregnant women	Dornelas (2006)	USA	**Intervention: High intensity behavioural** Experimental counselling intervention with planned telephone follow-up in addition to usual care from health care provider Short-term effect (quit rate): 28% 12-month effect (quit rate): 19%	**Counterfactual: Usual care** Usual care from health care provider Short-term effect (quit rate): 10% 12-month effect (quit rate):3%	Short term: 19% 12-month: 16%	£105
Maternity services - Pregnant women	Hegaard et al (2003)	Denmark	**Intervention: High intensity behavioural** Discussion with the patient about quitting smoking, then if they are willing the patient is given cognitive behaviour therapy Short-term effect (quit rate): 7% 12-month effect (quit rate): 5%	**Counterfactual: Usual care** Usual care from nurses not trained in specialist smoking cessation techniques Short-term effect (quit rate): 2% 12-month effect (quit rate): 1%	Short term: 5% 12-month: 4%	£233
Maternity services - Pregnant women	Ershoff (1989)	USA	**Intervention: High intensity behavioural** Support for quitting smoking through provision of weekly booklets posted to the patient, plus usual care Short-term effect (quit rate): 22% 12-month effect (quit rate): 15%	**Counterfactual: Usual care** Usual care from health care provider Short-term effect (quit rate): 9% 12-month effect (quit rate): 2%	Short term: 14% 12-month: 13%	£11
Maternity services - Pregnant women	Higgins et al (2010)	USA	**Intervention: Conditional incentives** Patients were given attendance vouchers and then incentive vouchers linked to negative breath or urine test outcomes. The value of the vouchers increased dependent on the length of time they were abstinent Short-term effect (quit rate): 34% 12-month effect (quit rate): 23%	**Counterfactual: Incentives** Patients were given attendance vouchers and then incentive vouchers whether or not they were confirmed abstinent at a flat rate for each visit. Short-term effect (quit rate): 7% 12-month effect (quit rate): 2%	Short term: 27% 12-month: 21%	£312

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Maternity services - Pregnant women	Donatelle (2000)	USA	**Intervention: Conditional incentives** Participants were given vouchers of increasing value linked to negative breath or urine test outcomes. A 'social supporter' was also given vouchers should the participant have negative results. Short-term effect (quit rate): 32% 12-month effect (quit rate): 21%	**Counterfactual: Incentives** Patients were given attendance vouchers, smoking cessation literature and followed up by telephone Short-term effect (quit rate): 9% 12-month effect (quit rate): 6%	Short term: 23% 12-month: 15%	£339
Maternity services - Pregnant women	Heil et al (2008)	USA	**Intervention: Conditional incentives** Patients were given attendance vouchers and then incentive vouchers linked to negative breath or urine test outcomes. The value of the vouchers increased dependent on the length of time they were abstinent. Short-term effect (quit rate):41% 12-month effect (quit rate): 24%	**Counterfactual: Incentives** Patients were given attendance vouchers for all visits pre and post partum at a flat rate not dependent on smoking status. Short-term effect (quit rate):10% 12-month effect (quit rate): 3%	Short term: 31% 12-month: 21%	£338

[1] Differences may be to rounding.

Table 2. Effect and cost of the interventions modelled – Mental health services: Patients with PTSD

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Mental health services - Patients with PTSD	McFall et al (2005)	USA	**Intervention: Behavioural plus pharmacological** Treatment with more than one anti-smoking medication, a mixture of bupropion, varenicline and nicotine replacement depending on the patient's profile plus 6 weeks of counselling Short-term effect (quit rate): 21% 12-month effect (quit rate): 12%	**Counterfactual: Usual care** Normal care (no further details provided) Short-term effect (quit rate): 10% 12-month effect (quit rate): 3%	Short term: 11% 12-month: 9%	£94
Mental health services - Patients with PTSD	McFall et al (2010)	USA	**Intervention: Behavioural plus pharmacological** 5 weeks of nurse counselling plus anti-smoking medication regime of bupropion, varenicline and nicotine replacement Short-term effect (quit rate): 14% 12-month effect (quit rate): 9%	**Counterfactual: Usual care** Normal care (no further details provided) Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%	Short term: 8% 12-month: 4%	£421

[1] Differences may be to rounding.

Table 3. Effect and cost of the interventions modelled – Mental health services: Patients with schizophrenia

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Mental health services - Patients with schizophrenia	George et al (2008)	Canada	**Intervention: Behavioural plus pharmacological** Combination of bupropion therapy and nicotine patches plus group therapy Short-term effect (quit rate): 28% 12-month effect (quit rate): 3%	**Counterfactual: Behavioural** Placebo in place of bupropion plus nicotine patches and group therapy Short-term effect (quit rate): 3% 12-month effect (quit rate): 2%	Short term: 25% 12-month: 0%	£65
Mental health services - Patients with schizophrenia	George et al (2002)	Canada	**Intervention: Behavioural plus pharmacological** Bupropion therapy for 10 weeks and group therapy Short-term effect (quit rate): 50% 12-month effect (quit rate): 5%	**Counterfactual: Behavioural** 10 weeks of placebo and drug therapy Short-term effect (quit rate): 13% 12-month effect (quit rate): 2%	Short term: 37% 12-month: 0%	£214
Mental health services - Patients with schizophrenia	Evins et al (2007)	USA	**Intervention: Behavioural plus pharmacological (NRT and bupropion)** Bupropion therapy plus nicotine gum and patches, and group therapy Short-term effect (quit rate): 52% 12-month effect (quit rate): 5%	**Counterfactual: Behavioural plus pharmacological (NRT)** Placebo therapy plus nicotine gum and patches, and group therapy Short-term effect (quit rate): 19% 12-month effect (quit rate): 2%	Short term: 33% 12-month: 0%	£124
Mental health services - Patients with schizophrenia	Steinberg et al (2004)	USA	**Intervention: High intensity behavioural** Motivational interviewing (plus smoking cessation intervention) Short-term effect (quit rate): 22% 12-month effect (quit rate): 2%	**Counterfactual: Brief advice** Brief advice from doctor Short-term effect (quit rate): 2% 12-month effect (quit rate): 2%	Short term: 20% 12-month: 0%	£119

[1] Differences may be to rounding.

Table 4. Effect and cost of the interventions modelled – Acute services: Preoperative patients

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - Preoperative patients	Moller et al (2002) [and follow-up study, Villebro et al (2008) [6]]	Denmark	**Intervention: High intensity behavioural plus pharmacological** 8 weeks of nurse counselling and follow up plus nicotine replacement therapy and intensive monitoring Short-term effect (quit rate): 39% 12-month effect (quit rate): 23%	**Counterfactual: Low intensity behavioural** Brief advice to quit smoking from nurse Short-term effect (quit rate): 7% 12-month effect (quit rate): 4%	Short term: 32% 12-month: 19%	£97
Acute services - Preoperative patients	Lindstrom et al (2008) [and follow-up study, Villebro et al (2008) [7]]	Sweden	**Intervention: High intensity behavioural plus pharmacological** 8 weeks of nurse counselling and follow up plus nicotine replacement therapy and mild monitoring Short-term effect (quit rate): 40% 12-month effect (quit rate): 24%	**Counterfactual: Low intensity behavioural** Brief advice to quit smoking from doctor Short-term effect (quit rate): 2% 12-month effect (quit rate): 2%	Short term: 38% 12-month: 22%	£114

[1] Differences may be to rounding.

[6] This was a follow –up study of patients from Moller et al(2002) that evaluated 12-month quit rates.

[7] Lindstrom et al (2008) did not provide 12-month quit rates thus the value provided was inferred from Villebro et al (2008). The original value inferred from Villebro et al (2008) was, in this case, slightly lower than the background cessation rate (2%). Therefore the 12-month quit rate was capped at 2%.

Table 5. Effect and cost of the interventions modelled – Acute services: COPD patients

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - COPD patients	British Thoracic Society B (1990)	UK	**Intervention: High intensity behavioural** Postal encouragement and/or a signed agreement with the doctor to quit smoking Short-term effect (quit rate): 11% 12-month effect (quit rate): 9%	**Counterfactual: Brief advice** Brief advice to quit smoking from doctor Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%	Short term: 5% 12-month: 4%	£135
Acute services - COPD patients	Tonnesen et al (2006)	Denmark	**Intervention: High intensity behavioural plus pharmacological** Nicotine replacement therapy and frequent telephone consultations with nurses for support Short-term effect (quit rate): 22% 12-month effect (quit rate): 14%	**Counterfactual: Low intensity behavioural** Placebo therapy and low intensity support from healthcare providers Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%	Short term: 16% 12-month: 9%	£182
Acute services - COPD patients	Borglykke 2008	Denmark	**Intervention: Pharmacological** Offered participation in a smoking cessation group therapy whilst inpatient, plus nicotine replacement therapy Short-term effect (quit rate): not reported 12-month effect (quit rate): 30%	**Comparator: Usual care** Usual care (no further details provided) Short-term effect (quit rate): not reported 12-month effect (quit rate): 13%	Short term: not reported 12-month: 17%	£291

[1] Differences may be to rounding.

Table 6. Effect and cost of the interventions modelled – Acute Services: Cardiac patients

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - Cardiac patients	De Busk (1994)	USA	**Intervention: Behavioural plus pharmacological** Counselling intervention with telephone support from nurses, relaxation materials and nicotine patches Short-term effect (quit rate): 69% 12-month effect (quit rate): 70%	**Counterfactual: Brief advice** Brief advice to quit smoking from doctor and opportunity to join an outpatient smoking programme for a fee Short-term effect (quit rate): 55% 12-month effect (quit rate): 53%	Short term: 14% 12 month: 17%	£133
Acute services - Cardiac patients	Quist-Paulsen (2003)	Norway	**Intervention: High intensity behavioural** Encouragement to quit through patient education, counselling and telephone follow up by nurses Short-term effect (quit rate): not reported 12-month effect (quit rate): 57%	**Counterfactual: Low intensity behavioural** Group counselling from nurse Short-term effect (quit rate): not reported 12-month effect (quit rate): 37%	Short term: not reported 12 month: 20%	£76
Acute services - Cardiac patients	Taylor et al (1990)	USA	**Intervention: Behavioural plus pharmacological** Encouragement to quit through signed agreement to quit, education, negative reinforcement, nicotine replacement therapy for those who were determined to need it, plus intensive follow up by nurses Short-term effect (quit rate): not reported 12-month effect (quit rate): 65%	**Counterfactual: Usual care** Patients received usual care where they were given no specific instructions on quitting smoking but were invited to join an outpatient stop smoking class (10% uptake) Short-term effect (quit rate): not reported 12-month effect (quit rate): 34%	Short term: not reported 12 month: 31%	£44

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - Cardiac patients	Hennrikus 2010	USA	**Intervention: High Intensity behavioural** Counselling intervention plus individual incentive letters Short-term effect (quit rate): 21% 12-month effect (quit rate): 17%	**Counterfactual: Brief advice** Verbal advice to quit from clinician Short-term effect (quit rate): 7% 12-month effect (quit rate): 5%	Short term: 14% 12 month: 11%	£306

[1] Differences may be to rounding.

Table 7. Effect and cost of the interventions modelled – Acute Services: General inpatients

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - General inpatients	Miller et al (1997)	USA	**Intervention: Pharmacological** Relapse preventing smoking cessation counselling with nurses, plus a videotape and nicotine replacement therapy Short-term effect (quit rate): not reported 12-month effect (quit rate): 27%	**Counterfactual: Low intensity behavioural** Strong physician advice, quit booklet and optional outpatient smoking cessation programme for a fee Short-term effect (quit rate): not reported 12-month effect (quit rate): 20%	Short term: not reported 12 month: 7%	£138

[1] Differences may be to rounding.

Table 8. Effect and cost of the interventions modelled – Acute Services: Hospital employees

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Acute services - Hospital employees	Dalsgaro et al (2004)	Denmark	**Intervention: Pharmacological plus low intensity behavioural** Nurse advice, counselling and a course of bupropion Short-term effect (quit rate): 18% 12-month effect (quit rate): 14%	**Counterfactual: Placebo plus low intensity behavioural** Nurse advice, counselling and a course of placebo tablets Short-term effect (quit rate): 7% 12-month effect (quit rate): 6%	Short term: 11% 12 month: 8%	£41

[1] Differences may be to rounding.

Table 9. Effect and cost of the interventions modelled – Smoke-free policies

Intervention type	Author	Country	Intervention	Comparator	Incremental effect[1]	Incremental cost per person
Smoke-free policies	Gadomski et al (2010)	USA	**Intervention: total (indoor and outdoor) smoke-free policy** Smoking ban across hospital campus, new signage and an employee programme to provide nicotine replacement therapy Short-term effect (quit rate): not reported 12-month effect (quit rate): 34%	**Counterfactual: indoor smoke-free policy** Comparator is to previous smoking rates when the smoking policy was an indoor ban only Short-term effect (quit rate): not reported 12-month effect (quit rate): 2%	Short term: not reported 12 month: 32%	£22

[1] Differences may be to rounding.

5.0 Method for modelling cost-effectiveness

Assessing the cost-effectiveness of the interventions required converting the intervention outcomes in terms of smoking cessation into QALYs gained and costs saved. The incremental cost effectiveness ratio (ICER) for the interventions was then calculated as the ratio of costs to QALYs gained. The economic model thus combines the following elements:

- The interventions' cost.
- The effect of the interventions in terms of smoking behaviour:
  - within 12-months of the delivery of the interventions; and
  - post 12 months.
- The change in the likelihood of experiencing different outcomes:
  - secondary care specific health impacts associated with smoking; and
  - general health impacts associated with smoking – i.e. morbidity and mortality impacts caused by chronic diseases associated with smoking.
- The economic value of those changes in outcomes, in terms of:
  - health related quality of life gains;
  - health care cost savings;
  - productivity gains.

The remainder of this section describes the model built to undertake this task. The model has two components:

1. A ***secondary care specific*** component simulating individuals' smoking behaviour up to 12 months and estimating the associated health outcomes and respective QALYs, health care and productivity costs.
2. A ***general long-term*** component simulating individuals' smoking behaviour beyond 12 months and estimating the associated health outcomes and respective QALYs, health care and productivity costs.

The following sub-sections describe these two components in further detail.

All QALYs and costs estimates are in present values. Following the Green Book guidance for economic evaluation (HM Treasury, 2003) an annual discount rate of 3.5% was used.[8] Where required, costs were also uplifted to 2011 prices using the GDP deflator.[9]

5.1 Secondary care specific component

The secondary care specific component of the model was developed to capture the benefits of smoking cessation occurring within 12 months of the delivery of the intervention. As mentioned in Section 3, given the variety of populations and settings covered by the interventions, a case

[8] Please refer to Appendix 4 for an illustrative example of how the results change when a discount of 1.5% is used.
[9] http://hm-treasury.gov.uk/data_gdp_index.htm

study approach was adopted. The following sections provide further details on the model structure and data used to populate it.

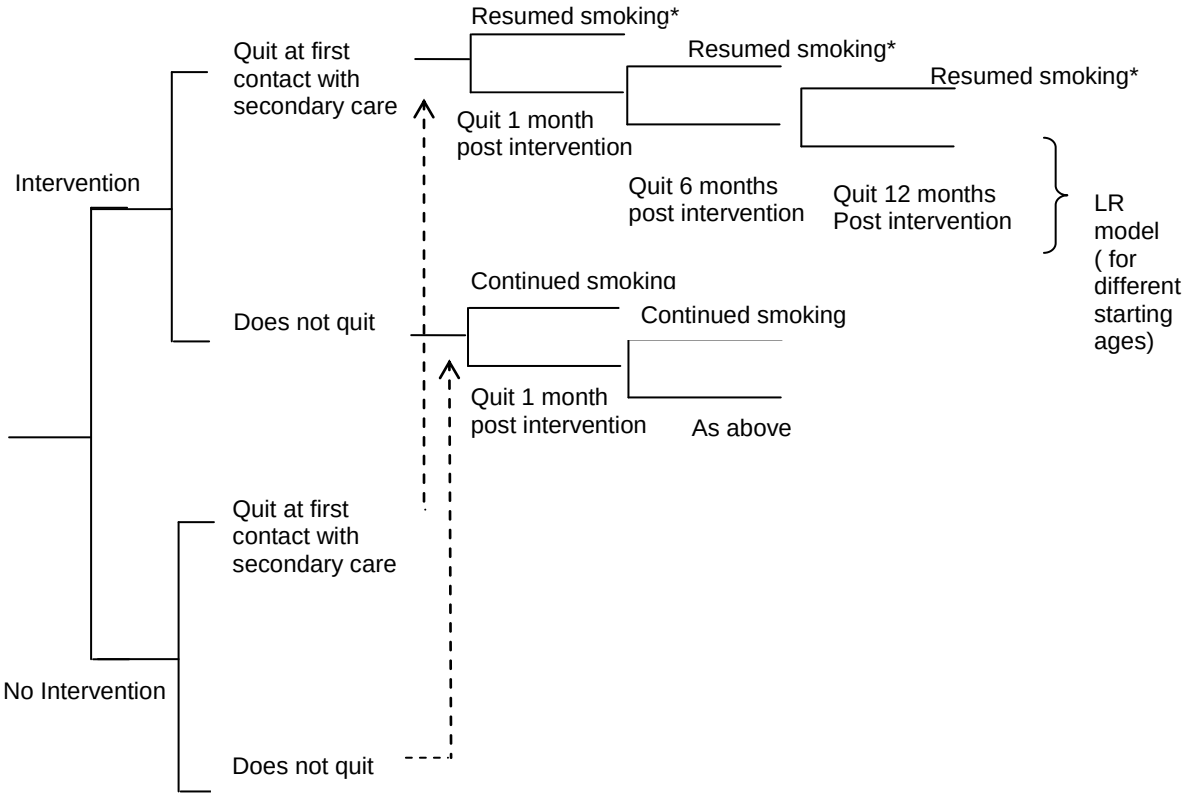
5.1.1 Model structure

A deterministic static structure was used to model the short-term effect of smoking behaviour interventions. This type of structure, commonly designated as decision tree, is used to represent mutually exclusive pathways where probabilities determine the likelihood of different events occurring. For example, for a specific intervention what is the likelihood that an individual will quit or not. Decision trees are useful when the effect of the intervention is fairly immediate but can only handle a fairly limited number of states or branches. Figure 1 illustrates the structure of the model. The effectiveness and cost-effectiveness reviews identified a number of different effectiveness measures, for example:

- Short-term quit rate (e.g. 1 month, 6 or 8 months after quit attempt).
- Long-term quit rate (e.g. 12 months after quit attempt).

The short-term quit rates were used to model secondary care specific health outcomes. The list of secondary care specific outcomes linked to short-term smoking cessation is extensive and varies by condition and population group (details are provided in the next section). The 12-month quit rate was used to link the secondary care component of the model with the general long-term component.

Figure 1. Static secondary care specific model to estimate smoking behaviour



* May include temporary abstinence.

5.1.2 Data used to populate the model

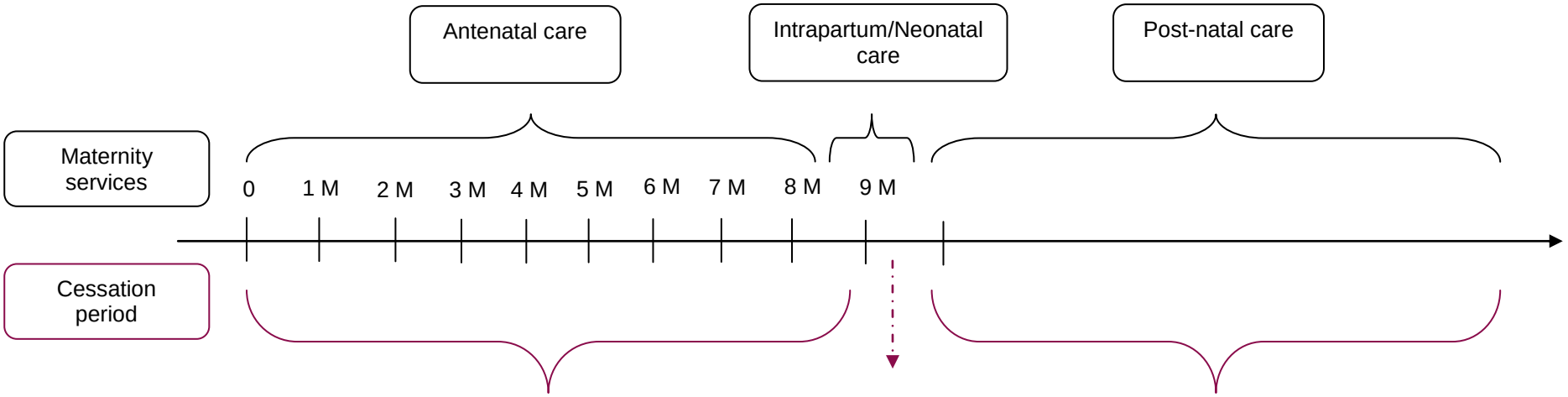
In this section the secondary care specific health outcomes are presented. The respective QALYs, health care and productivity costs are described for below. Prevalence rates and relative risks can be found in Appendix 2.

Maternity services

Maternity services cover care for women from when they become pregnant and access care, to sign off by the midwife after the baby is born. The components of maternity services are typically divided into the three stages of pregnancy, namely: antenatal, intrapartum (birth) and post natal care. In addition, neonatal care can be seen as an extension of maternity care as the baby has not yet been discharged home (CHIMat[10] definition). Figure 2 illustrates the three main stages of maternity services.

[10] Child and Maternal Health Observatory

Figure 2. Maternity services outcomes



Outcomes – Antenatal/Intrapartum care	
Mother	**Child**
Ectopic pregnancy	Preterm delivery
Spontaneous abortion	SIDS[11]
Pre-eclampsia	RDS[12]
Placenta previa	Asthma
Abruptio placenta	RSVB[13]
PPROM[14]	Otitis media
	Low birth weight

Outcomes – Post-natal care
Child
Outcomes associated with exposure to ETS not included in the model.

[11] Sudden infant death syndrome
[12] Respiratory distress syndrome
[13] Respiratory syncytial viral bronchitis
[14] Preterm premature rupture of membranes

A number of time perspectives are crucial for considering secondary care specific outcomes in maternity services:

- Time when women receive intervention.
- Time when quitting occurs.
- Time when the pregnancy specific health outcomes associated with quitting occur.

Cessation during pregnancy. If women stop smoking during pregnancy, especially before the third trimester, evidence suggests several secondary care specific outcomes for both mothers and children occur (e.g Bernstein et al, 2005). These outcomes may only be verified in intrapartum/neonatal care (for example low birth weight) but they can have lifetime consequences for children.

The secondary care specific outcomes associated with smoking cessation during pregnancy and associated QALYs are presented below in Table 10. A literature search showed that not every health outcome had a QALY estimate associated with it (for example, placenta previa). For the health outcomes with no QALY value associated, the health care costs were still calculated provided the data were available. Also some of the health outcomes for children presented in Figure 2 (were not included in the analysis as these would present double counting problems. This was the case for preterm delivery, respiratory distress syndrome (RDS) and respiratory syncytial viral bronchitis (RSVB). These outcomes are correlated with each other and with the outcomes modelled, and were thus excluded from the analysis.[15]

It should also be noted that QALY estimates represent total QALYs (i.e. not QALY gains) associated with the condition. The incremental health benefit will come from applying the prevalence and relative risks of the health outcomes to both smokers and former smoker. For example, below in Table 10 we see that ectopic pregnancy is associated with a utility value of 0.94. The benefit for former smokers will come from the fact that their risk of experiencing an ectopic pregnancy is lower hence avoiding the QALY loss of 0.06. The same approach was followed for all the QALY and cost calculations throughout the economic analysis and for all populations.

In Table 11 we describe the health care costs associated with the secondary specific outcomes. Cost estimates were taken from Godfrey et al (2010), a study that looked into the total annual cost to the NHS of smoking related outcomes. Estimates covered costs occurring during pregnancy and the first year after birth. As mentioned in Godfrey et al (2010) work, published NHS reference costs are only available for top level Healthcare Resource Groups (HRG) and so this required that the outcomes of smoking cessation during pregnancy be matched to HRGs categories. Since these costs were estimated for top level HRGs, disaggregation was not possible and the authors alert for a possible and likely underestimation of the cost estimates. For more details, the reader is advised to consult Godfrey et al (2010).

[15] For example modeling preterm delivery and low birth weight and their respective costs and QALYs would be considered as double counting since almost always a preterm baby will be underweight.

By way of illustrating how the health care costs associated with the secondary specific outcomes were calculated, let us consider a smoking pregnant woman suffering from PPROM. The formulae used to calculate costs are outlined below:

$$Acs = Ps * C$$

$$Afs = Pfs * C$$

Where Acs is the cost of PPROM attributable to smokers, Afs is the cost of PPROM attributable to former smokers, Ps is the prevalence of PPROM for a smoker, Pfs is the prevalence of PPROM for a former smoker, and C is the total cost to the NHS of managing a case of PPROM.

Based on the above formula and values of Ps=2.5%; Pfs=1.1%; and C=£662, it was estimated that:

$$Acs = £16$$

$$Afs = £7$$

Hence a smoking pregnant woman costs on average £9 more to the NHS than a former smoker, considering only PPROM. Note that the difference in costs is driven by the difference between the prevalence of PPROM for a smoker and a former smoker. The difference in prevalence in turn is given by the relative risk of PPROM for a smoker compared with a former smoker. There is also a high likelihood that, in this case, the baby will be born under the average birth weight. Assuming the baby's weight is within the category of 2000-2499 grams, and adding the costs of managing the child condition, then a smoking pregnant woman would cost the NHS on average £67 more than a former smoker, considering only PPROM and low birth weight.

All the interventions modelled were delivered during the first two trimesters (or around the beginning of the third). Based on the effect of the interventions in terms of quit rates at the end of pregnancy, we estimated the benefits associated with smoking cessation for both mothers and children. A limitation of this approach is that as we do not know exactly at which point in pregnancy mothers quit smoking (e.g. immediately after receiving the intervention or closer to the end of pregnancy), it is possible that some of the benefits may represent an overestimate. Sensitivity analysis was undertaken to deal with uncertainty.

Table 10. Total QALYs for secondary care specific health outcomes associated with smoking cessation – maternity services

Outcome	Description	Value	Source
Mother			
Ectopic pregnancy	This is a 1 year duration QALY estimate. It was assumed that the outcome duration would be same as the pregnancy period and that for the remainder of the year women would experience a utility value of 1.	0.94	Matrix calculation based on Sonnenberg et al (2003)
Spontaneous abortion		0.96	
Pre-eclampsia		0.97	
Child			
SIDS	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to SIDS over lifetime.	0	Matrix calculation based on Pollack (2001)
Low birth weight: <1000g	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to LBW (<1000g) over lifetime.	13.25	Matrix calculation based on the Victorian Infant Collaborative Study Group
Low birth weight: 1000g – 1499g	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to LBW (1000g-1499g) over lifetime.	14.81	Matrix calculation based on the Victorian Infant Collaborative Study Group.[16]
Low birth weight: 1500g – 1999g	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to LBW (1500g-1999) over lifetime.	20.89	Matrix calculation based on the Victorian Infant Collaborative Study Group.
Low birth weight: 2000g – 2499g	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to LBW (2000g-2499) over lifetime.	24.78	Matrix calculation based on the Victorian Infant Collaborative Study Group.

[16] The Victorian Infant Collaborative Study Group only provides the QALY loss for children born in the <1000g category. Assuming QALY losses across weight categories are proportional to treatment costs across weight categories, we estimated QALY loss for the remaining categories by applying the same ratio of the difference in costs between categories provided by Godfrey et al (2010).

Outcome	Description	Value	Source
Otitis media	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to otitis for a period of three years.	25.86	Matrix calculation based on Coco et al (2007)
Asthma	This is a lifetime QALY estimate. It was calculated as the difference between the present value of lifetime full health (i.e. utility value of 1 over 100 years using a 3.5% discount rate = 28.62) and the QALY loss due to asthma over lifetime.	23.76	Matrix calculation based on Chiou et al (2005)

Table 11. Health care costs to the NHS for secondary care specific health outcomes associated with smoking cessation – maternity services

Outcome	Value (£2011)	Source
Mother		
Ectopic pregnancy	£986	Godfrey et al (2010)
Spontaneous abortion	£554	
Pre-eclampsia	£662	
Placenta previa	£662	
Abruptio placenta	£662	
PPROM	£662	
Child		
SIDS	£1,321	Godfrey et al (2010)
Low birth weight <1000	£10,109	
Low birth weight 1000-1499	£9,086	
Low birth weight 1500-1999	£5,085	
Low birth weight 2000-2499	£2,526	
Otitis media	£697	
Asthma	£787	

Cessation during postnatal care. It is our understanding that smoking during postnatal care may affect children only through general exposure to ETS. The potential benefits of reduced exposure to ETS have not been included in the analysis as the relationship between ETS and long-term diseases is quite different from that for first hand smoking, and mothers' partners smoking behaviour would also play a role. With regards mothers, the benefits of quitting are captured through the general component of the model, based on 12 month quit rates achieved by the interventions.

Mental health services

No specific secondary care outcomes were considered for patients with PTSD. This decision was made given that the evidence about the short-term effects of quitting among people with common mental health problems such as PTSD on the severity of their condition is unclear (Campion et al 2008).[17] There is some evidence on the impact of smoking cessation on the frequency of aggressive incidents. However this impact only applies to inpatients whilst both interventions modelled refer to outpatients.

For patients with schizophrenia, due to lack of clarity in evidence about the effects of smoking cessation on the quality of life of patients, only costs related with the provision of antipsychotic drugs were included in the analysis as it expected that schizophrenic patients undergoing smoking cessation and receiving high dose of antipsychotics will reduce their dose after quitting. It has been estimated that smoking increases psychotropic drug costs by up to £40m per year (Royal College of Physicians & Royal College of Psychiatrists, 2013). Based on Aguilar et al (2005), the percentage of patients receiving a high dose of antipsychotics is 26% for smokers and 16% for non-smokers.

Table 12 presents the estimated annual cost of a high dose of antipsychotics per person. This represents the reduction in cost per quitter. The estimate was derived from NICE (2009) and adjusted to reflect that evidence suggesting that 20% of patients receive a high dose of antipsychotics (Aguilar et al, 2005). It was assumed that a high dose is twice as costly as a non-high dose.

Table 12. Health care costs to the NHS for secondary care specific health outcomes associated with smoking cessation – mental health services

Outcome	Value (£2011)	Source
Provision of antipsychotic drugs	£1,238	Matrix calculation based on NICE (2009) uplifted to 2011

Acute services: patients in elective surgery (preoperative interventions)

Smoking cessation interventions before surgery vary widely in intensity and time before surgery. It is known that they improve wound healing and reduce preoperative and postoperative complications, although these outcomes also vary with the characteristics of the interventions (Menzin et al 2009). However there is a general consensus that quitting smoking improves a number of short-term clinical outcomes, such as wound healing, risk of graft failure, bone healing, and pulmonary complications. We modelled the health outcomes for which best quality data was available – wound related complications and pulmonary complications – and excluded

[17] There is some evidence that a minority of people with problems such as depression who quit smoking experience an increase in depressive symptoms. This group would therefore benefit from closer monitoring, especially in the first few weeks following quitting (Campion et al 2008).

outcomes that may be correlated with them, e.g. length of stay. . Table 13 and Table 14 describe the QALY and health care costs associated with these outcomes respectively.

Table 13. Total QALYs for secondary care specific health outcomes associated with smoking cessation – preoperative patients

Outcome	Description	Value	Source
Wound related complications	This is a 1 year duration QALY estimate. It was assumed that the outcome duration would be same as the hospitalisation period (as provided by the papers) and that for the remainder of the year patients would experience a utility value of 1.	0.927	Slobogean et al (2010)
Pulmonary complications		0.997	Pepper and Owens (2000)

Table 14. Health care costs to the NHS for secondary care specific health outcomes associated with smoking cessation – preoperative patients

Outcome	Value (£2011)	Source
Wound related complications	£1,618	Plowman et al (2001)
Pulmonary complications	£2,659	NHS reference cost schedules (2010/2011)

Acute services: patients with specific conditions

In the case of patients with specific conditions, no health outcomes were considered during the first 12 months of smoking cessation for both COPD and cardiac patients. The reasons for this vary according to the patient condition but can be summarized as:

- COPD patients: Au et al (2009) shows that for COPD patients, smoking cessation only begins producing visible health benefits (e.g. reduction in COPD exacerbations in or outside the hospital) after a minimum of 1 year without smoking, with benefits significantly increasing up to 10 years of smoking cessation.
- Cardiac patients: for these patients smoking cessation produces visible benefits much faster than for COPD patients. Suskin et al (2001) shows that a cardiac patient that has quit for at least 2 years presents the same relative risk as a never smoker for myocardial infarction (MI), recurrent coronary heart failure (CHF) and others.

Since for both of these patients groups the effects of smoking cessation within the initial year are not visible (hence not measurable nor quantifiable), the health benefits associated with COPD and cardiac patients are explored only in the post 12 months analysis, described in detail in section 5.2.2.

All populations/conditions

For all populations, productivity costs due to work absenteeism and time spent smoking during working hours were considered. The estimate presented below represents the total annual productivity cost incurred by a smoker when compared to a non smoker.

Table 15. Annual productivity costs for secondary care associated with smoking cessation

Outcome	Description	Value	Source
Productivity costs	Disease related absenteeism – a smoker is considered to be absent from work due to illness 22 hours per year when compared to a non smoker	£1,569	Weng et al (2012)
	Time spent smoking during work – a smoker is estimated to spend 30 minutes per day smoking		As per PDG advice

The £1,569 value is therefore a combined estimate of the annual productivity cost associated with smoking. This value combines disease related absenteeism of 22 hours per year[18] with 30 minutes of smoking breaks per day, both valued using national salary data. Table A4.2 in Appendix 4 shows the alternative results for the economic model with 10 minutes and 1 hour as the estimates used to account for smoking breaks per day per smoker.

5.2 Long-term component

In this section we describe the long-term model of smoking behaviour and smoking related disease. The long-term component is a cohort simulation model. It was built based on a previous model developed for NICE by Raikou and McGuire (2008). The advantage of this model is that it allows individuals transitioning between smoking and disease states using a relatively simple model structure.[19] One of the limitations of this model is that, as it is time independent, it does not allow following individuals over time to establish for example how long they spend in a particular state – e.g. time since quitting smoking. Where possible, data were updated to current estimates. In addition, although the structure of the model was kept the same across population groups, where relevant and to the extent data was available, the model was populated with different sets of data for each case study. The following sections provide further details on the model structure and data used to populate it.

[18] Due to data availability, the estimate of the productivity loss due to illness is an average for all diseases and is not attached to any disease (CHD, COPD, etc) in particular. In other words, what determines the productivity loss is the fact that as smokers they are more likely than non-smokers to be ill.

[19] This could also be achieved with a decision tree structure but the dimensions of the model would increase exponentially.

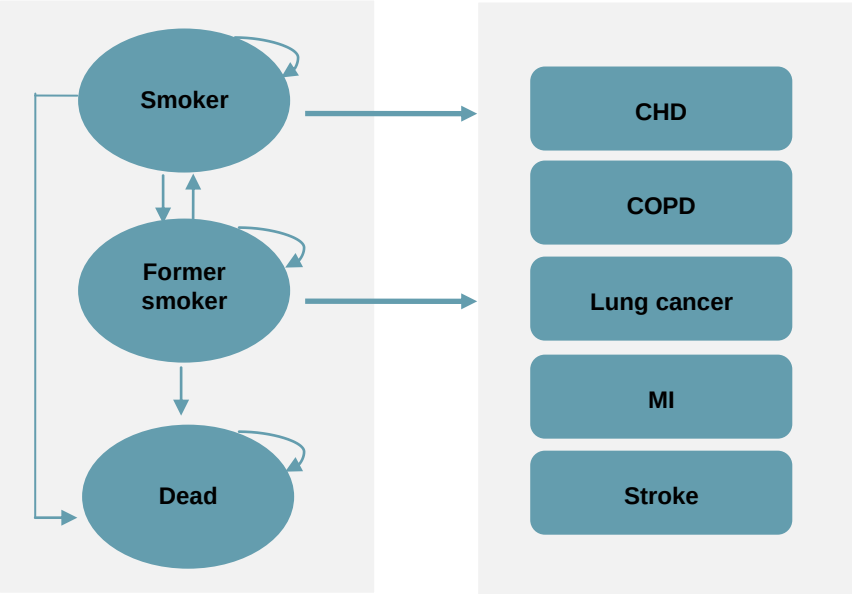
5.2.1 Model structure

Figure 3 illustrates the structure of the model. The ***baseline*** (no intervention) scenario can be described as follows:

- We adopted a cohort simulation model with annual cycles over lifetime (up to age of 100) using a hypothetical population of 1000 male and female individuals.
- The specific age at which individuals enter the model was varied for each case study, depending on the population targeted by the intervention.[20]
- In the first cycle all individuals enter the model in the smoker state.
- In each subsequent cycle individuals were allowed to transition between the smoker and former smoker states, or die.
- Transition between the smoker and former smoker states was modelled using transition probabilities which estimate how patients move from one state to the other, including if they resume smoking, quit or stay within the same smoking status (further details are provided in Section 5.2.2).
- The number of people dying within each cycle was calculated by multiplying the mortality rates by the number of individuals in each cycle. We used age, gender and smoking status specific mortality rates (Table A4.1 in Appendix 4).
- In each cycle individuals who do not die may develop one or more of the following smoking related diseases: chronic heart disease (CHD), COPD, lung cancer, myocardial infarction (MI) and stroke. A limitation of the model is that it is not possible to identify which individuals would suffer from more than one disease.
- The number of people developing these diseases within each cycle was calculated by multiplying the estimated disease probabilityby the number of individuals alive in each cycle (further details are provided in Section 5.2.2). We used age, gender and smoking status specific prevalence rates as well as relative risks. (Table A4.3 in Appendix 4). For simplicity, and due to data limitations, no interaction between disease states was assumed – i.e. diseases were treated as independent events.
- Having estimated the number of cases of smoking related diseases, the impact was captured in terms of: health related quality of life gains, health care costs savings, and productivity gains (further details are provided in Section 5.2.2).

[20] For example, for maternity services the mean age across women in the interventions varied between 23 and 29 years. Taking an average of all the mean ages across interventions provided an estimate of 25 years old used. The same approach was taken across all case studies.

Figure 3. Dynamic model of long-term smoking behaviour



How was the impact of the interventions modelled? The ***intervention*** model can be described as follows:

- The effect of the interventions was modelled by changing the distribution of individuals between the smokers and former smokers – i.e. in the first cycle, instead of putting all individuals through the smoker state, we applied the 12-month quit rates derived from the interventions thus increasing the proportion of former smokers (and reducing the proportion of smokers).
- The effect of the interventions was assumed to last for one year. This means that at the end of the first cycle, individuals were able to transition between the smoker and former smoker states (further details and justification for this assumption are provided in Section 5.2.2).
- In each subsequent cycle the population dying or developing smoking related diseases was estimated as described previously – i.e. by multiplying mortality and prevalence rates by the number of individuals in each cycle. As former smokers have reduced mortality rates and probabilities of diseases, the increase in the proportion of former smokers translates into reduced deaths and cases of CHD, COPD, lung cancer, MI and stroke.

5.2.2 Data used to populate the model

This section presents an overview of the data used to populate the model. We first focus on smoking behaviour and then present the epidemiological and economic data.

Smoking behaviour data

Long-term smoking behaviour was captured by means of two main components:

- Transition probabilities and background cessation rate.
- Maintenance of effect.

These are explained in turn below.

Transition probabilities dictate how patients move from one state to the other, including if they resume smoking, quit or stay within the same smoking status. Table 16 presents the transition probabilities used in the model. These indicate that, for example from cycle 1 to cycle 2, a smoker has a 98% probability of remaining a smoker and a 2% probability of quitting smoking. On the other hand, former smokers are assumed not to relapse.

The 2% quitting rate represents the background cessation rate. Following Raikou and McGuire (2008), this rate is used as a net quit rate in that this estimate already takes into account failed quitting attempts and individuals up-taking smoking (i.e. relapse). After all these things have been accounted for, it is assumed that 2% of smokers quit each year.

Table 16. Transition probabilities

	Smoker	Former smoker	Total
Smoker	0.98	0.02	1.00
Former smoker	0.00	1.00	1.00

Transition probabilities only determine individuals' behaviour after the effect of the intervention is considered to "wear off". For how long the effect of the intervention is assumed to last it is defined as the ***maintenance of effect***. For example, if the effect of the intervention is assumed to last for 5 years, this means that individuals are also allow to quit after the first cycle (e.g. in cycle 2, 3, etc) and only at the end of these 5 years (cycle 5) the transitions probabilities (thus the background cessation rate) will kick in. As the effectiveness of the intervention is expected to be higher than the net quit rate of 2%, the intervention then produces 4 extra years of benefits. Table 17 provides an illustrative example of how smoking cessation rates progress when different duration of effect is assumed, applying a 15% cessation rate for the intervention in the first, second, third, etc cycle and 2% as background cessation rate for the comparator.

Table 17. Example of maintenance of effect on smoking cessation rates

Cycle	No intervention (background cessation rate = 2%)	One year intervention (background cessation starts in cycle 2)	Two year intervention (background cessation starts in cycle 3)	Two year intervention (background cessation starts in cycle 4)	Two year intervention (background cessation starts in cycle 5)
1	2%	15%	15%	15%	15%
2	4%	17%	28%	28%	28%
3	6%	18%	29%	39%	39%
4	8%	20%	31%	40%	48%
5	10%	22%	32%	41%	49%
6	11%	23%	33%	42%	50%

There is little evidence about maintenance of effect. Most studies cover follow-up periods of up to 12 months, sometimes even less, and ignore any 'late' quitters. A few studies report longer term outcomes but this does not mean that the results can be generalised. We therefore adopted a relatively conservative approach and assumed that the effect of the interventions only lasts for one year. As the results in Section 6 show, the majority of the interventions were estimated cost-effective. This means that extending the duration of the effect would only make the results more favourable, without changing the conclusions of the analysis.

Epidemiological data

Table 18 summarises the mortality and disease prevalence data used to populate the model. Most of the data was drawn from Raikou and McGuire (2008). However, where possible, we used more recent sources. The first column in Table 18 refers to the general population (e.g. staff) and the remaining columns indicate what adjustment, if any, was made to account for the characteristics of the populations in the case studies.

The probabilities were calculated using the following equations:

$$P_{ds} = P_d / \left[P_s + P_{fs} * RR_{fs} + P_{ns} * RR_{ns}\right];$$
$$P_{dfs} = RR_{fs} * P_{ds}$$

Where P_{ds} is the probability of each disease for a smoker, P_d is the prevalence, by age, of each co-morbidity for the total population, P_{fs} is the prevalence of former smokers, RR_{fs} is the relative risk of each disease for a smokers versus a former smoker P_{ns} is the prevalence of non-smokers in the population, RR_{ns} is the relative risk of each disease for a smoker vs a non-smoker and P_{dfs} is the probability of each disease for a former smoker.

Table 18. Epidemiological data for long-term model: general and case studies

	General model	*Maternity services: pregnant women*	*Mental health services: patients with common/ severe and enduring mental health problems*	*Acute services: patients in elective surgery*	*Acute services: patients with respiratory conditions*	*Acute services: patients with cardiac conditions*
Parameter	**Source**	**Source**	**Source**	**Source**	**Source**	**Parameter**
Mortality rates by age, sex and smoking status	Own calculation based on Doll et al (1994) and ONS	Own calculation based on Doll et al (1994) and ONS	As in general model	As in general model	As in general model	Adjusted based on increased mortality risk for cardiac patients (Rosen et al, 2010)
Lung cancer prevalence by age, sex and smoking status	Raikou and McGuire (2008)	Female rates from Raikou and McGuire (2008)	As in general model	As in general model	As in general model	As in general model
CHD prevalence by age, sex and smoking status	Raikou and McGuire (2008)	Female rates from Raikou and McGuire (2008)	As in general model	As in general model	As in general model	The prevalence of CHD was adjusted to 1 to reflect the fact that these are cardiac patients.
COPD prevalence by age, sex and smoking status	Calculated based on smoking prevalence (Raikou and McGuire, 2008) and the relative risk of COPD (Au et al, 2009 – more recent than Raikou and McGuire, 2008).	Female rates as in general model	As in general model	As in general model	The baseline prevalence of COPD was adjusted to take into account the increased relative risk of COPD exacerbations (Au et al, 2009)	As in general model

	General model	*Maternity services: pregnant women*	*Mental health services: patients with common/ severe and enduring mental health problems*	*Acute services: patients in elective surgery*	*Acute services: patients with respiratory conditions*	*Acute services: patients with cardiac conditions*
Parameter	**Source**	**Source**	**Source**	**Source**	**Source**	**Parameter**
MI prevalence by age, sex and smoking status	Raikou and McGuire (2008)	Female rates from Raikou and McGuire (2008)	As in general model	As in general model	As in general model	Suskin et al (2001) was used to adjust the prevalence of MI, reflecting the higher risk of MI for cardiac patients. The increase in MI prevalence was of a 1.06 factor starting from age 55.
Stroke prevalence by age, sex and smoking status	Raikou and McGuire (2008)	Female rates from Raikou and McGuire (2008)	As in general model	As in general model	As in general model	As in general model

Economic data

The health and economic impacts of smoking cessation were expressed in terms of QALYs gained, health care cost savings, and productivity cost savings. We considered these impacts separately for 'healthy' and 'ill' individuals.

For 'healthy' individuals, we accounted for:

- QALY loss due to smoking. Table 19 presents the QALY estimates per year for smokers and former smokers. Total QALYs were calculated by multiplying the number of smokers and former smokers in each cycle by the respective utility value over individuals' lifetime.
- Productivity loss due to smoking. Table 22 presents an estimate of the time smokers spend in smoking breaks. Total QALYs were calculated by multiplying the number of smokers in each cycle by the respective cost value during individuals' working age[21] and for the period going from the year the intervention is implemented until the age of retirement.

For 'ill' individuals, we accounted for:

- QALYs loss associated with long-term smoking related diseases. Annual values are presented in Table 20. Total QALYs were calculated by multiplying the number of individuals in each disease state by the respective utility value over individuals' lifetime.
- Health care costs associated with the long-term smoking related diseases. Annual costs are presented in Table 21. Total costs were calculated by multiplying the number of individuals in each disease state by the respective cost value over individuals' lifetime.
- Productivity loss associated with smoking breaks and illness. This is an estimate of the productivity loss for smokers compared to non-smokers (Table 22). Total costs were calculated by multiplying the number of smokers in each cycle by the respective cost value during individuals' working age.

Table 19. Annual QALYs by smoking status

Disease	Description	Value	Source
Smoker	Utility value obtained an as average of utility scores across different smoking frequencies	0.85	Vogl et al (2012)
Former smoker	Utility value for a non smoker	0.87	

[21] Current state pension ages will be applied: men, 65 and women, 65 (maximum). Available from: http://www.direct.gov.uk/en/pensionsandretirementplanning/statepension/dg_4017919

Table 20. Annual QALYs for long-term smoking related diseases

Outcome	Description	Value	Source
CHD	Utility values were obtained as an average of utility scores across different stages, severity, duration and treatment of the disease. Once patients experienced the health outcome they are assumed to live with the respective utility value for the remainder of their lives.	0.80	Raikou and McGuire (2008)
COPD		0.73	
Lung cancer		0.58	
MI		0.80	
Stroke		0.48	

Table 21. Annual health care costs to the NHS for long-term smoking related diseases

Outcome	Description	Value (£2011)	Source
CHD	Total annual direct cost of CHD divided by the number of people with stroke in the UK in a year	£1,194	Raikou and McGuire (2008) uplifted to 2011 prices
COPD	Annual cost including GP visits, medication and hospital stay/admission	£1,043	
Lung cancer	Annual average cost per person of palliative and terminal care for lung cancer	£6,193	
MI	Combines the cost of an event with the ongoing yearly cost (GP and specialist visits and medication)	£4,449	
Stroke	Total annual direct cost of stroke divided by the number of people with stroke in the UK in a year	£2,320	

Table 22. Annual productivity costs associated with smoking cessation

Outcome	Description	Value	Source
Productivity costs	Disease related absenteeism – a smoker is considered to be absent from work due to illness 22 hours per year when compared to a non smoker	£1,569	Weng et al (2012)
	Time spent smoking during work – a smoker is estimated to spend 30 minutes per day smoking		As per PDG advice

6.0 Results

6.1 Model results

This section reports the results of the cost-effectiveness analysis. For each intervention we present two sets of results:

- Short-term values (including benefits and cost savings for up to 3 years following implementation of the intervention).
- Lifetime values (including benefits and cost savings through the individuals' lifetime – i.e. up to the age of 100).

Tables 23 to 42 summarise the following information for the interventions modelled:

- Description of intervention and comparator.
- Incremental effect of the intervention on smoking cessation.
- Cost of delivering the intervention per person.
- QALYs gained per person.
- Health care cost savings.
- Productivity cost savings.
- ICERs (incremental cost per QALYs gained).
- Total ICERs (net incremental cost per QALYs gained).

The incremental cost-effectiveness ratios (ICERs) were calculated as follows:

$$\text{ICER} = \frac{\text{Incremental cost}}{\text{QALYs gained}}$$

where the incremental cost is calculated as the cost of delivering the intervention minus the cost of delivering its comparator. When the cost of the intervention is smaller than the cost of the comparator, the numerator is negative while the denominator is positive. In this case the intervention generates both cost savings and health benefits. In this case the intervention is cost-effective and is said to be "Dominant".

In addition, the ***total*** incremental cost-effectiveness ratios were calculated by deducting the health care costs avoided (i.e. treatment costs) from the incremental cost of delivering the intervention.

$$\text{ICER} = \frac{\text{Incremental cost} - (\text{health care cost savings})}{\text{QALYs gained}}$$

Note that when the intervention generates health care cost savings larger than the incremental cost of the intervention, the numerator of the above ratio is negative while the denominator is

positive. In this case the intervention generates both total cost savings and health benefits. In this case the intervention is cost-effective and is said to be “Dominant”.

A third measure of cost-effectiveness takes into account the productivity cost savings generated by the intervention.

$$\text{ICER} = \frac{\text{Incremental cost} - (\text{health care cost savings} + \text{productivity cost savings})}{\text{QALYs gained}}$$

ICERs including productivity cost savings are not reported as they were estimated to be dominant for all the interventions modelled.

Results are presented separately for each of the case studies.

Maternity services. Tables 23 and 24 present short-term and lifetime results including the health outcomes for mothers only. Table 25 presents lifetime results including the health outcomes for mothers and children.

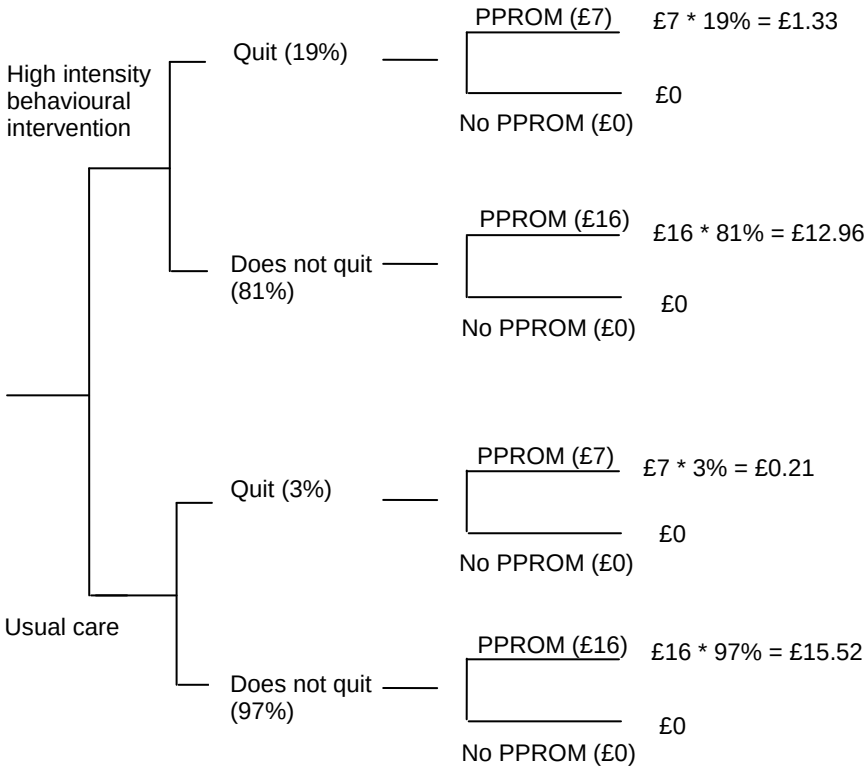
The lifetime results show that all eight interventions are cost-effective. As expected, when benefits for children are included (Table 25), the ICERs are lower as a result of wider health gains and higher cost savings. If only short-term costs and benefits are considered, the results are more mixed. The majority of the interventions remain cost-effective, but a few of them show ICERs above the £30,000 threshold, especially Hegaard (2003) due to its relatively low effect and high cost.

Below we provide an example to illustrate how cost savings estimates were calculated. Table 23 and 24 show that for example the high intensity behavioural intervention described in Dornelas (2006) generates health care cost savings for £13 in the first three years after the delivery of the intervention and £69 over lifetime. Comparing these cost savings with the health care costs to the NHS associated with the specific health outcomes provided on Table 11, the economic cost savings might seem small to the naked eye. However these costs are not directly comparable with those in Table 11, as they represent cost savings due to the interventions as opposed to absolute costs.

The diagram below helps to illustrate the process for calculating the cost savings due to an intervention:

- Using again the example of PPROM, the cost to the NHS of managing this condition is of £662. In Section 5.1.2 it was also explained how we derived the difference between the cost of PPROM attributable to smokers (£16) and the cost of PPROM attributable to former smokers (£7).
- Compared with usual care, the high intensity behavioural intervention has an incremental effect at 12 months of 16% points. Adding the health care costs associated with the high intensity behavioural intervention yields a total cost of £14.29.
- Repeating the process for usual care leads to a total cost of £15.73.

- The difference between these values (£1.44) represents the annual cost savings associated with PPROM from delivering the high intensity behavioural intervention compared to usual care.



Mental health services: PTSD patients. The two interventions for patients with PTSD are estimated to be cost-effective when a lifetime perspective is adopted as shown in Table 27. Table 26 shows that when only short-term costs and benefits are considered, only one of the interventions remains cost-effective with an ICER of £13,000 and a total ICER of £11,000. For the other intervention, due to a relatively high cost per person (£421), the short-term ICERs exceed £115,000.

Mental health services: patients with schizophrenia. As indicated in Section 4.1.2 it was not possible to estimate the impact of smoking cessation on the quality of life of patients with schizophrenia. The estimated health care cost savings refer to a one-off annual reduction in the dose of antipsychotics in a proportion of patients. Tables 28 and 29 show that for the four interventions the estimated health care cost savings are smaller than the cost of delivering the interventions. This suggests that if only health care cost savings are considered, the interventions are not cost-effective. These results however must be treated with caution as several assumptions had to be made to estimate the cost associated with reduced dose of antipsychotics. Moreover, smoking cessation or temporary abstinence is likely to be associated with health benefits not captured in this analysis – for example, reduced anxiety and fewer long-

term side-effects. However, the interaction between nicotine dependence and schizophrenic symptoms is complex, and there is mixed evidence with regards improvement/worsening of symptoms after people stop smoking (Campion et al, 2008; Aguilar et al, 2005).

Productivity cost savings were calculated assuming the same employment rate as in the general population (70%). Therefore they may represent an overestimation of the potential benefits.

The interventions showed no impact on the 12 month smoking rates; hence no QALYs and ICERs were estimated. To address this limitation, we simulated what the benefits of the interventions would be in terms of reduced incidence of long-term smoking related diseases, if 1 in 10 patients would quit in the long-term (12 months). The results in Table 30 show that in such scenario all the interventions – except for the referral intervention, which is less relatively less effective – would be cost-effective in the long-term.

Acute services: patients in elective surgery (preoperative interventions). Tables 31 and 32 show that both interventions for preoperative patients are cost-effective, regardless of the ICER used and the timeframe considered.

Acute services: COPD patients. All three interventions for COPD patients are cost-effective when a lifetime perspective is adopted (Table 34). If only short-term costs and benefits are considered, the ICERs range between £15,000 and £33,000 and total ICERs range between £7,000 and £25,000 (Table 33). This suggests that even with a short-time frame, the interventions are generally cost-effective.

Acute services: cardiac patients. Table 36 reveals that all four interventions for cardiac patients are cost-effective when a lifetime perspective is adopted. Table 35 shows that if only short-term costs and benefits are considered, the ICERs range between £2,500 and £47,000 and the total ICERs show that all interventions are cost-effective even in the short-term. .

Acute services: general inpatients. An intervention delivered to general inpatients was estimated to be cost-effective, even in the short-term. The short-term ICER is £24,000 and the total short-term ICERs is £22,000 (Tables 37 and 38).

Acute services: hospital employees. An intervention for hospital employees was estimated to be cost-effective, even in the short-term. The short-term ICER is £6,000 and the total short-term ICERs is £4,000 (Table 39 and Table 40).

Smoke-free policy: hospital employees. The results indicate that, compared to an indoor smoke-free policy, a total smoke-free policy has the potential to generate benefits for the policy to be cost-effective. Regardless of the ICER used and the timeframe considered, the ICERs are below £30,000 as shown in Tables 41 and 42. These results only account for the impact of the ban on smoking behaviour among hospital employees (no potential impact on patients' smoking rates were observed).

Table 23. Results for interventions delivered in maternity services: pregnant women (mother outcomes) – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
Hartmann (1996)	High intensity behavioural vs. low intensity behavioural	10%	£21	0.004	-£7	-£352	£5,445	£3,630
Walsh (1997)	High intensity behavioural vs. low intensity behavioural	9%	£4	0.003	-£5	-£277	£1,331	Dominant
Dornelas (2006)	High intensity behavioural vs. usual care	16%	£105	0.006	-£13	-£593	£17,827	£15,683
Hegaard (2003)	High intensity behavioural vs. usual care	4%	£233	0.001	-£3	-£150	£157,696	£155,506
Ershoff (1989)	High intensity behavioural vs. usual care	12%	£11	0.004	-£9	-£443	£2,344	£292
Higgins (2010)	Conditional incentives vs. non-conditional incentives	21%	£312	0.008	-£18	-£806	£41,088	£38,712
Donatelle (2000)	Conditional incentives vs. non-conditional incentives	15%	£339	0.006	-£15	-£640	£60,409	£57,699
Heil (2008)	Conditional incentives vs. non-conditional incentives	21%	£338	0.008	-£21	-£877	£43,161	£40,537

Table 24. Results for interventions delivered in maternity services: pregnant women (mother outcomes) – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Hartmann (1996)	High intensity behavioural vs. low intensity behavioural	10%	£21	0.037	-£44	-£1,299	£563	Dominant
Walsh (1997)	High intensity behavioural vs. low intensity behavioural	9%	£4	0.031	-£37	-£1,092	£136	Dominant
Dornelas (2006)	High intensity behavioural vs. usual care	16%	£105	0.056	-£69	-£2,047	£1,864	£634
Hegaard (2003)	High intensity behavioural vs. usual care	4%	£233	0.014	-£17	-£514	£16,515	£15,281
Ershoff (1989)	High intensity behavioural vs. usual care	12%	£11	0.043	-£53	-£1,557	£244	Dominant
Higgins (2010)	Conditional incentives vs. non-conditional incentives	21%	£312	0.072	-£90	-£2,668	£4,331	£3,076
Donatelle (2000)	Conditional incentives vs. non-conditional incentives	15%	£339	0.053	-£68	-£1,997	£6,441	£5,149
Heil (2008)	Conditional incentives vs. non-conditional incentives	21%	£338	0.074	-£94	-£2,778	£4,589	£3,306

Table 25. Results for interventions delivered in maternity services: pregnant women (mother and children outcomes) – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Hartmann (1996)	High intensity behavioural vs. low intensity behavioural	10%	£20	0.113	-£83	-£1,299	£183	Dominant
Walsh (1997)	High intensity behavioural vs. low intensity behavioural	9%	£5	0.085	-£64	-£1,092	£51	Dominant
Dornelas (2006)	High intensity behavioural vs. usual care	16%	£105	0.199	-£143	-£2,047	£528	Dominant
Hegaard (2003)	High intensity behavioural vs. usual care	4%	£233	0.051	-£36	-£514	£4,594	£3,874
Ershoff (1989)	High intensity behavioural vs. usual care	12%	£11	0.147	-£107	-£1,557	£72	Dominant
Higgins (2010)	Conditional incentives vs. non-conditional incentives	21%	£312	0.278	-£198	-£2,668	£1,124	£412
Donatelle (2000)	Conditional incentives vs. non-conditional incentives	15%	£339	0.228	-£159	-£1,997	£1,488	£788
Heil (2008)	Conditional incentives vs. non-conditional incentives	21%	£338	0.310	-£218	-£2,778	£1,091	£388

Note: Children's outcomes include SIDS, LBW, asthma and otitis.

Table 26. Results for interventions delivered in mental health services: patients with PTSD – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
McFall (2005)	Behavioural plus pharmacological vs. usual care	9%	£94	0.007	-£13	-£519	£12,734	£11,032
McFall (2010)	Behavioural plus pharmacological vs. usual care	4%	£421	0.004	-£6	-£254	£116,617	£114,915

Table 27. Results for interventions delivered in mental health services: patients with PTSD – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
McFall (2005)	Behavioural plus pharmacological vs. usual care	9%	£94	0.100	-£220	-£1,538	£940	Dominant
McFall (2010)	Behavioural plus pharmacological vs. usual care	4%	£421	0.049	-£108	-£752	£8,607	£6,407

Table 28. Results for interventions delivered in mental health services: patients with schizophrenia – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 1 month	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
George (2008)	Behavioural plus pharmacological vs. behavioural	25%	£65	-	-£30	-£380	n/a	n/a
George (2002)	Behavioural plus pharmacological vs. behavioural	37%	£214	-	-£46	-£588	n/a	n/a
Evins (2007)	Behavioural plus pharmacological (NRT and bupropion) vs. behavioural plus pharmacological (NRT)	33%	£124	-	-£41	-£518	n/a	n/a
Steinberg (2004)	High intensity behavioural vs. brief advice	20%	£119	-	-£25	-£311	n/a	n/a

Table 29. Results for interventions delivered in mental health services: patients with schizophrenia – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
George (2008)	Behavioural plus pharmacological vs. behavioural	0%	£65	-	-£30	-£380	n/a	n/a
George (2002)	Behavioural plus pharmacological vs. behavioural	0%	£214	-	-£46	-£588	n/a	n/a
Evins (2007)	Behavioural plus pharmacological (NRT and bupropion) vs. behavioural plus pharmacological (NRT)	0%	£124	-	-£41	-£518	n/a	n/a
Steinberg (2004)	High intensity behavioural vs. brief advice	0%	£119	-	-£25	-£311	n/a	n/a

Table 30. Results for interventions delivered in mental health services: patients with schizophrenia – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months (*)	Cost per person (£2011)	QALYs gained per person (*)	Lifetime health care cost savings (£2011) (*)	Lifetime productivity cost savings (£2011) (*)	Lifetime ICER (£2011) (*)	Lifetime Total ICER (£2011) (*)
George (2008)	Behavioural plus pharmacological vs. behavioural	*0.8%*	£65	*0.008*	*-£49*	*-£498*	*£7,728*	*£1,981*
George (2002)	Behavioural plus pharmacological vs. behavioural	*3.0%*	£214	*0.033*	*-£120*	*-£1,054*	*£6,414*	*£2,821*
Evins (2007)	Behavioural plus pharmacological (NRT and bupropion) vs. behavioural plus pharmacological (NRT)	*3.2%*	£124	*0.036*	*-£119*	*-£1,015*	*£3,493*	*£145*
Steinberg (2004)	High intensity behavioural vs. brief advice	*0.2%*	£119	*0.002*	*-£29*	*-£340*	*£58,369*	*£44,094*

(*) Simulated, assuming 1 in 10 patients quit at 12 months.

Table 31. Results for interventions delivered in acute services: preoperative patients – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
Moller et al (2002)	High intensity behavioural plus pharmacological vs. low intensity behavioural	19%	£97	0.024	-£273	-£1,318	£3,999	Dominant
Lindstrom et al (2008)	High intensity behavioural plus pharmacological vs. low intensity behavioural	22%	£114	0.028	-£317	-£1,503	£4,136	Dominant

Table 32. Results for interventions delivered in acute services: preoperative patients – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Moller et al (2002)	High intensity behavioural plus pharmacological vs. low intensity behavioural	19%	£97	0.222	-£716	-£3,492	£435	Dominant
Lindstrom et al (2008)	High intensity behavioural plus pharmacological vs. low intensity behavioural	22%	£114	0.250	-£815	-£3,950	£455	Dominant

Table 33. Results for interventions delivered in acute services: patients with COPD – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
British Thoracic Society B (1990)	Behavioural vs. brief advice	4%	£135	0.004	-£33	-£106	£33,202	£25,061
Tonnesen et al 2006	High intensity behavioural plus pharmacological vs. low intensity behaviour	9%	£182	0.011	-£87	-£278	£17,114	£8,973
Borglykke 2008	Pharmacological vs. usual care	17%	£291	0.020	-£161	-£517	£14,732	£6,592

Table 34. Results for interventions delivered in acute services: patients with COPD – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)[22]	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
British Thoracic Society B (1990)	Behavioural vs. brief advice	4%	£135	0.043	-£137	-£106	£3,142	Dominant
Tonnesen et al 2006	High intensity behavioural plus pharmacological vs. low intensity behaviour	9%	£182	0.112	-£357	-£278	£1,620	Dominant
Borglykke 2008	Pharmacological vs. usual care	17%	£291	0.209	-£665	-£517	£1,394	Dominant

[22] Lifetime productivity cost savings are the same as in the 3 years analysis as COPD patients are already 64 when entering the economic model and the average age of retirement is 65.

Table 35. Results for interventions delivered in acute services: cardiac patients – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
De Busk (1994)	High intensity behavioural plus pharmacological vs. brief advice	17%	£133	0.010	-£3,747	-£975	£13,604	Dominant
Quist-Paulsen (2003)	High intensity behavioural vs. low intensity behavioural	20%	£76	0.011	-£2,680	-£1,125	£6,715	Dominant
Taylor et al (1990)	Behavioural plus pharmacological vs. usual care	31%	£44	0.017	-£2,535	-£1,733	£2,512	Dominant
Hennrikus (2010)	High intensity behavioural vs. brief advice	11%	£306	0.0065	-£523	-£646	£47,110	Dominant

Table 36. Results for interventions delivered in acute services: cardiac patients – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
De Busk (1994)	High intensity behavioural plus pharmacological vs. brief advice	17%	£133	0.347	-£20,365	-£1,672	£384	Dominant
Quist-Paulsen (2003)	High intensity behavioural vs. low intensity behavioural	20%	£76	0.401	-£15,792	-£1,928	£190	Dominant
Taylor et al (1990)	Behavioural plus pharmacological vs. usual care	31%	£44	0.617	-£15,024	-£2,969	£71	Dominant
Hennrikus (2010)	High intensity behavioural vs. brief advice	11%	£306	0.230	-£6,746	-£1,107	£1,330	Dominant

Table 37. Results for interventions delivered in acute services: general patients – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
Miller et al (1997)	Pharmacological vs. low intensity behavioural	7%	£138	0.006	-£10	-£404	£24,065	£22,362

Table 38. Results for interventions delivered in acute services: general patients – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Miller et al (1997)	Pharmacological vs. low intensity behavioural	7%	£138	0.078	-£171	-£1,197	£1,776	Dominant

Table 39. Results for interventions delivered in acute services: hospital employees – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
Dalsgaro et al (2004)	Pharmacological plus low intensity behavioural vs. placebo plus low intensity behavioural	8%	£41	0.007	-£12	-£692	£5,976	£4,273

Table 40. Results for interventions delivered in acute services: hospital employees – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Dalsgaro et al (2004)	Pharmacological vs. placebo plus low intensity behavioural	8%	£41	0.093	-£205	-£2,051	£441	Dominant

Table 41. Results for smoke-free policy: hospital employees – short-term (3 years)

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
Gadomski (2010)	Total smoke free policy vs. indoor smoke free policy	32%	£22	0.026	-£45	-£2,637	£829	Dominant

Table 42. Results for smoke-free policy: hospital employees – lifetime

Author	Intervention versus comparator	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Lifetime health care cost savings (£2011)	Lifetime productivity cost savings (£2011)	Lifetime ICER (£2011)	Lifetime Total ICER (£2011)
Gadomski (2010)	Total smoke free policy vs. indoor smoke free policy	32%	£22	0.355	-£782	-£7,814	£61	Dominant

6.2 Sensitivity analysis

Inevitably, the parameters required to model the interventions are subject to uncertainty. To address this issue, probabilistic sensitivity analysis (PSA) was performed. PSA provides a useful technique to quantify the level of confidence in the conclusions of the economic model. PSA was undertaken by assigning distributions to model parameters (effectiveness and cost of the interventions) and generating 1000 Monte Carlo simulations for each of these parameters. Table 43 presents the distributions used for each parameter. Tables A5.1 and A5.2 in Appendix 5 show specific parameter values.

Table 43. Parameters distributions

	Distribution	Distribution parameters	Parameter definition
Costs	Gamma	α, β	α - number of quitters β - Total individuals in the intervention-number of quitters
Effects	Beta	α, β	α,- cost^2 / standard deviation β – variance/cost

For each intervention, we present the results from PSA in two formats:

- Cost-effectiveness scatter plane, where each iteration is plotted on a two-way graph, where the x-axis represents the QALY gain and the y-axis represents the incremental cost. Points can fall in four quadrants:
    - Quadrant I (upper right), where the intervention is both more costly and more effective than the comparator.
    - Quadrant II (upper left), where the intervention is more costly but less effective than the comparator (Dominated).
    - Quadrant III (lower left), where the intervention is both less costly and less effective than the comparator.
    - Quadrant IV (lower right), where the intervention is less costly and more effective than the comparator (Dominant).

  Given the results of the economic model presented in Section 6.1, it is expected that most iterations should fall in Quadrants I and IV. In addition to showing in which of the four quadrants simulations tend to concentrate, scatter plots illustrate how sensitive the cost-effectiveness of the intervention is to the variability of the cost and QALY values.
- Cost-effectiveness acceptability curves (CEACs). CEACs are graphical representations of the probability that a particular intervention is cost-effective over a range of willingness-to-pay (WTP) for a QALY. The resulting distribution of costs and effects produced by the Monte Carlo simulations is used to produce a distribution of net monetary benefit (for each intervention and a range of WTPs). Net monetary benefit is defined as:

$$\lambda.\Delta QALYs - \Delta Costs$$

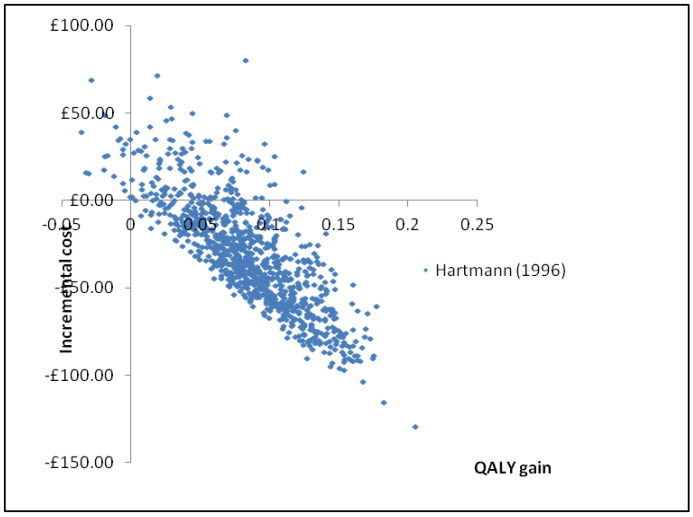
where λ is the maximum WTP for a QALY, ΔQALYs is the incremental QALY and ΔCosts represents the incremental costs.

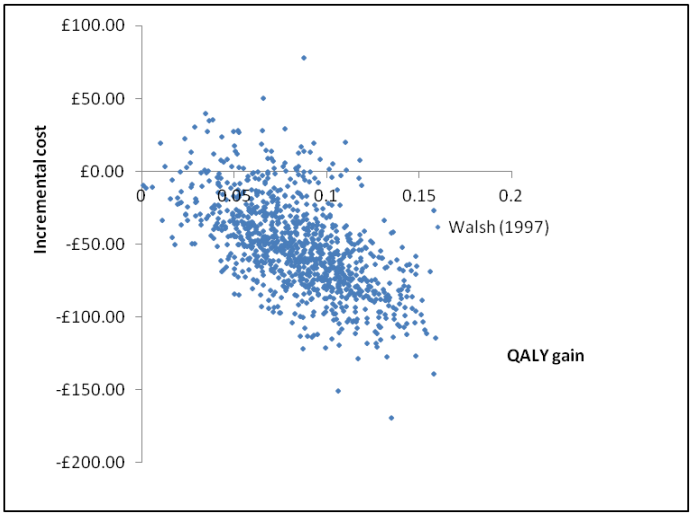
We ran PSA for the total lifetime ICERs. Figures 4 to 17 show the scatter plots and CEACs resulting from PSA for the all the interventions across populations. A brief interpretation of each intervention and associated CEAC and scatter plot is provided below.

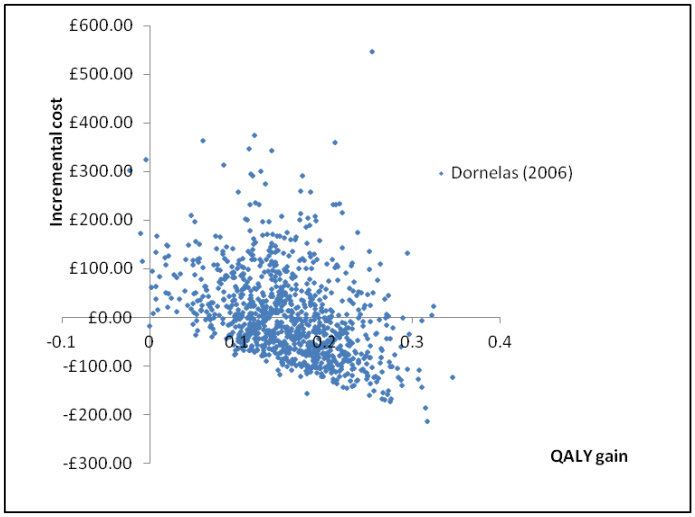
Figures 4 and 5 present the results for interventions targeted at pregnant women. In line with the results presented in Section 6.1, the analysis shows that all interventions are likely to remain cost-effective. For some of them (e.g. Hegaard 2003) the simulation dots tend to concentrate in the upper right quadrant. This means that, when we allowed the cost and the effectiveness of these interventions to randomly vary, the interventions tend to produce more QALYs than their comparators but at a higher cost. This is not the case for interventions which tend to concentrate in the lower right quadrant where QALY gains are obtained even with cost savings (e.g. Hartmann 1996).

The CEACs show that except for Hegaard (2003), the probability that the interventions are cost-effective reaches 100% even for very low WTP values indicating that for a wide range of WTP values, the interventions are always cost-effective.

Figure 4. Scatter plots for interventions delivered in maternity services






Incremental cost
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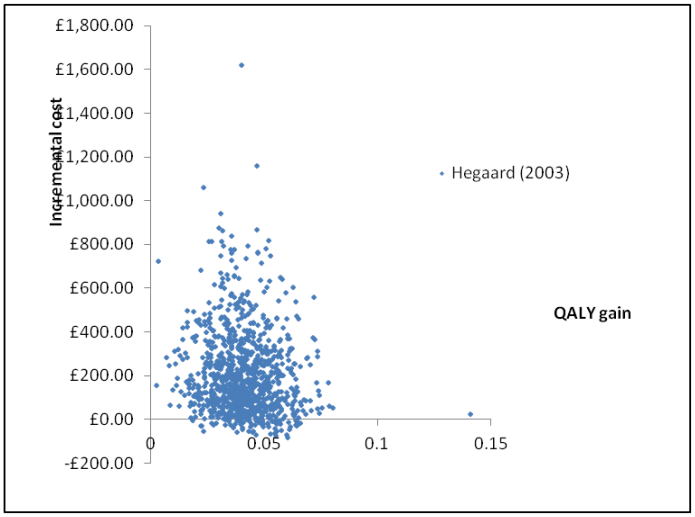
£500.00
£400.00
£300.00
£200.00
£100.00
£0.00
-£100.00
-£200.00
-£300.00
-0.1
0
0.1
0.2
0.3
0.4
Dornelas (2006)
QALY gain


Incremental cost
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£1,600.00
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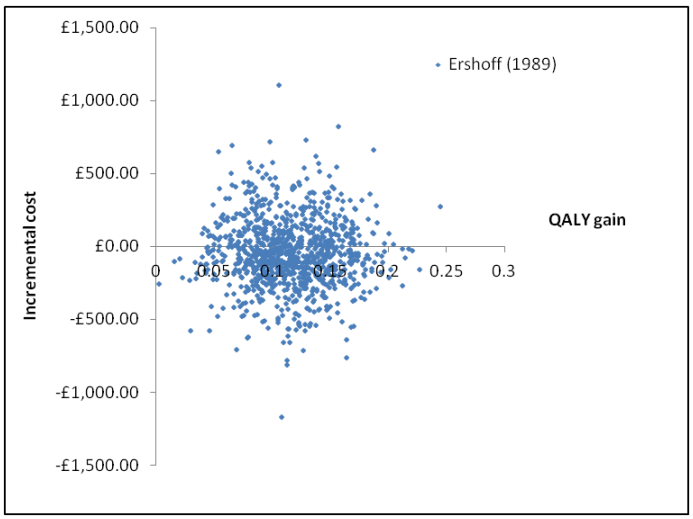
£1,200.00
£1,000.00
£800.00
£600.00
£400.00
£200.00
£0.00
-£200.00
0
0.05
0.1
0.15
Hegaard (2003)
QALY gain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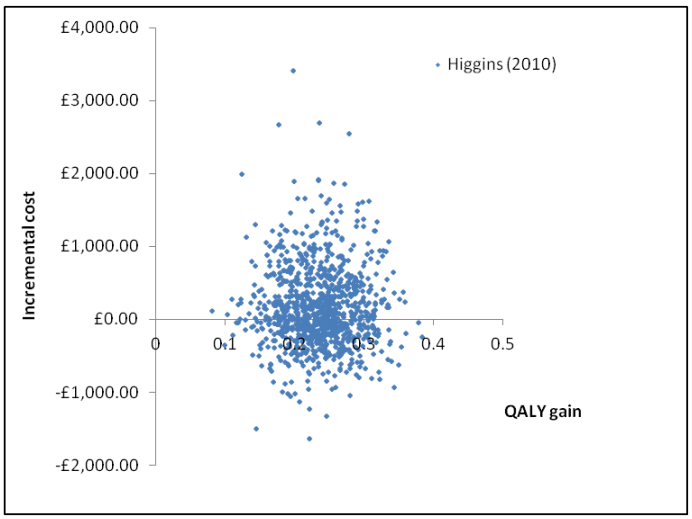
£0.00
-£500.00
-£1,000.00
-£1,500.00
0
0.05
0.1
0.15
0.2
0.25
0.3
Ershoff (1989)
QALY gain


Incremental cost
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£0.00
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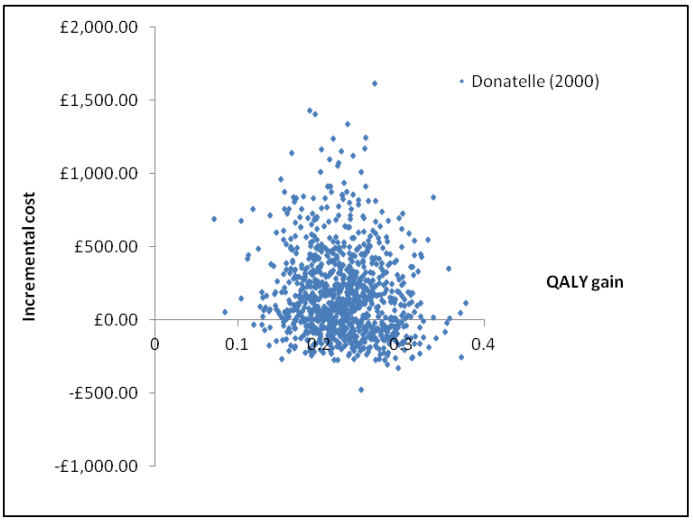
-£2,000.00
0
0.1
0.2
0.3
0.4
0.5
Higgins (2010)
QALY gain


Incremental cost
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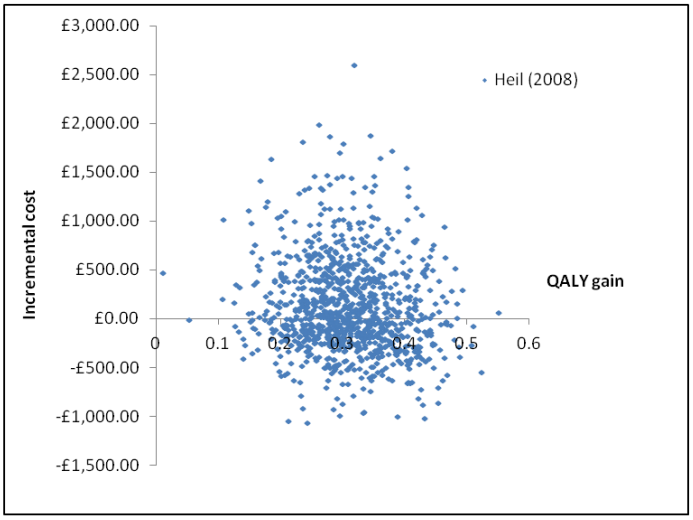
£500.00
£0.00
-£500.00
-£1,000.00
0
0.1
0.2
0.3
0.4
Donatelle (2000)
QALY gain


Incremental cost
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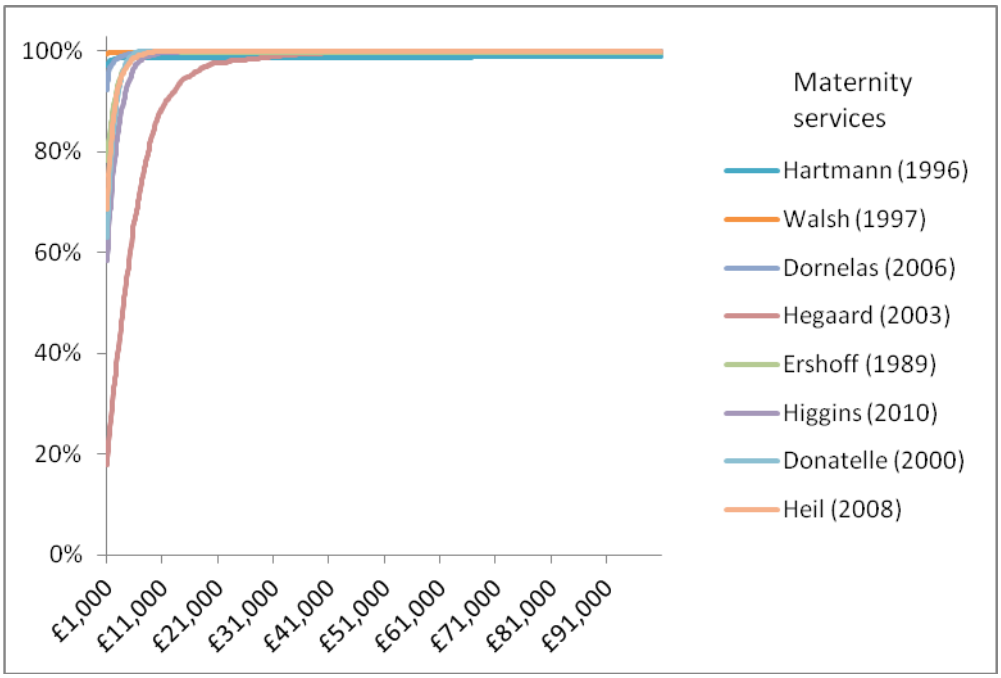
£2,000.00
£1,500.00
£1,000.00
£500.00
£0.00
-£500.00
-£1,000.00
-£1,500.00
0
0.1
0.2
0.3
0.4
0.5
0.6
Heil (2008)
QALY gain

Figure 5. CEACs for interventions delivered in maternity services



Figures 6 and 7 show PSA for interventions delivered to PTSD patients. In line with the results presented in Section 6.1, the analysis shows that both interventions are likely to remain cost-effective. For McFall (2005) the dispersion of cost outputs is not much but we see some observations falling into the left quadrants, especially the upper one which means less QALYs at a higher cost. This means that this intervention is more likely to vary in terms of effectiveness than in terms of costs when sensitivity analysis is performed. This intervention is less sensitive to the WTP hence presents a more stable CEAC but also a CEAC that does not reach 100% probability of cost-effectiveness.

In contrast, McFall (2010) produced more estimates falling on the upper right quadrant with more variance in costs and less variance in effectiveness. This makes this intervention more sensitive to WTP and explains why in Figure 7 we can observe that from the £30,000 threshold onwards, McFall (2010) presents a likelihood of cost-effectiveness of 96% while McFall (2005) presents 92%.

Figure 6. Scatter plot for interventions delivered in mental health services – PTSD patients

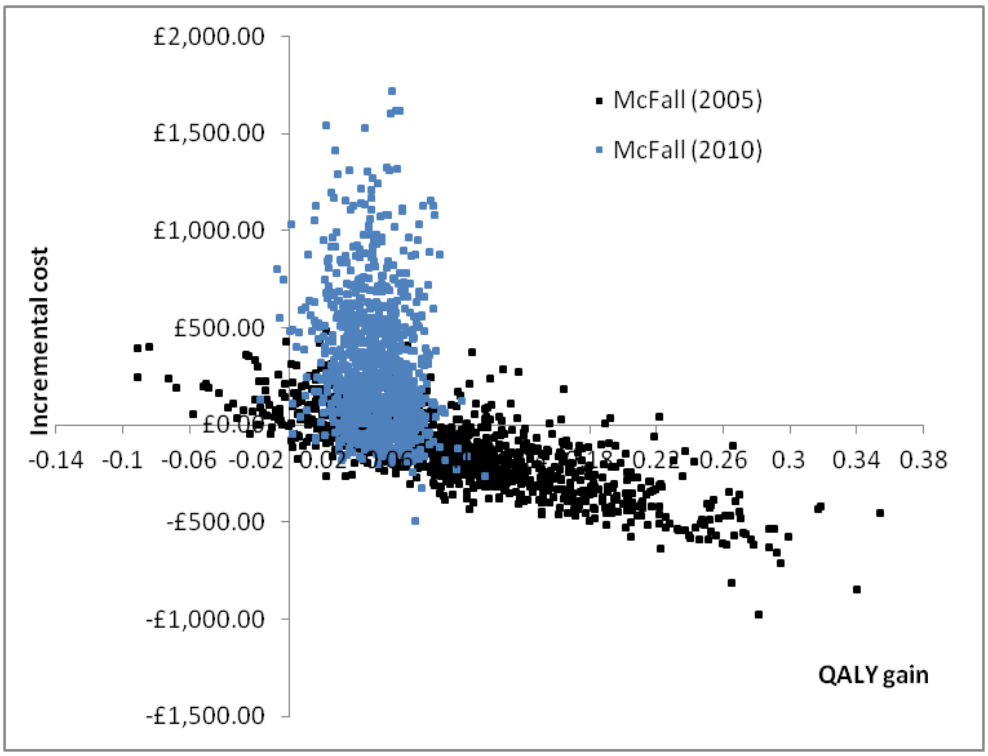
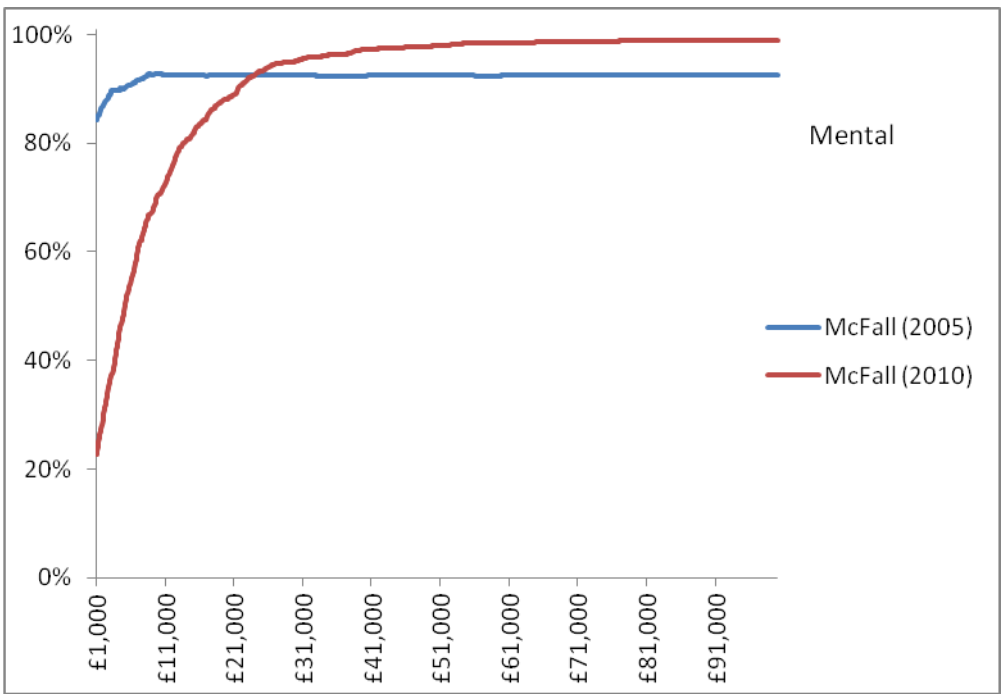


Figure 7. CEACs for interventions delivered in mental health services – PTSD patients



Figures 8 and 9 show PSA for interventions delivered to preoperative patients. In line with the results in Section 6.1, where both interventions were presented as dominant, the scatter plot shows that all the iterations fall within the lower right quadrant and both interventions remain always cheaper (producing cost savings between $200 and £1,600) and more beneficial that their comparators. Correspondingly, the CEACs show that the two interventions have 100% probability of being cost-effective irrespective of the WTP.

Figure 8. Scatter plot for interventions delivered in acute services – preoperative patients

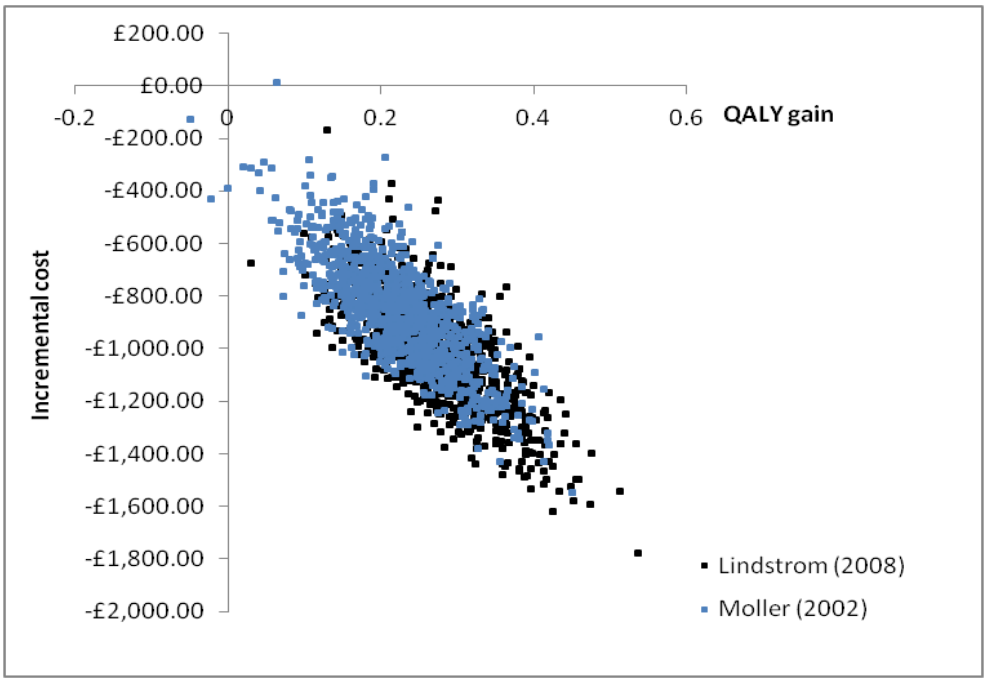
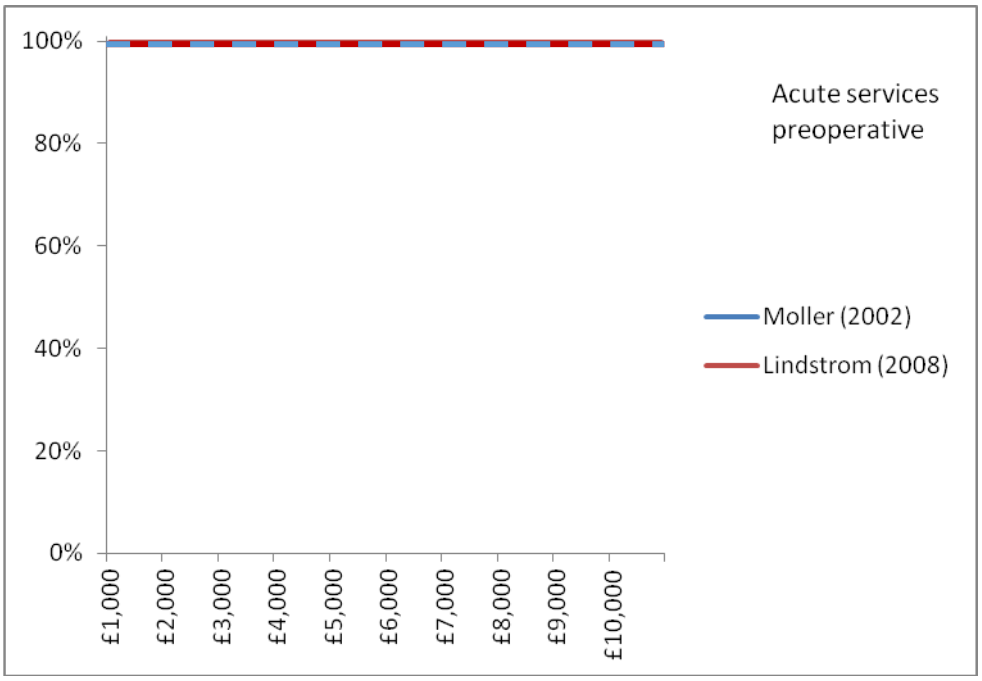


Figure 9. CEACs for interventions delivered in acute services – preoperative patients



Figures 10 and 11 show PSA for interventions delivered to patients with COPD. Sensitivity analysis generally produced outputs falling in the lower right quadrant. This means that the three interventions considered tend to generate more QALYs at lower costs than their comparators. We see relatively higher variance in costs than in effect hence the CEACs in Figure 11 initially vary with the WTP, reaching a probability of cost-effectiveness of 100% at £30,000.

Figure 10. Scatter plot for interventions delivered in acute services – COPD patients

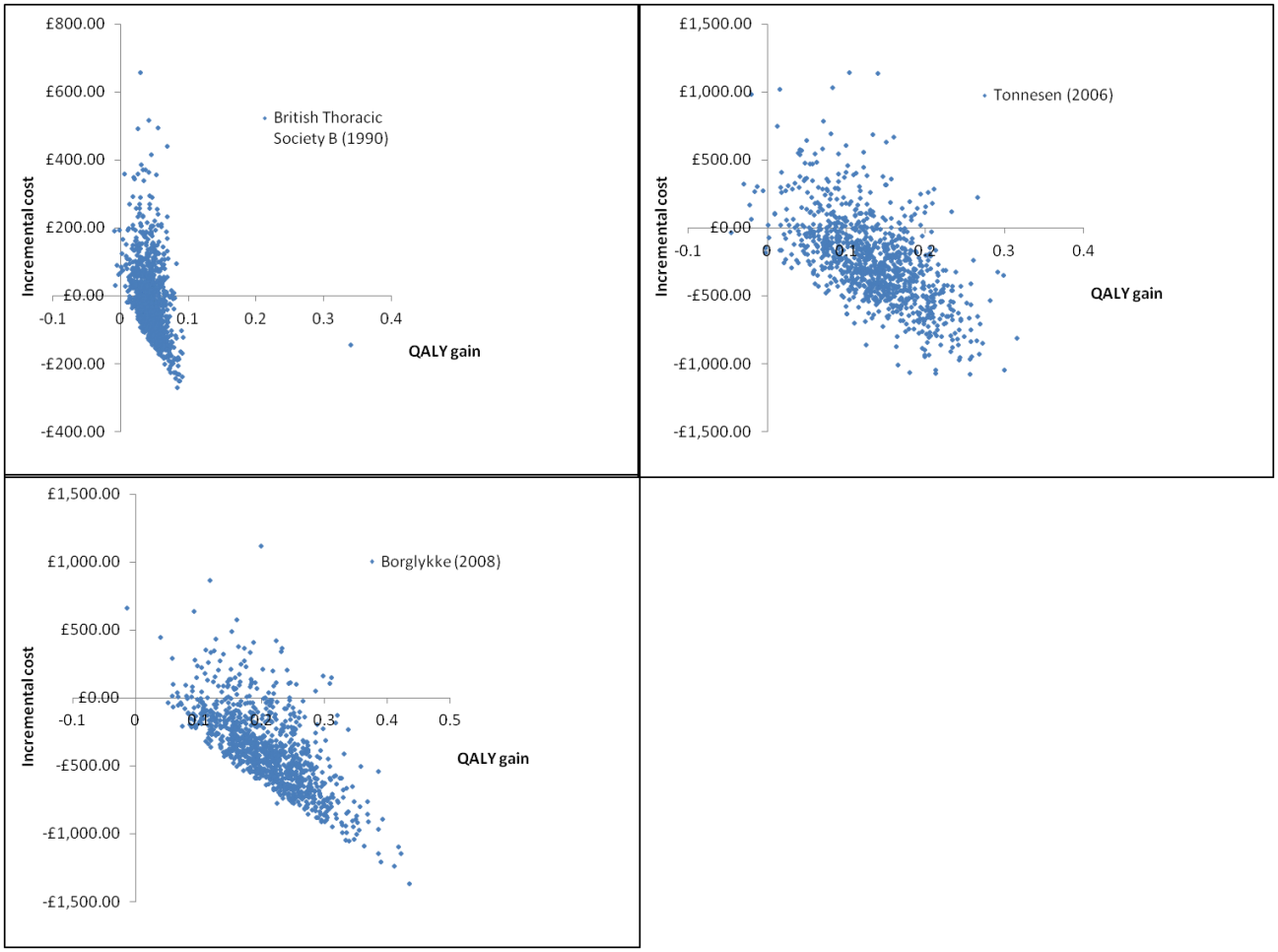
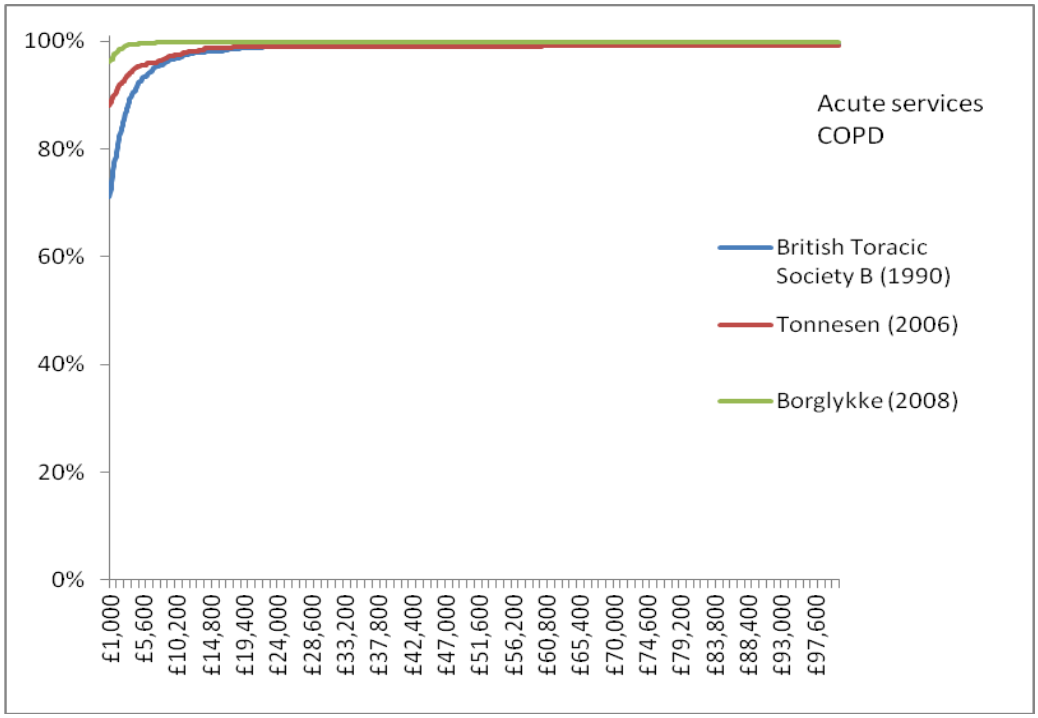


Figure 11. CEACs for interventions delivered in acute services – COPD patients



Figures 12 and 13 show PSA for interventions delivered to patients with cardiac conditions. As in the case of preoperative patients, the analysis confirms the results in Section 6.1 where the three interventions were identified as dominant. The interventions are always cheaper (producing high cost savings between $1,000 and £16,000) and generate more QALYs than their comparators. Correspondingly, the CEACs show that the two interventions have 100% probability of being cost-effective irrespective of the WTP.

Figure 12. Scatter plot for interventions delivered in acute services – cardiac patients

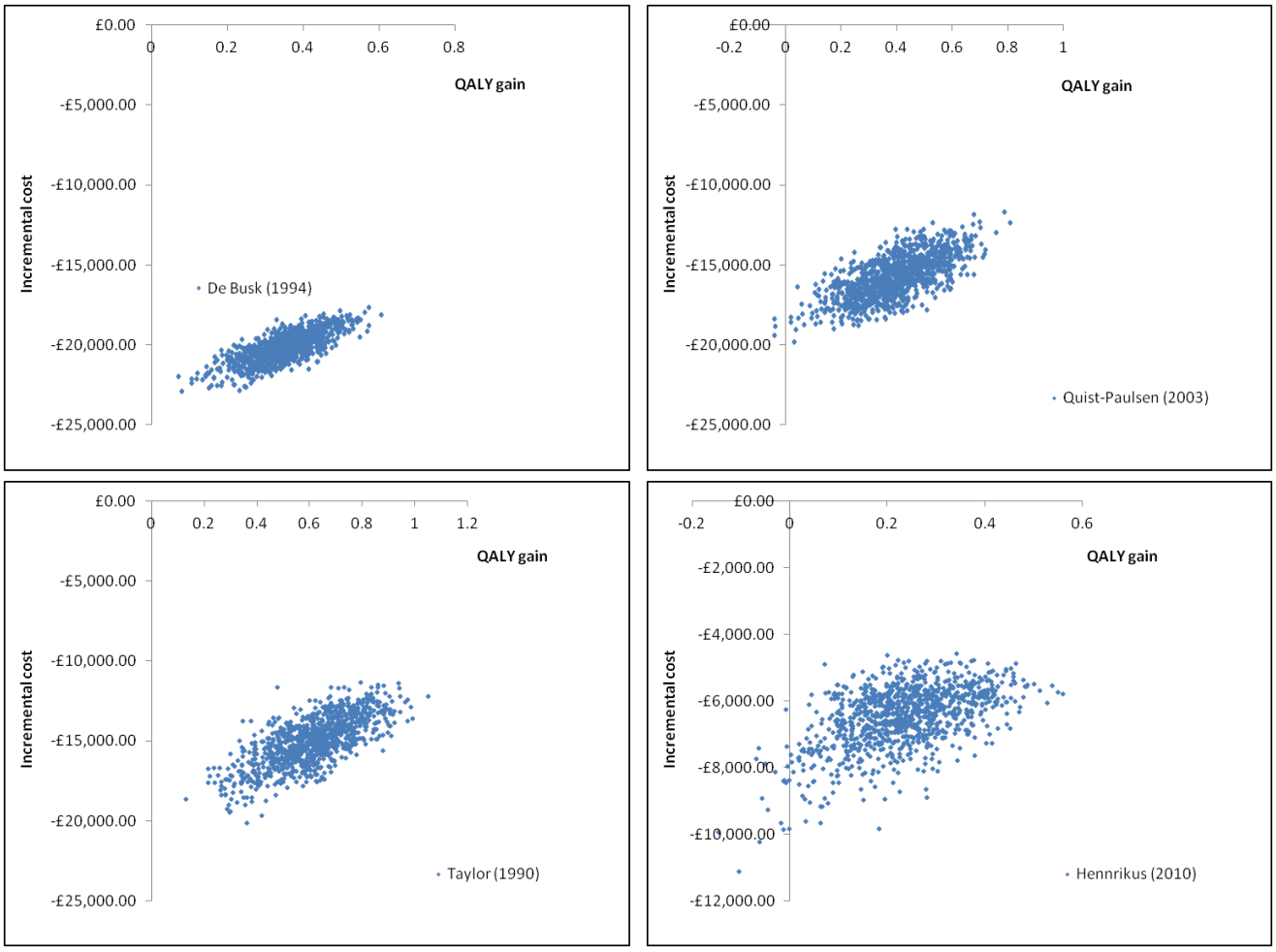
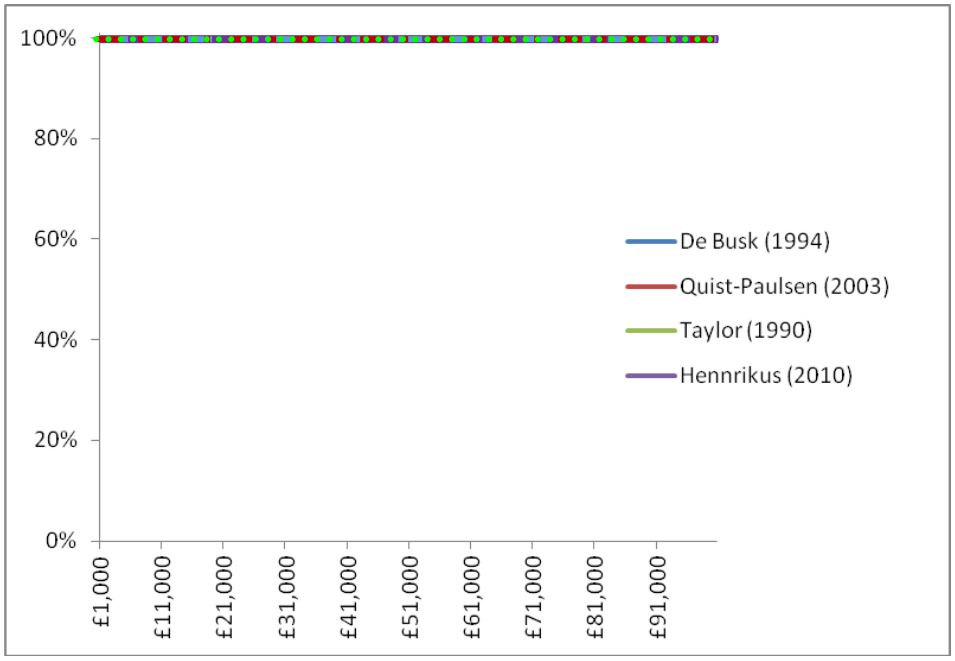


Figure 13. CEACs for interventions delivered in acute services – cardiac patients (all lines overlap)



Figures 14 and 15 show PSA for interventions delivered to general patients (Miller, 1997) and hospital staff (Dalsgaro, 2004). Sensitivity analysis generally produced outputs falling in the lower right quadrant, especially in the case of Dalsgaro, 2004). This means that the two interventions considered generated more QALYs at lower costs than their comparators. We see higher variance in costs than in effect hence the CEACs in Figure 14 initially vary with the WTP, reaching a probability of cost-effectiveness of 100% at £30,000

Figure 14. Scatter plot for interventions delivered in acute services – general patients and hospital staff

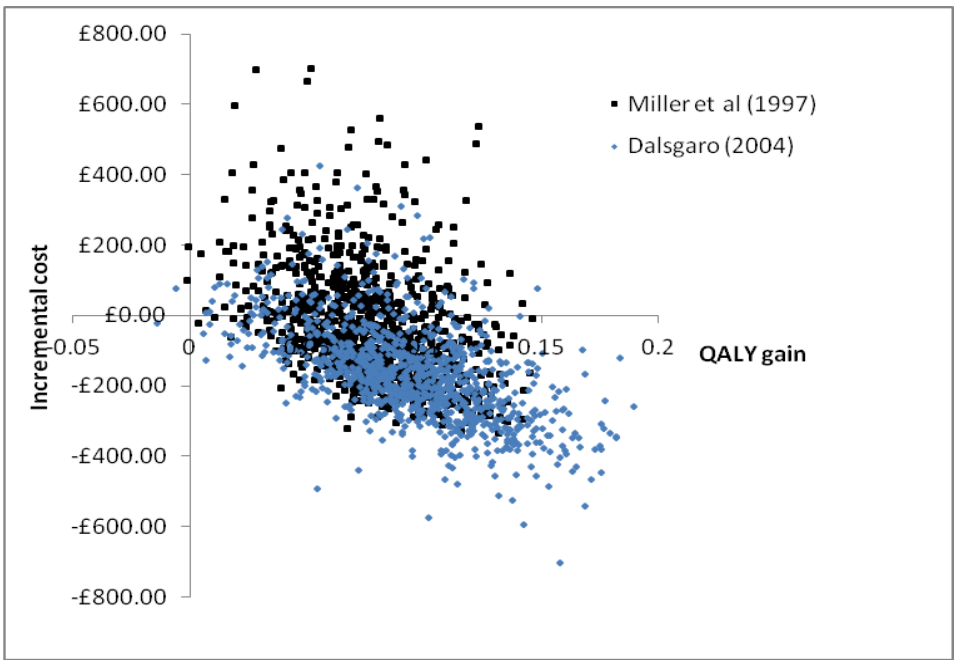
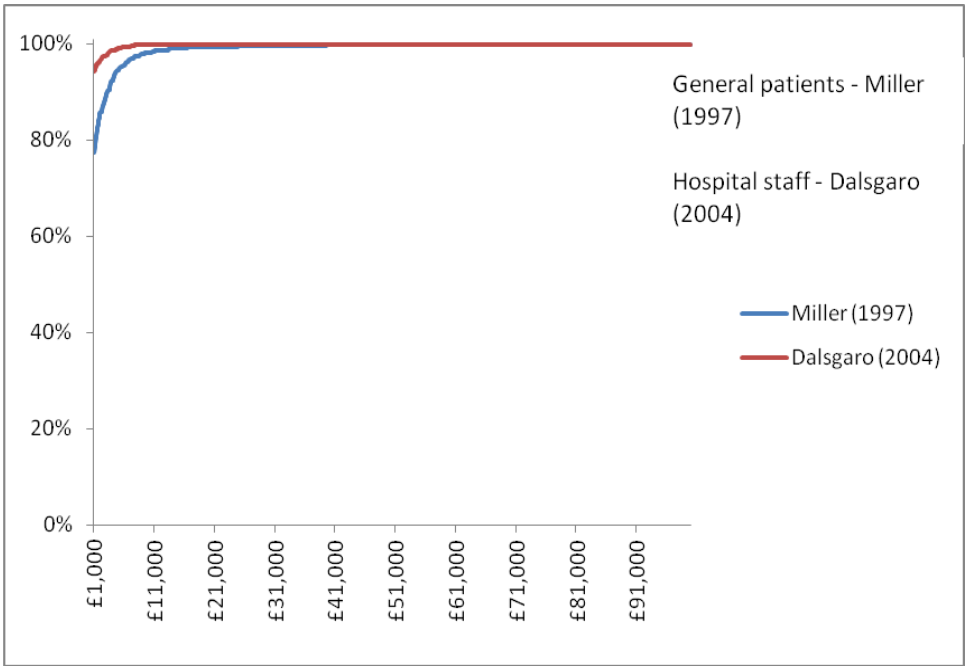


Figure 15. CEACs for interventions delivered in acute services – general patients and hospital staff



Figures 16 and 17 show PSA for the smoke-free intervention. The results show that the conclusion from the analysis is not sensitive to variability in costs and effects. A total indoor and outdoor smoking ban remains always cheaper (producing cost savings between $600 and £900) and more beneficial that an indoor ban.

Figure 16. Scatter plot for smoke-free policy: hospital employees

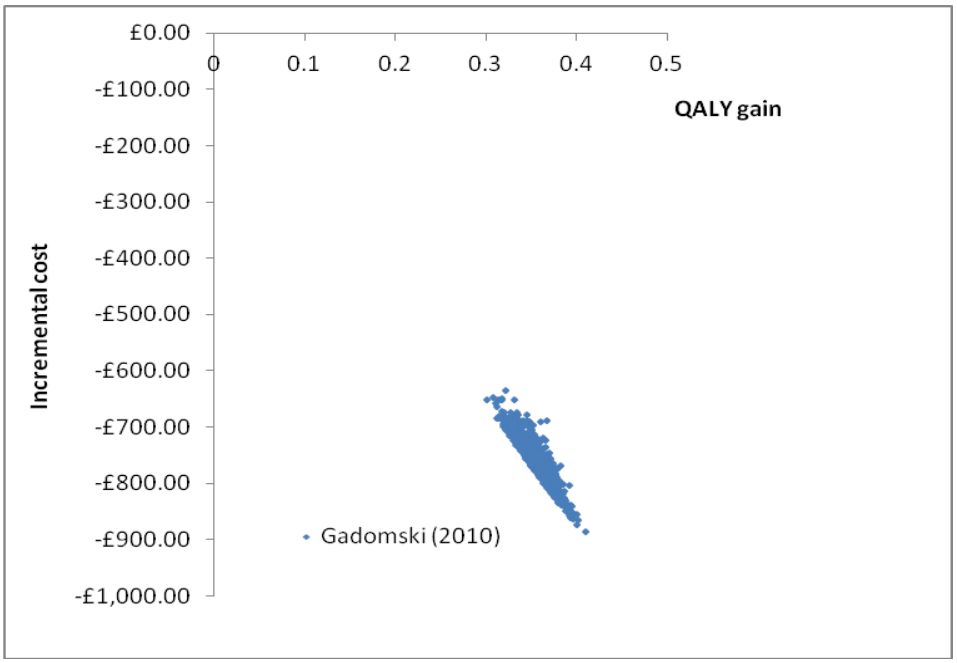
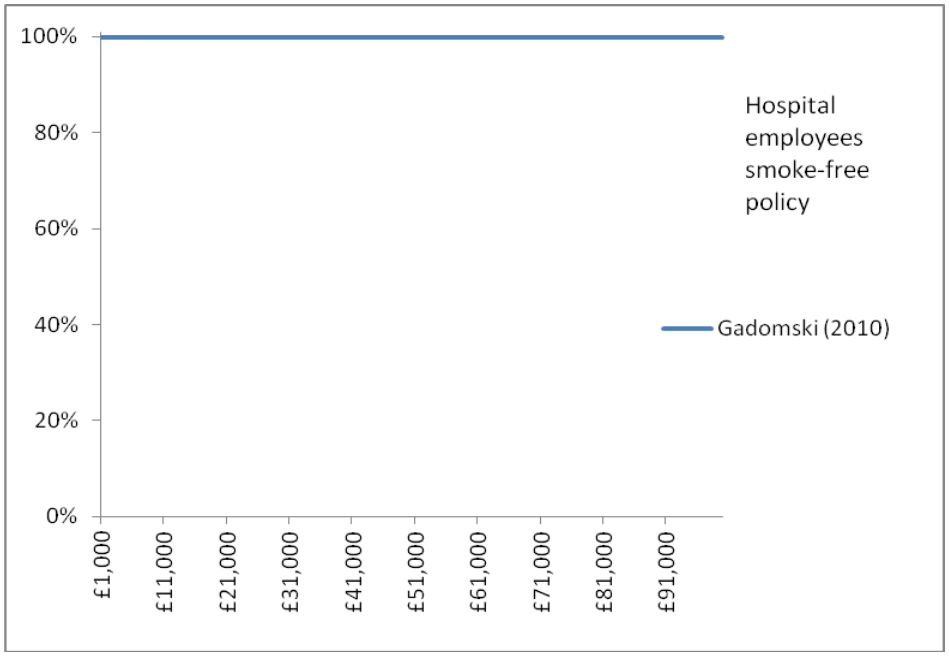


Figure 17. CEACs for smoke-free policy: hospital employees



7.0 Discussion

The results of the economic analysis suggest that smoking cessation interventions in secondary care tend to be cost-effective. Below we present a summary and discussion of the results for each of the population groups analysed in this study, along with the limitations of the analysis.

Maternity services

Interventions for pregnant women are cost-effective, with the potential not just to reduce the risk of long-term smoking related diseases, but also to avoid a number of pregnancy outcomes associated with smoking that can affect mothers and children. For the relative low cost interventions, the conclusion holds even when a short-term perspective is adopted and only mothers' outcomes accrued during the first three years are considered.

The previous results apply to both high intensity behavioural interventions and interventions providing vouchers conditional on smoking behaviour. Caution should be taken with the latter as the design of these interventions tends to be quite sophisticated and the estimated implementation costs may represent an underestimate. However, the sensitivity analysis suggests that the interventions are likely to remain cost-effective even if the costs of interventions were considerably higher than estimated.

As with any modelling exercise, a number of assumptions were made in the analysis. Literature searches revealed a dearth of data comparing smokers to former smokers. Most of the epidemiological evidence refers to smokers vs. non smokers meaning that the effects of smoking cessation may represent an overestimate of the potential benefits

The estimation of the QALYs gained related to children's outcomes relied on the assumption that a person with full health would experience a utility value of 1 every year up to 100 years. This implied a present value of lifetime with full health of 28.62. This may represent an overestimation of the benefits of smoking cessation. Ideally, a diminishing, time-dependent utility value as children age would have been used. However, such assumption is unlikely to have a major impact on the conclusions. The analysis shows that when only mother outcomes are considered, three out of the seven interventions considered are dominant while other three interventions have ICERs between £364 and £5,149.

There was only one intervention (Donatelle, 2000) that was not cost-effective when only mother outcomes were considered and became so when children benefits were included in the analysis.

More broadly it should be considered that we have included a number of children's outcomes resulting from mothers' smoking behaviour but we have not estimated any potential impact resulting from exposure to ETS and from the smoking behaviour of the children themselves when they become adults. There is evidence suggesting that children of parents who smoke are more likely to be smokers than children of parents who do not smoke. This evidence would imply that interventions reducing smoking rates among mothers could have an impact on smoking rates among children as they grow older. These potential intergenerational benefits have not been captured in the analysis.

Mental health services: PTSD patients and patients with schizophrenia

Behavioural plus pharmacological interventions for patients with PTSD are cost effective when a lifetime perspective is adopted. For the interventions to remain cost-effective in the short-term, the interventions' delivery costs need to be kept relatively low.

In the case of patients with schizophrenia, behavioural plus pharmacological interventions show good cessation outcomes in the short-term, but almost all patients relapse to smoking before 12 months. In this scenario, the only outcome considered in the analysis was the potential short-term reduction in the use of antipsychotics – as compared to smokers, non-smokers tend to need lower doses of antipsychotics. For the four interventions the estimated health care cost savings are smaller than the cost of delivering the interventions. This suggests that if only health care cost savings are considered, the interventions are not cost-effective. These results however must be treated with caution as several assumptions (such as having to assume the quit rate for interventions only reporting the number of people seeking stop smoking services) had to be made to estimate the cost associated with reduced dose of antipsychotics. Moreover, smoking cessation (or temporary abstinence) may be associated with health benefits not captured in this analysis, such as a decrease in long-term side effects of antipsychotic drugs intake..

Previous research has indicated that the costs to the NHS associated with treating smoking related diseases in mental health patients amount to £720m per year (Royal College of Physicians & Royal College of Psychiatrists, 2013), suggesting that the health care cost savings associated with smoking cessation in this population go well beyond the reduction on the use of antipsychotic drugs.

It is worth noting that the efficacy of the EQ-5D[23] in patients with schizophrenia is contested. While the EQ-5D is 'reasonably valid and moderately responsive' for patients with anxiety disorders (Konig 2010), the same cannot be said for schizophrenia. In studies of the EQ-5D and its validity for patients with schizophrenia it is found that in approximately half of the studies patients give responses indicative of full health (Saarni et al 2010, Konig et al 2009) which skews the results far higher than other quality of life questionnaires. While this 'ceiling effect' is in place for all measures that use the time-trade off method, it is exceptionally pronounced in the EQ-5D, at 55.4% of the sample this is nearly three times larger than in the 15D questionnaire[24]. The EQ-5D has trouble capturing the subtleties of psychotic disorders which can lead to their utilities being overestimated, but is generally valid for other forms of mental illness.

Given that the interventions showed no impact on the 12 month smoking rates; no QALYs and ICERs were estimated. To address this limitation, we simulated what the benefits of the interventions would be in terms of reduced incidence of long-term smoking related diseases, if 1

[23] This is a widely used health questionnaire that looks at a person's general level of health. The outcomes can be used to calculate the number of QALYs associated with an intervention

[24] This is a generic, 15-dimensional, self-administered instrument for measuring health related quality of life among adults.

in 10 patients would quit in the long-term (12 months). The results showed that in such scenario the interventions would be cost-effective.[25]

Acute services: patients in elective surgery (preoperative interventions)

High intensity behavioural plus pharmacological interventions for patients about to undergo surgery represent an opportunity to avoid surgery complications, such as wound related and pulmonary complications, and reduce the risk of long-term smoking related diseases. These interventions are cost-effective, even if benefits only for the first three years are considered.

Acute services: COPD patients

COPD patients that quit smoking have a reduced risk of experiencing COPD exacerbations. Behavioural and/or pharmacological interventions for these patients are cost-effective when a lifetime perspective is adopted, and even if only short-term benefits are considered the interventions are generally value for money.

Acute services: cardiac patients

Cardiac patients that quit smoking experience a lower risk of suffering cardiac events (e.g. myocardial infarction). As in the case of COPD patients, behavioural and/or pharmacological interventions for these patients are cost-effective when a lifetime perspective is adopted, and even if only short-term benefits are considered the interventions are generally value for money.

Acute services: general inpatients

It is interesting to see that even for general inpatients – for whom no particular secondary care specific outcomes related to smoking cessation are considered – interventions can be cost-effective. Compared to low intensity behavioural support, a pharmacological intervention was estimated cost-effective. This conclusion applies to the lifetime calculation. When only short-term benefits are considered, the ICERs remain within the £20,000 to £30,000 threshold.

Acute services: hospital employees

For hospital employees, the conclusions are similar to the conclusions reached for general inpatients. Even though no secondary care specific outcomes related to smoking cessation are considered, a pharmacological intervention was estimated more costly but also more beneficial than low intensity behavioural support. This conclusion applies to lifetime as well as short-term estimates.

Smoke-free policy: hospital employees

The results indicate that, compared to an indoor smoke-free policy, a total smoke-free policy reduces smoking rates among staff. No significant impact on smoking behaviour was observed among patients. The implementation of the smoke-free policy involved distribution of leaflets among staff, patients and families, the design of new campus map, no smoking signs, and NRT offered to employees. Regardless of the timeframe considered, the intervention was estimated cost-effective. However these results should be taken with caution. The study was a before-

[25] It should be noted that these calculations do not take into account evidence showing that life expectancy in mental health patients is estimated to be reduced by 20 years due to higher smoking rates verified amongst these patients (conservative estimate from McManus et al, 2010).

after evaluation; therefore it is difficult to assess what would have happened in the absence of the intervention. In the analysis, a background cessation rate of 2% was used. Another reason for caution is that due to lack of information in the study, no enforcement costs have been estimated. In practice, however, it is likely that a smoke-free policy would require some kind of mechanism put in place to enforce compliance with the policy. For these reasons, it is possible that the effect of the policy may be an overestimate and the cost may be an underestimate. Despite this uncertainty, the results of the sensitivity analysis show that a smoke-free policy of this kind is likely to be cost-effective and represent good value for money.

It should be noted that enforcement costs are expected to be more relevant in some settings that in others. More specifically, for mental health inpatients these extra measures are likely to be necessary not only to enforce smoking bans but also to prevent patients to try to leave an acute hospital setting if no smoking on the ground is permitted.

Productivity costs

For all interventions we estimated the productivity cost savings. These combine two components: fewer smoking breaks (which make up 56% of the total cost savings) and reduced absenteeism (accounting for the remaining 44% of the total cost savings). The estimates show that these cost savings are high and usually far greater than health care cost savings. These figures should be taken as indicative given that they were calculated based on the general population employment rate (70%[26]) and the only adjustment made to specific populations was based on working age – i.e. the impact was only computed for individuals up to the age of 65.

However, it is worth stressing the potential benefits in terms of productivity gains. For example, for every 1,000 employees, it is estimated that 200 are smokers. Considering only smoking breaks (30 minutes per day per smoker), the productivity loss of these 200 smokers amounts to over 3,000 days lost per year, which based on the average hourly wage[27] in monetary terms are equivalent to over £375,000 per year. Moreover, although we have not been able to estimate the impact of smoke-free policies in patients' smoking behaviour, it should be noted that any potential reductions in smoking rates among patients are likely to generate productivity gains in staff. For example, it has been reported that 1.6 staff whole time equivalents are lost as a result of staff having to manage patients in secure units who smoke (e.g. by supervising their smoking breaks outside the building).[28] Therefore there is great potential for employers to benefit from smoking cessation interventions.

Training costs

Training costs were not considered in any of the smoking cessation interventions modelled. However, it is likely that staff will require training, especially in specific settings. Training costs vary widely according to staff needs and baseline qualification. A seven-month study in Liverpool estimated the costs of training staff to deliver smoking cessation services to vary between £105 and £200 per worker over the 7 months period (Hackshaw et al, 2011).

[26] Source: Labour Force Survey 2011.
[27] 2012 Annual Survey of Hours and Earnings
[28] Source: PDG member, PDG meeting 30th January, 2013.

The sensitivity analysis shows that even if training costs were included, smoking cessation are likely to remain cost-effective across different settings.

General assumptions and implications

All interventions were modelled for the average age of the populations of interest. These were derived based on the effectiveness reviews. Instead of taking the average age, ideally each intervention would be run for all possible ages within the population of interest. However, it is unlikely that this would have an impact on the overall results.

The present analysis looks into different populations with very specific characteristics. Adding to the age and gender specific prevalence and mortality rates being used, we also made adjustments to these parameters trying to capture the specificities of the different populations of interest. To the extent data were available, parameters were adjusted to reflect higher risks for different patients groups (like for example cardiac patients have a higher baseline mortality rate) thus providing more insight into the effect of smoking cessation for different populations than the vast majority of studies have realised so far.

Dose response relationships were excluded from the analysis. The effect of this unfolds in two different directions:

- The potential benefits of reducing smoking (instead of quitting) were not measured thus reflecting a potential underestimation of smoking cessation interventions. Evidence suggests that even though health benefits related with smoking reduction are not well established, patients reducing the amount they smoke are more likely to stop smoking eventually, especially if using licensed nicotine—containing products. It is thus predicted that, was this included in the analysis, long-term ICERs would decrease reflecting broader health benefits associated with smoking cessation.
- The impact of former smokers category not being split into recent and long-term former smokers is not as clear. This is mainly associated with the relative risk for comorbidities. If long-term smokers have in fact the same relative risk as non-smokers (which in some cases is suggested to happen, for example to cardiac patients) then the model results might represent an overestimation of smoking cessation results as there will be an overestimation of the number of people developing diseases in each cycle.

Even though patients' suitability to different pharmacotherapies was not considered in this study, it is likely that not all patients would be suitable to undertake the "mainstream" smoking cessation pharmacotherapies modelled in this analysis.

Conclusion

This study was designed with the purpose of estimating both the short and long-term economic impacts of smoking cessation. The conclusion from the analysis is that smoking cessation interventions in secondary care tend to be cost-effective across populations with different conditions. For the majority of interventions and population groups, this conclusion holds even

when a short-term perspective is adopted and only the first three years of potential benefits are considered. This means that many interventions generate enough benefits within three years of implementation for the interventions to be worth the investment. This type of information can help health commissioners maximise the returns of their investment decisions – or, in the current climate of budget cuts, prevent disinvestment in interventions and populations where large benefits exist.

As with any modelling exercise, the results are subject to uncertainty and numerous assumptions. However, given that the ICERs generally fall well below the £30,000 threshold, it is unlikely that the conclusions are sensitive to those assumptions. In fact, the sensitivity analysis showed that interventions tend to remain cost-effective when the costs and effects of the interventions are randomly varied. Moreover, the benefits associated with smoking cessation captured in our analysis are limited to a number of health outcomes and only health care cost and productivity cost savings have been considered. Improvements in these and other health outcomes associated with smoking cessation are also likely to lead to reduced use of social care resources and savings in individuals costs – such as direct health care payments and transport costs.

8.0 References

Aguilar, M. C., Gurpegui, M., Diaz, F. J. (2005). Nicotine dependence and symptoms in schizophrenia. Naturalistic study of complex interactions. British Journal of Psychiatry, 186, 215–221.

Au, D. H., Bryson, C. L., Chien, J. W., Sun, H., Udris, E. M., Evans, L. E., & Bradley, K. A. (2009). The effects of smoking cessation on the risk of chronic obstructive pulmonary disease exacerbations. Journal of general internal medicine, **24**(4), 457-463.

Bernstein, I.M., Mongeon, J.A., Badger, G.J., Solomon, L., Heil, S. and Higgings, S.T. (2005). Maternal smoking and its association with birth weight. Obstetrics & Gynecology, **106**(5) Part1, 986-990.

Borglykke, A., C. Pisinger (2008). The effectiveness of smoking cessation groups offered to hospitalised patients with symptoms of exacerbations of chronic obstructive pulmonary disease (COPD). The clinical respiratory journal, 158-165.

Briggs, A., Sculpher, M., & Claxton, K. (2011). Decision modelling for health economic evaluation. OUP Catalogue.

British Thoracic Society (1990). Smoking cessation in patients: two further studies by the British Thoracic Society. Research Committee of the British Thoracic Society. Thorax **45**(11): 835-840.

Campion J, Checinski, K and Nurse, J (2008). Review of smoking cessation treatments for people with mental illness. Advances in Psychiatric Treatment **14**:208-216

Castles AA. (2009) Effects of smoking during pregnancy: Five meta-analyses. American Journal of Preventive Medicine **16**(3):Apr.

Chiou, C. F., Weaver, M. R., Bell, M. A., Lee, T. A., & Krieger, J. W. (2005). Development of the multi-attribute Pediatric Asthma Health Outcome Measure (PAHOM). International Journal for Quality in Health Care, **17**(1), 23-30.

Coco, A. S. (2007). Cost-effectiveness analysis of treatment options for acute otitis media. The Annals of Family Medicine, **5**(1), 29-38.

Dalsgaro, O. J., N.C. G. Hansen, et al. (2004). A multicenter, randomized, double-blind, placebo-controlled, 6-month trial of bupropion hydrochloride sustained-release tablets as an aid to smoking cessation in hospital employees. Nicotine & Tobacco Research **6**(1): 55-61.

DeBusk, R. F., N. H. Miller, et al. (1994). "A case-management system for coronary risk factor modification after acute myocardial infarction." Annals Of Internal Medicine **120**(9): 721-729.

Department of Health (2011). NHS reference cost schedules 2010/2011. Available at: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_131140 Accessed: 11/12/12

Donatelle, R. J., S. L. Prows, et al. (2000). Randomised controlled trial using social support and financial incentives for high risk pregnant smokers: significant other supporter (SOS) program. Tobacco Control **9 Suppl 3**: III67-III69.

Dornelas, E. A., J. Magnavita, et al. (2006). Efficacy and cost-effectiveness of a clinic-based counseling intervention tested in an ethnically diverse sample of pregnant smokers. Patient Education And Counseling **64**(1-3): 342-349.

Dornelas, E. A., R. A. Sampson, et al. (2000). A randomized controlled trial of smoking cessation counseling after myocardial infarction. Preventive Medicine **30**(4): 261-268.

Ershoff DH, Q. V., Mullen PD. (1989). A randomized trial of a serialized self-help smoking cessation program for pregnant women in an HMO. American Journal of Public Health **79**(2): 182-187.

Everett, C. (1997). Incidence and outcome of bleeding before the 20th week of pregnancy: prospective study from general practice. BMJ, **315**(7099), 32-34.

Fenwick, E., Claxton, K., & Sculpher, M. (2001). Representing uncertainty: the role of cost-effectiveness acceptability curves. Health economics, ***10***(8), 779-787.

Flack, S., Taylor, C. M., & Trueman, P. (2007). Economic analysis of interventions for smoking cessation aimed at pregnant women. Supplementary report. York Health Economics Consortium for National Institute for Health and Clinical Excellence.

Gadomski, A. M., Stayton, M., Krupa, N., & Jenkins, P. (2010). Implementing a smoke-free medical campus: Impact on inpatient and employee outcomes. Journal of Hospital Medicine, **5**(1), 51-54.

Godfrey, C., Pickett, K.E., Parrott, S., Mdege, N.D., and Eapen, D. (2010). Estimating the Costs to the NHS of Smoking in Pregnancy for Pregnant Women and Infants. Public Health Research Consortium (PHRC), University of York.

Hackshaw, L.,Robinson, J., Jones,L., Laverty, L., Amos, A., McEwen, A. (2011). Children's Centre Workforces and Stop Smoking Services. UK Centre for Tobacco Control Studies (UKCRC).

Hartmann, K. E., J. M. Thorp, Jr., et al. (1996). A randomized controlled trial of smoking cessation intervention in pregnancy in an academic clinic. Obstetrics And Gynecology **87**(4): 621-626.

Hawn, M. T., Houston, T. K., Campagna, E. J., Graham, L. A., Singh, J., Bishop, M., & Henderson, W. G. (2011). The attributable risk of smoking on surgical complications. Annals of surgery, **254**(6), 914.

Hegaard, H. K., H. Kjaergaard, et al. (2003). Multimodal intervention raises smoking cessation rate during pregnancy. Acta obstetricia et gynecologica Scandinavica, 813-819.

Heil, S. H., S. T. Higgins, et al. (2008). Effects of voucher-based incentives on abstinence from cigarette smoking and fetal growth among pregnant women. Addiction (Abingdon, England) **103**(6): 1009-1018.

Hennrikus, D., A. M. Joseph, et al. (2010). Effectiveness of a smoking cessation program for peripheral artery disease patients: a randomized controlled trial. Journal Of The American College Of Cardiology **56**(25): 2105-2112.

Higgins, S. T., I. M. Bernstein, et al. (2010). Effects of smoking cessation with voucher-based contingency management on birth outcomes. Addiction (Abingdon, England) **105**(11): 2023-2030.

Keeley, D., & McKean, M. (2006). Asthma and other wheezing disorders in children. Clinical Evidence, 2006.

Konig, HH, Gunther, OH, Angermeyer, MC, Roick, C. (2009) Utility assessment in patients with mental disorders: Validity and discriminative ability of Time Trade Off methodology. Pharmacoeconomics **27**(5):405-419

Konig, HH. Born, A. Gunther, O. Matschinger, H. Heinrich, S. Reidel-Heller, S. Angermeyer, MC. Roick, C. (2010) Validity and responsiveness of the EQ-5D in assessing and valuing health states in patients with anxiety disorders. Health and Quality of Life Outcomes **8**:47

Lindstrom, D., O. Sadr Azodi, et al. (2008). Effects of a perioperative smoking cessation intervention on postoperative complications: a randomized trial. Annals Of Surgery **248**(5): 739-745.

Lydakis C, Beevers M, Beevers DG, Lip GY. (2001). The prevalence of pre-eclampsia and obstetric outcome in pregnancies of normotensive and hypertensive women attending a hospital specialist clinic. Int J Clin Pract; **55**: 361-7.

McManus, S., Meltzer, H., Campion, J. (2010). Cigarette smoking and mental health in England - Data from the Adult Psychiatric Morbidity Survey 2007. National Centre for Social Reasearch.

Menzin, J., White, L., Friedman, M., Nichols, C., Menzin, J. A., Jones, C., & Hoesche, J. (2011). Failure to correct the international normalized ratio in patients with anticoagulant-related major bleeding is associated with increased 90-day mortality. Critical Care, **15**, 1-190.

Miller, N. H., P. M. Smith, et al. (1997). Smoking cessation in hospitalized patients. Results of a randomized trial. Archives Of Internal Medicine **157**(4): 409-415.

Moller, A. M., N. Villebro, et al. (2002) Effect of preoperative smoking intervention on postoperative complications: a randomised clinical trial. Lancet, 114-117.

Nash, R & Featherstone H. (2010). Cough Up: Balancing tobacco income and costs in society. Policy Exchange. Available at: http://www.policyexchange.org.uk/publications/publication.cgi?id=182 Accessed: 11/12/12

National Institute for Health and Clinical Excellence. (2007) Workplace interventions to promote smoking cessation (PH5). Public Health Guidance 5. London: National Institute for Health and Clinical Excellence.

National Institute for Health and Clinical Excellence. (2009) Schizophrenia: Core interventions in the treatment and management of schizophrenia in adults in primary and secondary care. Clinical Guidance 90 (CG90)

NHS Information Centre (2011) Health Survey for England 2011, Available at: http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles-related-surveys/health-survey-for-england Accessed: 11/12/12

Office of National Statistics (2011). Annual survey of hours and earnings 2011. Available at: http://www.ons.gov.uk/ons/rel/ashe/annual-survey-of-hours-and-earnings/ashe-results-2011/ashe-statistical-bulletin-2011.html Accessed: 11/12/12

Office of National Statistics (2011). Labour Market Statistics 2011, Available at : http://www.ons.gov.uk/ons/publications/all-releases.html?definition=tcm%3A77-21589 Accessed: 11/12/12

Office of National Statistics (2012) Annual Survey of House and Earnings 2012. Available at: http://www.ons.gov.uk/ons/rel/ashe/annual-survey-of-hours-and-earnings/2012-provisional-results/stb-ashe-statistical-bulletin-2012.html Accessed: 11/12/12

ONS (2009) Live Births, Stillbirths and Infant Deaths, Babies born in 2009 in England and Wales. Available at: www.ons.gov.uk/ons/dcp171778_266305.pdf Accessed: 11/12/12

Pepper, P. V., & Owens, D. K. (2000). Cost-effectiveness of the pneumococcal vaccine in the United States Navy and Marine Corps. Clinical infectious diseases, **30**(1), 157-164.

Plowman R. (2000).The socioeconomic burden of hospital acquired infection. Euro Surveill. **5**(4):pii=4.

Pollack, H. A. (2001). Sudden infant death syndrome, maternal smoking during pregnancy, and the cost-effectiveness of smoking cessation intervention. American Journal of Public Health, **91**(3), 432.

Quist-Paulsen, P. and F. Gallefoss (2003). Randomised controlled trial of smoking cessation intervention after admission for coronary heart disease. BMJ (Clinical Research Ed.) **327**(7426): 1254-1257.

Royal College of Physicians, Royal College of Psychiatrists (2013). Smoking and mental health. London: RCP, Royal College of Psychiatrists Council Report CR178.

Saarni, SI., Vierno, S. Perala, J. Koskinen, S. Lonnqvist, J. Suvisaari, J. (2010). Quality of life of people with schizophrenia, bipolar disorder and other psychotic disorders. The British Journal of Psychiatry **197**:386-394

Shetty, A., Alex, R., & Bloye, D. (2010). The experience of a smoke-free policy in a medium secure hospital. The Psychiatrist, **34**(7), 287-289.

Slobogean, G. P., O'Brien, P. J., & Brauer, C. A. (2010). Single-dose versus multiple-dose antibiotic prophylaxis for the surgical treatment of closed fractures. Acta orthopaedica, **81**(2), 256-262.

Sonnenberg, F. A., Burkman, R. T., Hagerty, C. G., Speroff, L., & Speroff, T. (2004). Costs and net health effects of contraceptive methods. Contraception, **69**(6), 447-459.

Sonnenberg, F. A., Burkman, R. T., Speroff, L., Westhoff, C., & Hagerty, C. G. (2005). Cost-effectiveness and contraceptive effectiveness of the transdermal contraceptive patch. American journal of obstetrics and gynecology, **192**(1), 1-9.

Steinberg, M. B., J. Randall, et al. (2011). Tobacco dependence treatment for hospitalized smokers: a randomized, controlled, pilot trial using varenicline. Addictive Behaviors **36**(12): 1127-1132.

Suskin, N., Sheth, T., Negassa, A., & Yusuf, S. (2001). Relationship of current and past smoking to mortality and morbidity in patients with left ventricular dysfunction. Journal of the American College of Cardiology, **37**(6), 1677-1682.

Taylor, C. B., N. Houston-Miller, et al. (1990). Smoking cessation after acute myocardial infarction: effects of a nurse-managed intervention. Annals Of Internal Medicine **113**(2): 118-123.

The Victorian Infant Collaborative Study Group, Available at: http://www.vics-infantstudy.org.au/ accessed: 11/12/12

Treasury, H. M. S. (2003). The green book. Appraisal and evaluation in central government.

Tonnesen, P., K. Mikkelsen, et al. (2006). Nurse-conducted smoking cessation in patients with COPD using nicotine sublingual tablets and behavioral support. Chest, 334-342.

van Steenkiste, B., Knevel, M. F., van den Akker, M., & Metsemakers, J. F. (2010). Increased attendance rate: BMI matters, lifestyles don't. Results from the Dutch SMILE study. Family practice, **27**(6), 632-637.

Walsh, R. A., S. Redman, et al. (1997). A smoking cessation program at a public antenatal clinic. American Journal Of Public Health **87**(7): 1201-1204.

Waseem, M (2010). Otitis Media. Medscape Reference. Available at: http://emedicine.medscape.com/article/994656-overview Last accessed: 11/12/12

Weng SF, Ali S, Leonard-Bee J. (2012) Smoking and absence from work: systematic review and meta-analysis of occupational studies. Addiction. Oct 18. doi:10.1111/add.12015

9.0 Appendix 1: Effect and cost of the interventions

This appendix summarises the effect and cost of the interventions, and the comparators. The effect section reports the short-term effect and 12-month effect of the interventions and comparators in terms of quit rates. The cost section provides details on the calculation of the incremental cost per person, including assumptions made and data sources used.

Table A1.1. Detailed description of interventions modelled – Maternity services

Reference	Hartmann et al (1996)	
Description	Population: Pregnant women Targeted population: 207 Setting: Primary care Intervention: 250 prenatal patients were given self-help materials and were encouraged to set goals towards quitting at each visit. If patients set quit dates then were contacted by smoking cessation counsellors. Smoking status verified by a CO breath test Control: Controls were assessed and encouraged to quit and were revisited 3 times during the study. If control patients requested quit help they were given it.	
Significant effects	Short-term effect (quit rate): 20% 12-month effect (quit rate): 13%	Short-term effect (quit rate): 10% 12-month effect (quit rate)::3%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 2 mins nurse advice: £1.03 2 mins doctor letter writing: £1.97 2 x 10 minutes counsellor: £17 CO breath test + postage: £1.98 **Comparator:** Brief doctor counselling as part of normal care: £1.97	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes

Reference	Walsh (1997)	
Description	Population: Pregnant women Targeted population: 252 Setting: Outpatient Intervention: Patients were given brief advice by a doctor, shown a smoking cessation videotape, given 10 minutes counselling by a midwife and given a self-help manual and four packets of chewing gum (not nicotine gum). Patients were also entered into a lottery where they had a chance to win one of 4 $75 prizes. If patients had social support they were also invited to join the programme. Control: Advice from both doctor and nurse plus a smoking cessation booklet	
Significant effects	Short-term effect (quit rate): 13% 12-month effect (quit rate): 10%	Short-term effect (quit rate): 6% 12-month effect (quit rate): 1%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** Two mins doc advice: £1.77 10 mins midwife: £5.67 One booklet + postage for booklet: £1.39 4 packs Sugar free chewing gum: £1.32 Four chances of winning a £75 lottery prize: £2.36 1 Urine test: £17 **Comparator:** Two minutes doctor advice: £1.97 10 minutes midwife advice: £5.67 One booklet: £0.79 Urine test: £17	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Sugar free chewing gum price: www.sugarfreemegastore.com Stop smoking booklet price: http://www.kramsstore.com Assumptions Assume that brief advice on smoking cessation takes 2 minutes

Reference	Dornelas (2006)	
Description	Population: Pregnant women Targeted population: 105 Setting: Primary care Intervention: Experimental counselling intervention with planned telephone follow-up in addition to usual care from health care provider Control: Usual care from health care provider	
Significant effects	Short-term effect (quit rate): 28.3% 12-month effect (quit rate): 19%	Short-term effect (quit rate): 9.6% 12-month effect (quit rate)::3%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 90 min counsellor session: £76.50 4 x 10 minutes counsellor phone calls: £34 CO breath test: £1.98 **Comparator:** 10 minutes nurse counselling: £5.67 CO breath test: £1.98	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk <u>Assumptions</u> None

Reference	Hegaard et al (2003)	
Description	Population: Pregnant women Targeted population: 647 Setting: Outpatient Intervention: Discussion with the patient about quitting smoking, then if they are willing the patient is given cognitive behaviour therapy Control: Usual care from nurses not trained in specialist smoking cessation techniques	
Significant effects	Short-term effect (quit rate): 7% 12-month effect (quit rate): 5%	Short-term effect (quit rate): 2.2% 12-month effect (quit rate): 1%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 2 x saliva sample: £27 3 hours 40 minutes (3.66) nursing time: £124.44 9 sessions of 1.5 hours group session in a group of 5 with 2 midwives programme: £91.80 11 days NRT: £18.11 **Comparator:** Brief counselling with doctor: £1.77 Two saliva samples: £27	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf NicAlert Saliva Testing Strips: Price from http://www.gasp.org.uk <u>Assumptions</u> Nurse time split 40 minutes initial visit then 3 hours total of follow up monitoring visits. Paper does not give size of smoking cessation classes – assume 5 patients per class.

Reference	Ershoff (1989)	
Description	Population: Pregnant women Targeted population: 242 Setting: Primary care Intervention: Support for quitting smoking through provision of weekly booklets posted to the patient, plus usual care Control: Usual care from health care provider	
Significant effects	Short-term effect (quit rate): 22.2% 12-month effect (quit rate): 15%	Short-term effect (quit rate): 8.6% 12-month effect (quit rate): 2.4%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 45 mins health educator: £25.5 2 mins with doctor: £1.77 5 sessions of 30 mins nurse class: £85 8 booklets + 7x postage (one booklet given in class, the rest posted): £10.52 One 10 minute call: £5.67 7 urine tests: £119 **Comparator:** 45 mins health educator: £25.5 2 mins with doctor: £1.77 5 sessions of 30 mins nurse class: £85 One 10 minute call: £5.67 7 urine tests : £119	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf <u>Assumptions</u> Uses nurse rate for health educator

Reference	Higgins et al (2010)	
Description	Population: Pregnant women Targeted population: 166 Setting: Primary care Intervention: Patients were given attendance vouchers and then incentive vouchers linked to negative breath or urine test outcomes. The value of the vouchers increased dependent on the length of time they were abstinent Control: Patients were given attendance vouchers and then incentive vouchers whether or not they were confirmed abstinent at a flat rate for each visit.	
Significant effects	Short-term effect (quit rate): 34% 12-month effect (quit rate): 23%	Short-term effect (quit rate): 7% 12-month effect (quit rate): 2%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** 20 urine tests: £340 5 CO breath tests: £9.88 Attendance vouchers for each visit: £21.82 Average intervention vouchers for intervention arm based on outcomes of tests: £291.09 10 minutes physician advice: £9.83 **Comparator:** 2 urine tests: £34 2 CO breath tests: £3.95 Attendance vouchers for each visit: £21.82 Average intervention vouchers for comparator arm: £291.09 10 minutes physician advice: £9.83	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Assumptions First week monitoring is with breath tests, after that urine tests. Average intervention voucher price given in paper and adjusted for inflation and exchange rate to get UK price. Intervention price given the same value for intervention and comparator in the paper. Assumes that in practice the comparator arm will not be monitored with tests at every visit.

Reference	Donatelle (2000)	
Description	Population: Pregnant women Targeted population: 220 Setting: Primary care Intervention: Participants were given vouchers of increasing value linked to negative breath or urine test outcomes. A 'social supporter' was also given vouchers should the participant have negative results. Control: Patients were given attendance vouchers, smoking cessation literature and followed up by telephone	
Significant effects	Short-term effect (quit rate): 32% 12-month effect (quit rate): 21%	Short-term effect (quit rate): 9% 12-month effect (quit rate): 6%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 3 visit incentive vouchers ($5): £12.05 13 saliva tests: £175.5 (10 to confirm quit, 3 at compulsory visits) 3 sessions of brief information about quitting from research staff: £1.29 1 stop smoking booklet: £0.79 10 telephone interviews with research staff: £23.92 Maximum potential vouchers - 5 months (10 weeks antepartum + 8 weeks post partum - round up to 5 months) @ $50 per month for mother + $50 first and last month for supporter and $25 other months: £203.83 **Comparator:** 3 visit incentive vouchers: £12.05 3 sessions of brief information about quitting from research staff: £1.29 3 saliva tests: £40.50 one stop smoking booklet: £0.79 10 telephone interviews:£23.92	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Voucher values from: Donatelle et al (2000) adjusted to £2012 NicAlert Saliva Testing Strips: Price from http://www.gasp.org.uk Stop smoking booklet price: http://www.kramsstore.com <u>Assumptions</u> Costed for maximum potential voucher payout – if patient quits on the agreed quit date and maintains quit.

Reference	Heil et al (2008)	
Description	Population: Pregnant women Targeted population: 82 Setting: Primary care Intervention: Patients were given attendance vouchers and then incentive vouchers linked to negative breath or urine test outcomes. The value of the vouchers increased dependent on the length of time they were abstinent Control: Patients were given attendance vouchers for all visits pre and post partum at a flat rate not dependent on smoking status.	
Significant effects	Short-term effect (quit rate):41% 12-month effect (quit rate): 24%	Short-term effect (quit rate):10% 12-month effect (quit rate): 3%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 20 urine tests: £340 5 CO breath tests: £9.88 Average intervention vouchers: £248.46 10 minutes of physician advice: £9.83 **Comparator:** 2 urine tests: £34 2 CO breath tests: £3.95 Control vouchers (not linked to CO levels in blood/urine): £222.59 10 mins physician advice: £9.83	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Voucher values from Heil et al (2008) adjusted to £2012 <u>Assumptions</u> First week monitoring is with breath tests, after that urine tests. Average intervention voucher price given in paper and adjusted for inflation and exchange rate to get UK price. Assumes that in practice the comparator arm will not be monitored with tests at every visit.

Table A1.2. Detailed description of interventions modelled – Mental health services: PTSD patients and patients with schizophrenia

Reference	McFall et al (2005)	
Description	Population: PTSD patients Targeted population: 66 Setting: Outpatient Intervention: Treatment with more than one anti-smoking medication, a mixture of bupropion, varenicline and nicotine replacement depending on the patient's profile plus 6 weeks of counselling Control: Normal care (no further details provided)	
Significant effects	Short-term effect (quit rate): 21% 12-month effect (quit rate): 12%	Short-term effect (quit rate): 10% 12-month effect (quit rate): 3%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** Of the 33 subjects - 20 used buproprion, 31 used nicotine patches, 29 used nicotine gum and 1 used nicotine spray as part of their medication regime: £142.26 (average cost of medication regime) 6 weeks of 20 minute group counselling sessions with counsellor (assuming groups of 6: £18.55 **Comparator:** 20 mins nurse counselling: £11.33 6 weeks nicotine replacement therapy: £55.50	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Prescription medication costs: BNF 2012 <u>Assumptions</u> No specific data available for the comparator which is usual treatment at the veteran's affairs clinic. Assumed 20 minutes nurse counselling and 6 weeks nicotine replacement therapy

Reference	McFall et al (2010)	
Description	Population: PTSD patients Targeted population: 943 Setting: Outpatient Intervention: 5 weeks of nurse counselling plus anti-smoking medication regime of bupropion, varenicline and nicotine replacement Control: Normal care (no further details provided)	
Significant effects	Short-term effect (quit rate): 14% 12-month effect (quit rate): 9%	Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 5 weekly smoking cessation sessions with a nurse: £170 8 weeks of a 3 pronged therapy of nicotine replacement tablets, bupropion & varenicline: £290.66 5 CO breath tests: £9.88 1 urine test: £17 **Comparator:** 20 mins nurse counselling: £11.33 6 weeks nicotine replacement therapy: £55.50	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf <u>Assumptions</u> No specific data available for the comparator which is usual treatment at the veteran's affairs clinic. Assumed 20 minutes nurse counselling and 6 weeks nicotine replacement therapy

Reference	George et al (2008)	
Description	Population: Schizophrenia or schizoaffective disorder patients Targeted population: 58 Setting: Outpatients Intervention: Combination of bupropion therapy and nicotine patches plus group therapy Control: Placebo in place of bupropion plus nicotine patches and group therapy	
Significant effects	Short-term effect (quit rate): 28% 12-month effect (quit rate): 0%	Short-term effect (quit rate): 3% 12-month effect (quit rate): 0%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** One blood test: £17 One CO breath test: £1.98 150 mg bupropion for 3 days: £0.36 then 300 mg bupropion for 67 days: £53.40 55 days nicotine patches:£78.34 10 week course of 50 minute sessions of group therapy: £70.81 **Comparator:** Two CO breath tests: £3.95 70 days placebo dextrose tablets: £3.54 55 days nicotine patches: £78.34 10 week course of 50 minute sessions of group therapy: £70.81	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 Placebo pill cost: http://www.chemistdirect.co.uk Assumptions Placebo pills cost 5p per pill.

Reference	George et al (2002)	
Description	Population: Schizophrenia or schizoaffective disorder Targeted population: 32 Setting: Outpatients Intervention: Bupropion therapy for 10 weeks and group therapy Control: 10 weeks of placebo drug therapy	
Significant effects	Intervention Short-term effect (quit rate): 50% 12-month effect (quit rate): 0%	Counterfactual Short-term effect (quit rate): 13% 12-month effect (quit rate): 0%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** One blood test: £17 one CO breath test: £1.98 300 mg bupropion daily for 10 weeks: £117.65 10 weeks of 60 min once weekly group therapy (assuming 5 people per group): £102 **Comparator:** One blood test: £17 One CO breath test: £1.98 10 weeks dextrose placebo tablets: £5.90	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 Blood test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Placebo pill cost: http://www.chemistdirect.co.uk Assumptions Placebo pills cost 5p per pill.

Reference	Evins et al (2007)	
Description	Population: Schizophrenia patients Targeted population: 51 Setting: Unclear Intervention: Bupropion therapy plus nicotine gum and patches, and group therapy Control: Placebo therapy plus nicotine gum and patches, and group therapy	
Significant effects	Intervention Short-term effect (quit rate): 52% 12-month effect (quit rate): 0%	Counterfactual Short-term effect (quit rate): 19% 12-month effect (quit rate): 0%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** Bupropion 150mg for 7 days: £5.58 Bupropion 300mg for 77 days: £122.74 12 sessions of 1 hour group counselling with counsellor with 5 people per group: £122.40 8 week supply of nicotine patches: £79.92 8 week supply of nicotine gum at 18mg max per day: £44.89 **Comparator:** Placebo tablets for 12 weeks: £4.13 12 sessions of 1 hour group counselling with counsellor with 5 people per group: £122.40 8 week supply of nicotine patches: £79.92 8 week supply of nicotine gum at 18mg max per day (assuming max use that is 63pieces per week so if standard packs are 96 pieces =5.25 packs of nicotine gum over 8 weeks): £44.89	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Prescription medication costs: BNF 2012 Placebo pill cost: http://www.chemistdirect.co.uk <u>Assumptions</u> Nicotine Gum: Assumes max use is 63 pieces per week. Priced using the costs for standard packs which contain are 96 pieces = 5.25 packs of nicotine gum over 8 weeks Placebo pills cost 5p per pill.

Reference	Steinberg et al (2004)	
Description	Population: Schizophrenia or schizoaffective disorder patients Targeted population: 78 Setting: Outpatients Intervention: Motivational interviewing Control: Brief advice from doctor	
Significant effects	Intervention Short-term effect (quit rate): 22% 12-month effect (quit rate): 0%	Counterfactual Short-term effect (quit rate): 2% 12-month effect (quit rate): 0%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** One CO breath test: £1.98 45 minutes motivational interviewing with counsellor: £33.66 **Comparator:** CO breath test: £1.98 Brief advice of 5 minutes with a nurse: £2.72	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk

Table A1.3. Detailed description of interventions modelled – Acute services: COPD patients

Reference	British Thoracic Society (B) (1990)	
Description	Population: Chest outpatients Targeted population: 1392 Setting: Outpatients Intervention: Postal encouragement and/or a signed agreement with the doctor to quit smoking Control: Brief advice to quit smoking from doctor	
Significant effects	Effect size: Point prevalence abstinence Intervention Short-term effect (quit rate): 11% 12-month effect (quit rate): 9%	Effect size: Point prevalence abstinence Counterfactual: Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%
Incremental cost per person (2012 prices)	Cost per person **Intervention** Two minutes physician advice: £1.97 Two visits by health visitor: £85.76 6 letters from physician & 5 First Class postage: £15.40 Two blood tests: £34 **Comparator:** Two minutes physician advice: £1.97	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Blood test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf First class postage costs: http://www.royalmail.com/price-finder Assumptions Assume that brief advice on smoking cessation takes 2 minutes

Reference	Tonnesen et al (2006)	
Description	Population: COPD patients Targeted population: 370 Setting: Inpatients Intervention: Nicotine replacement therapy and frequent telephone consultations with nurses for support Control: Placebo therapy and low intensity support from healthcare providers	
Significant effects	Effect size: Point prevalence abstinence Intervention Short-term effect (quit rate): 22% 12-month effect (quit rate): 14%	Effect size: Point prevalence abstinence Counterfactual Short-term effect (quit rate): 6% 12-month effect (quit rate): 5%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** Pulmonary function test: £114.03 12 weeks nicotine sublingual tablets @ 40 per day: £58.18 7 x 30 minute clinic visits with nurse: £119 5 x 10 minute phone calls from a nurse: £28.33 Two CO breath tests (disposable mouthpiece + dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £3.95 **Comparator:** Pulmonary function test: £114.03 12 weeks placebo pills @ 40 per day: £23.6 2 CO breath tests (disposable mouthpiece + dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £3.95	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Pulmonary function test cost from NHS Improvements: http://system.improvement.nhs.uk/ImprovementSystem/ViewDocument.aspx?path=Lung/National/Mid-Term Review 07.12.2010/Diagnosis – Robert Buttery.pdf Prescription medication costs: BNF 2012 Placebo pill cost: http://www.chemistdirect.co.uk <u>Assumptions</u> Placebo pills are dextrose

Reference	Borglykke 2008	
Description	Population: COPD patients Targeted population: 223 Setting: Inpatient Intervention: Offered participation in a smoking cessation group therapy whilst inpatient, plus nicotine replacement therapy Control: Usual care (no further details provided)	
Significant effects	Percentage abstinent Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 30%	Percentage abstinent Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 13%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** Two minutes nurse counselling: £1.13 Ten hours smoking cessation sessions (over 5 weeks) run by 2 nurses in groups of 5: £136 1 full course of nicotine replacement therapy: £138.30 1 blood test: £17 **Comparator:** Two minutes nurse counselling: £1.13	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Prescription medication costs: BNF 2012 Blood test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes

Table A1.4. Detailed description of interventions modelled – Acute Services: cardiac patients

Reference	De Busk (1994)	
Description	Population: AMI Patients Targeted population: 585 Setting: Inpatient Intervention: Counselling intervention with telephone support from nurses, relaxation materials and nicotine patches Control: Brief advice to quit smoking from doctor and opportunity to join an outpatient smoking programme for a fee	
Significant effects	Percentage continuous abstinent Intervention Short-term effect (quit rate): 69% 12-month effect (quit rate): 70%	Percentage continuous abstinent Counterfactual Short-term effect (quit rate): 55% 12-month effect (quit rate): 53%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** Two mins physician counselling: £1.97 Two hour nurse counselling: £68 Smoking cessation manual: £0.79 Relaxation CD: £12 8 x 10 minute nurse phone calls: £45.33 4 week nicotine patches: £39.96 **Comparator:** 2 mins physician counselling: £1.97 Group outpatient smoking programme: £32.64	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Manual cost: http://www.kramsstore.com Nicotine Patch cost: http://www.boots.co.uk Relaxation CD cost: http://www.amazon.co.uk <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes Outpatient smoking programme cost taken from paper as insurance copay

Reference	Quist-Paulsen (2003)	
Description	Population: Coronary Heart Disease patients Targeted population: 240 Setting: Inpatient cardiac unit Intervention: Encouragement to quit through patient education, counselling and telephone follow up by nurses Control: Brief advice to quit smoking from nurse	
Significant effects	Smoking cessation rate Intervention Short-term effect (quit rate): Not reported 12-month effect (quit rate): 57%	Smoking cessation rate Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 37%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 2x 0.5 hour nurse counselling: £34 5x 10 min nurse telephone appt: £28.33 1 urine test: £17 1 booklet: £0.79 Two minutes doctor counselling: £1.97 **Comparator:** Two per week nurse group session (assume two nurses for 1 hour total each week for 6 weeks)/122pts: £3.34 One booklet: £0.79 Two mins usual doctor advice: £1.97	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Urine test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Booklet cost: http://www.kramsstore.com <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes

Reference	Taylor et al (1990)	
Description	Population: Acute MI Targeted population: 173 Setting: Inpatient Intervention: Encouragement to quit through signed agreement to quit, education, negative reinforcement, nicotine replacement therapy for those who were determined to need it, plus intensive follow up by nurses Control: Usual care were given no specific instructions on quitting smoking but were invited to join an outpatient stop smoking class (10% uptake)	
Significant effects	Continuous Abstinence Intervention Short-term effect (quit rate): Not reported 12-month effect (quit rate): 65%	Continuous Abstinence Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 34%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 2 mins doctor counselling: £1.97 10 mins nurse counselling: £5.67 one booklet: £0.7989 2 x CD: £24 7 x 10 min nurse phone contact: £39.67 2x CO breath test: £3.95 2x blood serum test: £34 5 weeks supply nicotine gum (not used by all patients, cost spread across patient group): £0.50 **Comparator:** 2 mins physician counselling: £1.97 group outpatient smoking programme (nurse led, attended by 10% of patients): £3.40 4 x 10 min nurse visits: £22.67 2x CO breath test: £3.95 2x blood serum test: £34	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Blood test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf Prescription medication costs: BNF 2012 Booklet cost: http://www.kramsstore.com <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes

Reference	Hennrikus 2010	
Description	Population: Peripheral Heart Disease Targeted population: 124 Setting: Outpatients Intervention: Counselling intervention plus individual incentive letters Control: Verbal advice to quit from clinician	
Significant effects	Point prevalent smoking abstinence Intervention Short-term effect (quit rate): 21% 12-month effect (quit rate): 17%	Point prevalent smoking abstinence Counterfactual Short-term effect (quit rate): 7% 12-month effect (quit rate): 5%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** 6 letters (nurse time + postage): £6.80 10 mins nurse phone call: £5.67 30 mins nurse home visit: £17 2 x saliva test and postage: £28.2 2x CO breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer) + postage: £5.15 Two mins physician quit advice: £1.97 6x 1 hour CBT with therapist: £306 **Comparator:** 6 letters (nurse time + postage): £6.80 10 mins nurse phone call: £5.67 30 mins nurse home visit: £17 2 x saliva test and postage: £28.20 2x CO breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer) + postage: £5.15 Two mins physician quit advice:£1.97	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk NicAlert Saliva Testing Strips: Price from http://www.gasp.org.uk <u>Assumptions</u> Assume that brief advice on smoking cessation takes 2 minutes

Table A1.5. Detailed description of interventions modelled – Acute services: general inpatients

Reference	Miller et al (1997)	
Description	Population: Hospital inpatients Targeted population: 1942 Setting: Inpatients Intervention: Relapse preventing smoking cessation counselling with nurses, plus a videotape and nicotine replacement therapy Control: Strong physician advice, quit booklet and optional outpatient smoking cessation programme for a fee	
Significant effects	Continuous Abstinence Intervention Short-term effect (quit rate): Not reported 12-month effect (quit rate): 27%	Continuous Abstinence Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 20%
Incremental cost per person (2012 prices)	Cost per person **Intervention:** Two min physician advice: £1.97 30 min nurse counselling: £17 1 CD: £12 12 week supply of nicotine patches: £119.88 4 x 10 min nurse phone calls: £22.67 1 blood test: £17 **Comparator:** Two min physician advice: £1.96 1 booklet: £0.79 Fee for outpatient SC programme: £32.64 1 blood test: £17	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf Blood test: UCLH Provider-to-provider tariffs : http://www.uclh.nhs.uk/aboutus/wwd/Documents/Provider%20to%20Provider%20Tariff%202012-13.pdf CD cost: http://www.amazon.co.uk Prescription medication costs: BNF 2012 Fee for outpatient smoking cessation programme from: DeBrusk (1994) Booklet cost: http://www.kramsstore.com Assumptions Assume that brief advice on smoking cessation takes 2 minutes

Table A1.6. Detailed description of interventions modelled – Acute services: hospital employees

Reference	Dalsgaro et al (2004)	
Description	Population: Hospital employees Targeted population: 336 Setting: Hospital Intervention: Nurse advice, Counselling and a course of Bupropion Control: Nurse advice, counselling and a course of placebo tablets	
Significant effects	Continuous smoking abstinence from quit time date Intervention Short-term effect (quit rate): 18% 12-month effect (quit rate): 14%	Continuous smoking abstinence from quit time date Counterfactual Short-term effect (quit rate): 7% 12-month effect (quit rate): 6%
Incremental cost per person (2012 prices)	<u>Cost per person</u> **Intervention:** One CO breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £1.98 Nurse interview 1 hour: £34 Counselling 1 hour total: £51 52 bupropion tablets: £43.70 **Comparator:** One CO Breath test (disposable mouthpiece + dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £1.98 Nurse interview 1 hour: £34 Counselling 1 hour total: £51 52 placebo tablets: £2.56	<u>Sources and assumptions</u> Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 <u>Assumptions</u> Individual placebo pill cost is 5p

Reference	Moller et al (2002)	
Description	Population: Hip and knee replacement Targeted population: 120 Setting: Inpatients Intervention: 8 weeks of nurse counselling and follow up plus nicotine replacement therapy and intensive monitoring Control: Brief advice to quit smoking from nurse	
Significant effects	Abstinence Rate Intervention Short-term effect (quit rate): 39% 12-month effect (quit rate): 23[29]%	Abstinence Rate Counterfactual Short-term effect (quit rate): 7% 12-month effect (quit rate): 4[30]%

[29] Villerbo et al (2008)
[30] Villerbo et al (2008)

Incremental cost per person (2012 prices)	Cost per person **Intervention:** 10 x CO Breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £19.75 8 weeks nurse meetings at 10 minutes per meeting: £45.33 3 weeks (21 days) nicotine replacement therapy supply: £34.58 **Comparator:** CO breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £1.98 Brief counselling with nurse: £1.13	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 Assumptions Assume that brief advice on smoking cessation takes 2 minutes

Table A1.7. Detailed description of interventions modelled – Acute services: preoperative patients

Reference	Lindstrom et al (2008)	
Description	Population: Orthopaedic surgery patients Targeted population: 117 Setting: Surgical Intervention: 8 weeks of nurse counselling and follow up plus nicotine replacement therapy and mild monitoring Control: Brief advice to quit smoking from doctor	
Significant effects	Smoking cessation rate Intervention Short-term effect (quit rate): 40% 12-month effect (quit rate): 24[31]%	Smoking cessation rate Counterfactual Short-term effect (quit rate): 2% 12-month effect (quit rate): 2[32]%

[31] Villerbo et al (2008)
[32] Villbro et al (2008)

Incremental cost per person (2012 prices)	Cost per person **Intervention:** Eight 10 minute nurse meetings: £45.33 8 weeks Nicorette supply: £68.40 2 x CO breath test (disposable mouthpiece+ dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £3.96 **Comparator:** Two mins basic smoking cessation information with doctor: £1.97 CO breath test (disposable mouthpiece + dpiece (to attach mouthpiece to monitor for Bedfont Smokelyzer): £1.98	Sources and assumptions Staff costs: PSSRU: Unit Costs of Health and Social Care 2011. http://www.pssru.ac.uk/archive/pdf/uc/uc2011/uc2011.pdf CO Breath test: Details from http://www.bedfont.com/, prices from http://www.medisave.co.uk Prescription medication costs: BNF 2012 Assumptions Assume that brief advice on smoking cessation takes 2 minutes

Table A1.8. Detailed description of interventions modelled – Smoke-free policies

Reference	Gadomski et al (2010)	
Description	Population: Hospital employees Targeted population: 624 Setting: Hospital campus Intervention: Smoking ban across hospital campus, new signage and an employee programme to provide nicotine replacement therapy Control: None	
Significant effects	Percentage quit Intervention Short-term effect (quit rate): Not reported	Percentage quit Counterfactual Short-term effect (quit rate): Not reported 12-month effect (quit rate): 2%

Reference	Gadomski et al (2010)	
	12-month effect (quit rate): 34%	
Incremental cost per person (2012 prices)	Cost per person **Intervention:** 3000 leaflets (1300 for staff + 1700 for patient/family education): £107 New campus map 1 day designer time: £200 Cost of new map printing (+VAT): £90 100 no smoking signs: £207 Course of nicotine replacement therapy: £138.30 **Comparator:** No counterfactual	Sources and assumptions Prescription medication costs: BNF 2012 Leaflets cost: http://www.trade-print.com Designer pay rate: http://www.payscale.com/research/uk Map printing costs: http://www.zip-posters.co.uk/prices.php No smoking signs: http://www.screwfix.com Assumptions Assumes that redesign of map to add smoking boundaries would take 1 day for a graphic designer There was no comparator for this intervention as it was a change to the whole building

10.0 Appendix 2: Modelling

Table A2.1. Population distribution

% women in population	% men in population	Source
51%	49%	ONS (2010)

Table A2.2. Population distribution by smoking status

% smokers in population	% former smokers in population	% never smokers in population	Source
20%	25%	55%	Health survey for England (2010)

Table A2.3. Relative risks and prevalence used in the economic model – mother outcomes

Outcome	Relative risk	Source	Prevalence	Source
Ectopic pregnancy	1.89	Godfrey et al (2010)	1.30%	Castles et al (1999)
Spontaneous abortion	1.42	Godfrey et al (2010)	12.00%	NHS evidence (Everett, 1997)
Pre-eclampsia	0.59	Godfrey et al (2010)	2.30%	Lydakis et al (2001)
Placenta previa	2.84	Godfrey et al (2010)	0.66%	Castles et al (1999)
Abruptio placenta	2.62	Godfrey et al (2010)	2.25%	Castles et al (1999)
PPROM	2.30	Godfrey et al (2010)	1.35%	Castles et al (1999)

Table A2.4. Relative risks and prevalence used in the economic model – child outcomes

Outcome	Relative risk	Source	Prevalence	Source
SIDS	4.90	Godfrey et al (2010)	0.07%	Pollack (2001)
Low birth weight <1000	2.20	Godfrey et al (2010)	0.40%	ONS (2009)
Low birth weight 1000-1499	2.20	Godfrey et al (2010)	0.80%	ONS (2009)
Low birth weight 1500-1999	2.20	Godfrey et al (2010)	1.40%	ONS 92009)

Outcome	Relative risk	Source	Prevalence	Source
Otitis media	2.00	Godfrey et al (2010)	18.50%	Medscape (Waseem, 2010)
Asthma	1.65	Godfrey et al (2010)	10.00%	NHS evidence (Keeley and Mckean, 2006)

Table A2.5. Relative risks and prevalence used in the economic model – mental health services

Outcome	Former smokers	Smokers	Source
Proportion of patients with schizophrenia receiving high dose of antipsychotics	16.0%	26.0%	Aguilar et al (2005)

Table A2.6. Relative risks and prevalence used in the economic model – acute services: preoperative patients

Outcome	Relative risk	Source	Prevalence	Source
Wound related complications	0.16	Moller et al (2002)	25.00%	Moller et al (2002)
Risk of pulmonary complications	1.45	Hawn et al (2011)	1.93%	Hawn et al (2011)

Table A2.7. Productivity cost calculations

Minutes spent smoking per day	Hours spent smoking per working year	Productivity - disease related absenteeism(hours) per year smoker	Average hourly wage for men	Average hourly wage for women	Employment rate	Productivity - annual cost (absenteeism) smoker	Productivity - annual cost (time spent) smoker
30.00	42.33	33.00	£16.38	£13.80	70%	£349	£448
Nash and Featherstone (2010)	= (10 minutes/60)* 254	NICE 2007	2011 Annual survey of hours and earnings	2012 Annual survey of hours and earnings	Labour Market Statistics (2011)	= (33 hours* employment rate)*(average female wage* % women in pop + average male wage* % men in pop)	= (42.33 hours* employment rate)*(average female wage* % women in pop + average male wage* % men in pop)

11.0 Appendix 3: Mortality and prevalence rates

Table A3.1. Mortality in the general population

Age	Male Smoker	Male former smoker	Female Smoker	Female Former Smoker
18	0.000761461	0.000543901	0.013422813	0.000238936
19	0.000762946	0.000544961	0.014823288	0.000241974
20	0.000860912	0.000614937	0.016094267	0.000229824
21	0.000878724	0.00062766	0.018014324	0.000221725
22	0.000838647	0.000599033	0.020118233	0.000218687
23	0.000906926	0.000647804	0.022493924	0.000254123
24	0.000892083	0.000637202	0.024364421	0.000250073
25	0.000813145	0.000580818	0.026821646	0.000284627
26	0.00093201	0.000665721	0.030420354	0.000316829
27	0.000909047	0.000649319	0.034265264	0.000318906
28	0.000991442	0.000708173	0.034095209	0.000362535
29	0.00104277	0.000744836	0.039011047	0.000377078
30	0.001161635	0.00082974	0.043511319	0.000420707
31	0.001126516	0.000804654	0.049481275	0.000424862
32	0.001226471	0.000876051	0.056110054	0.000498616
33	0.001288605	0.000920432	0.064082544	0.000522508
34	0.001446641	0.001033315	0.072430057	0.000574447
35	0.001656045	0.001182889	0.081109153	0.000617321
36	0.001622533	0.001158952	0.091919653	0.000632963
37	0.001749599	0.001249714	0.104020288	0.000753924
38	0.002026072	0.001447194	0.101146274	0.000809191
39	0.002063773	0.001474124	0.114194192	0.000843602
40	0.002245296	0.001603783	0.12862213	0.000987505
41	0.00235002	0.001678586	0.146960956	0.001065713
42	0.002446367	0.001747405	0.157086917	0.001114723
43	0.002643249	0.001888035	0.179814906	0.001247155
44	0.00295463	0.00211045	0.19558799	0.001358732
45	0.003641936	0.002203147	0.228786945	0.001402314
46	0.003848233	0.002327944	0.256779686	0.001527468
47	0.004124354	0.00249498	0.28662823	0.001612217
48	0.004476646	0.002708094	0.315937471	0.001795514
49	0.004873371	0.002948089	0.347677939	0.001981766
50	0.005316116	0.003215922	0.375944691	0.002265579
51	0.005936594	0.003591273	0.413849166	0.002372009
52	0.006488835	0.003925345	0.442350074	0.00268243
53	0.007014099	0.004243097	0.486817119	0.002902189

Age	Male Smoker	Male former smoker	Female Smoker	Female Former Smoker
54	0.007679011	0.004645327	0.005525672	0.00334269
55	0.008488212	0.005603057	0.005841874	0.003856212
56	0.00942207	0.006219495	0.006373103	0.004206876
57	0.01010391	0.006669576	0.006879662	0.004541255
58	0.01090944	0.007201305	0.007478322	0.00493643
59	0.012025741	0.007938174	0.008303948	0.005481424
60	0.013168325	0.008692392	0.008902608	0.005876598
61	0.014069715	0.009287398	0.009780863	0.006456333
62	0.015292698	0.010094687	0.010308802	0.006804825
63	0.017226897	0.011371449	0.011481453	0.00757889
64	0.019094613	0.012604326	0.012813637	0.008458263
65	0.020071934	0.013495173	0.013422813	0.0090247
66	0.022531174	0.015148619	0.014823288	0.009966296
67	0.024577261	0.016524286	0.016094267	0.010820826
68	0.027829511	0.018710905	0.018014324	0.012111758
69	0.030461275	0.020480347	0.020118233	0.013526301
70	0.032681401	0.021973027	0.022493924	0.015123574
71	0.03626054	0.024379427	0.024364421	0.016381185
72	0.040419304	0.027175532	0.026821646	0.018033277
73	0.044988192	0.03024738	0.030420354	0.020452834
74	0.048724723	0.032759601	0.034265264	0.023037922
75	0.051555955	0.037596937	0.034095209	0.02486377
76	0.057994398	0.042292141	0.039011047	0.028448622
77	0.063884676	0.046587599	0.043511319	0.031730424
78	0.071409482	0.052075028	0.049481275	0.036083986
79	0.080066212	0.058387908	0.056110054	0.040917992
80	0.090469951	0.065974785	0.064082544	0.046731893
81	0.101735091	0.074189835	0.072430057	0.052819277
82	0.112254157	0.081860814	0.081109153	0.059148468
83	0.124373579	0.090698846	0.091919653	0.067031973
84	0.141988886	0.103544726	0.104020288	0.075856305
85	0.137827266	0.113249015	0.101146274	0.083109215
86	0.153675268	0.126270899	0.114194192	0.093830344
87	0.168417336	0.138384066	0.12862213	0.105685399
88	0.185283439	0.152242497	0.146960956	0.120753927
89	0.192733027	0.158363626	0.157086917	0.129074161
90	0.207903119	0.170828488	0.179814906	0.147749147
91	0.22194501	0.182366339	0.19558799	0.160709473
92	0.254291708	0.208944764	0.228786945	0.187988176
93	0.284597253	0.233846028	0.256779686	0.21098907

Age	Male Smoker	Male former smoker	Female Smoker	Female Former Smoker
94	0.317395479	0.260795462	0.28662823	0.235514829
95	0.349933921	0.287531439	0.315937471	0.259597455
96	0.381742497	0.313667703	0.347677939	0.285677757
97	0.41067243	0.337438663	0.375944691	0.308903799
98	0.441486408	0.362757693	0.413849166	0.340048903
99	0.455915499	0.374613696	0.442350074	0.363467344
100	0.515702707	0.423739261	0.486817119	0.400004738

Table A3.2. Mortality rates for cardiac patients

Age	Male Smoker	Male Former Smoker	Female Smoker	Female Former Smoker
18	0.000761461	0.000543901	0.000334511	0.000238936
19	0.000762946	0.000544961	0.000338763	0.000241974
20	0.000860912	0.000614937	0.000321754	0.000229824
21	0.000878724	0.00062766	0.000310415	0.000221725
22	0.000838647	0.000599033	0.000306162	0.000218687
23	0.000906926	0.000647804	0.000355772	0.000254123
24	0.000892083	0.000637202	0.000350102	0.000250073
25	0.000813145	0.000580818	0.000398477	0.000284627
26	0.00093201	0.000665721	0.00044356	0.000316829
27	0.000909047	0.000649319	0.000446469	0.000318906
28	0.000991442	0.000708173	0.000507549	0.000362535
29	0.00104277	0.000744836	0.00052791	0.000377078
30	0.001161635	0.00082974	0.00058899	0.000420707
31	0.001126516	0.000804654	0.000594807	0.000424862
32	0.001226471	0.000876051	0.000698062	0.000498616
33	0.001288605	0.000920432	0.000731511	0.000522508
34	0.001446641	0.001033315	0.000804226	0.000574447
35	0.003941388	0.002815277	0.002056913	0.001469224
36	0.003861629	0.002758307	0.002109031	0.001506451
37	0.004164046	0.002974319	0.002512075	0.001794339
38	0.004822052	0.003444323	0.002696224	0.001925874
39	0.00491178	0.003508414	0.002810883	0.002007774
40	0.005343804	0.003817003	0.003290366	0.002350262
41	0.005593048	0.003995035	0.003550955	0.002536397
42	0.005822353	0.004158824	0.003714257	0.002653041
43	0.006290933	0.004493524	0.004155521	0.002968229
44	0.00703202	0.005022872	0.004527294	0.003233781
45	0.008667808	0.005243489	0.005517103	0.003337507
46	0.009158795	0.005540506	0.006009494	0.003635373

Age	Male Smoker	Male Former Smoker	Female Smoker	Female Former Smoker
47	0.009815962	0.005938051	0.006342924	0.003837078
48	0.010654417	0.006445265	0.007064063	0.004273322
49	0.011598623	0.007016451	0.007796834	0.004716603
50	0.012652356	0.007653894	0.008913437	0.005392079
51	0.014129094	0.00854723	0.009332163	0.005645382
52	0.015443428	0.009342321	0.010553447	0.006384184
53	0.016693556	0.010098571	0.011418039	0.006907209
54	0.018276045	0.011055879	0.013151099	0.007955603
55	0.020201946	0.013335274	0.01390366	0.009177786
56	0.022424528	0.014802398	0.015167985	0.010012365
57	0.024047307	0.015873592	0.016373595	0.010808186
58	0.025964468	0.017139107	0.017798407	0.011748702
59	0.028621263	0.018892853	0.019763395	0.013045788
60	0.031340614	0.020687893	0.021188207	0.013986304
61	0.033485921	0.022104007	0.023278453	0.015366073
62	0.03639662	0.024025355	0.02453495	0.016195484
63	0.041000014	0.027064049	0.027325859	0.018037759
64	0.045445178	0.029998295	0.030496457	0.020130666
65	0.047771204	0.032118511	0.031946296	0.021478786
66	0.053624194	0.036053713	0.035279425	0.023719784
67	0.058493881	0.039327801	0.038304355	0.025753566
68	0.066234236	0.044531954	0.04287409	0.028825984
69	0.072497835	0.048743225	0.047881394	0.032192597
70	0.077781735	0.052295804	0.053535539	0.035994107
71	0.086300086	0.058023037	0.057987321	0.03898722
72	0.096197942	0.064677766	0.063835518	0.042919199
73	0.107071897	0.071988765	0.072400443	0.048677745
74	0.11596484	0.07796785	0.081551329	0.054830255
75	0.122703172	0.089480709	0.081146598	0.059175774
76	0.138026667	0.100655296	0.092846292	0.06770772
77	0.15204553	0.110878485	0.10355694	0.07551841
78	0.169954568	0.123938567	0.117765435	0.085879888
79	0.190557586	0.138963221	0.133541929	0.097384822
80	0.215318483	0.157019988	0.152516456	0.111221906
81	0.242129515	0.176571807	0.172383536	0.12570988
82	0.267164893	0.194828738	0.193039785	0.140773353
83	0.296009119	0.215863254	0.218768774	0.159536097
84	0.33793355	0.246436447	0.247568286	0.180538005
85	0.328028893	0.269532657	0.240728131	0.197799932
86	0.365747137	0.300524739	0.271782176	0.223316219

Age	Male Smoker	Male Former Smoker	Female Smoker	Female Former Smoker
87	0.400833259	0.329354077	0.306120669	0.251531249
88	0.440974586	0.362337142	0.349767075	0.287394346
89	0.458704604	0.376905429	0.373866863	0.307196504
90	0.494809422	0.406571802	0.427959476	0.351642971
91	0.528229123	0.434031886	0.465499416	0.382488547
92	0.605214264	0.497288538	0.544512929	0.447411858
93	0.677341462	0.556553547	0.611135652	0.502153986
94	0.755401239	0.620693199	0.682175188	0.560525292
95	0.832842733	0.684324824	0.751931181	0.617841944
96	0.908547143	0.746529134	0.827473494	0.679913063
97	0.977400383	0.803104018	0.894748364	0.735191043
98	1.050737651	0.86336331	0.984961016	0.80931639
99	1.085078888	0.891580595	1.052793175	0.86505228
100	1.227372443	1.008499442	1.158624742	0.952011277

Table A3.3. Prevalence of disease in the general population by smoking status – Male

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
19	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
20	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
21	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
22	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
23	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
24	0.000066971	0	0.013273524	0	0.001245504	0.000029467	0	0.010353	0	0.001009
25	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
26	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
27	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
28	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
29	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
30	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
31	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
32	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
33	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
34	0.000044420	0	0.012396798	0	0.004749411	0.000019545	0	0.00967	0	0.003848
35	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
36	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
37	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
38	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
39	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
40	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
41	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
42	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
43	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
44	0.000053865	0.016773096	0.012923331	0	0.003667814	0.000023701	0.008333	0.01008	0	0.002972
45	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
46	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
47	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
48	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
49	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
50	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
51	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
52	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
53	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
54	0.003831175	0.064164505	0.012945458	0	0.014590472	0.001685717	0.031877	0.010097	0	0.011821
55	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
56	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
57	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
58	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
59	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
60	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
61	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
62	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
63	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
64	0.003842282	0.209772495	0.013047145	0.092101381	0.02691476	0.001690604	0.104214	0.010177	0.063895	0.021807
65	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
66	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
67	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
68	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
69	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
70	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
71	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
72	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
73	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
74	0.022355694	0.440384009	0.066279513	0.172460808	0.094728454	0.009836505	0.218781	0.051698	0.119645	0.076751
75	0.023041311	0.555679058	0.133382191	0.174624632	0.166749911	0.010138177	0.276059	0.104038	0.121146	0.135104
76	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
77	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
78	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
79	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
80	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
81	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
82	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
83	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
84	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
85	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
86	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
87	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
88	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
89	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
90	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
91	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
92	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
93	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
94	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
95	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
96	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
97	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
98	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
99	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104
100	0.023041311	0.555679058	0.134592536	0.174624632	0.166749911	0.010138177	0.276059	0.104982	0.121146	0.135104

Table A3.4. Prevalence of disease in the general population by smoking status – Female

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
19	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
20	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
21	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
22	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
23	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
24	0.000059513	0.003778	0.013779	0	0.002458	0.000012498	0.001877	0.010747	0	0.001992
25	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
26	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
27	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
28	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
29	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
30	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
31	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
32	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
33	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
34	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
35	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
36	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
37	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
38	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
39	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
40	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949

	Female smokers						Female former smokers			
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
41	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
42	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
43	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
44	0.000059645	0.00747	0.013415	0	0.007342	0.000012525	0.003711	0.010464	0	0.005949
45	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
46	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
47	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
48	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
49	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
50	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
51	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
52	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
53	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
54	0.00213282	0.037668	0.013438	0	0.011029	0.00044789	0.018713	0.010482	0	0.008936
55	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
56	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
57	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
58	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
59	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
60	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
61	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
62	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
63	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
64	0.00240536	0.11597	0.013544	0.042499	0.030946	0.00050513	0.057614	0.010564	0.017092	0.025073
65	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419

	Female smokers						Female former smokers			
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
66	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
67	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
68	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
69	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
70	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
71	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
72	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
73	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
74	0.01007129	0.209617	0.068802	0.092832	0.0684	0.00211497	0.104137	0.053666	0.037334	0.055419
75	0.01166369	0.414775	0.138459	0.098111	0.113766	0.00244938	0.206058	0.107998	0.039458	0.092175
76	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
77	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
78	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
79	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
80	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
81	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
82	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
83	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
84	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
85	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
86	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
87	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
88	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
89	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
90	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175

	Female smokers						Female former smokers			
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
91	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
92	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
93	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
94	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
95	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
96	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
97	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
98	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
99	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175
100	0.01166369	0.414775	0.139715	0.098111	0.113766	0.00244938	0.206058	0.108978	0.039458	0.092175

Table A3.5. Prevalence of disease in the cardiac patients by smoking status – Male

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
19	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
20	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
21	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
22	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
23	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
24	0.000066971	0	0.013274	0	0	0.000029467	0	0.010353	0	0.001009
25	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
26	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
27	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
28	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
29	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
30	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
31	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
32	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
33	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
34	0.000044420	0	0.012397	0	0	0.000019545	0	0.00967	0	0.003848
35	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
36	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
37	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
38	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
39	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
40	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
41	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
42	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
43	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
44	0.000053865	1	0.012923	0	0	0.000023701	1	0.01008	0	0.002972
45	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
46	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
47	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
48	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
49	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
50	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
51	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
52	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
53	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
54	0.003831175	1	0.012945	0	0	0.001685717	1	0.010097	0	0.011821
55	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
56	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
57	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
58	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
59	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
60	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
61	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
62	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
63	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
64	0.003842282	1	0.013047	0.092101	0.097627	0.001690604	1	0.010177	0.067729	0.021807
65	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
66	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
67	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
68	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
69	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
70	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
71	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
72	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
73	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
74	0.022355694	1	0.06628	0.172461	0.182808	0.009836505	1	0.051698	0.126823	0.076751
75	0.023041311	1	0.133382	0.174625	0.185102	0.010138177	1	0.104038	0.128415	0.135104
76	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
77	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
78	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
79	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
80	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
81	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
82	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
83	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
84	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
85	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
86	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
87	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
88	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
89	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
90	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
91	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
92	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
93	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
94	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
95	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
96	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
97	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
98	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
99	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104
100	0.023041311	1	0.134593	0.174625	0.185102	0.010138177	1	0.104982	0.128415	0.135104

Table A3.6. Prevalence of disease in the cardiac patients by smoking status – Female

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
19	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
20	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
21	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
22	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
23	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
24	0.000059513	0	0.013779	0	0.002458	0.000012498	0	0.010747	0	0.001992
25	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
26	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
27	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
28	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
29	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
30	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
31	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
32	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
33	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
34	0.000059105	0	0.012869	0	0.00367	0.000012412	0	0.010038	0	0.002974
35	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
36	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
37	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
38	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
39	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
40	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
41	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
42	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
43	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
44	0.000059645	1	0.013415	0	0.007342	0.000012525	1	0.010464	0	0.005949
45	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
46	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
47	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
48	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
49	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
50	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
51	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
52	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
53	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
54	0.002132824	1	0.013438	0	0.011029	0.000447893	1	0.010482	0	0.008936
55	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
56	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
57	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
58	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
59	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
60	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
61	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
62	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
63	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
64	0.002405359	1	0.013544	0.045049	0.030946	0.000505125	1	0.010564	0.018117	0.025073
65	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
66	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
67	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
68	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
69	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
70	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
71	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
72	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
73	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
74	0.010071292	1	0.068802	0.098401	0.0684	0.002114971	1	0.053666	0.039575	0.055419
75	0.011663695	1	0.138459	0.103997	0.113766	0.002449376	1	0.107998	0.041825	0.092175
76	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
77	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
78	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
79	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
80	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
81	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
82	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
83	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
84	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
85	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
86	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
87	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
88	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
89	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
90	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
91	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
92	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
93	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
94	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
95	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
96	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
97	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
98	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
99	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175
100	0.011663695	1	0.139715	0.103997	0.113766	0.002449376	1	0.108978	0.041825	0.092175

Table A3.7. Prevalence of disease in COPD patients by smoking status – Male

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
19	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
20	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
21	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
22	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
23	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
24	0.000044420	0	0.0143354	0	0.0012455	0.000029467	0	0.0111816	0	0.0010091
25	0.000044420	0	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
26	0.000044420	0	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
27	0.000044420	0	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
28	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
29	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
30	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
31	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
32	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
33	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
34	0.000053865	0.0167731	0.0133885	0	0.0047494	0.000019545	0	0.0104431	0	0.0038481
35	0.000053865	0.0167731	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
36	0.000053865	0.0167731	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
37	0.000053865	0.0167731	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
38	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
39	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
40	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
41	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
42	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
43	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
44	0.003831175	0.0641645	0.0139572	0	0.0036678	0.000023701	0.0083328	0.0108866	0	0.0029717
45	0.003831175	0.0641645	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
46	0.003831175	0.0641645	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
47	0.003831175	0.0641645	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
48	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
49	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
50	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
51	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
52	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
53	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
54	0.003842282	0.2097725	0.0139811	0	0.0145905	0.001685717	0.0318766	0.0109053	0	0.0118215
55	0.003842282	0.2097725	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
56	0.003842282	0.2097725	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
57	0.003842282	0.2097725	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
58	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
59	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
60	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
61	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
62	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
63	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
64	0.022355694	0.440384	0.0140909	0.0921014	0.0269148	0.001690604	0.1042139	0.0109909	0.0638953	0.0218068
65	0.022355694	0.440384	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
66	0.022355694	0.440384	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
67	0.022355694	0.440384	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
68	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
69	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
70	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
71	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
72	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
73	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
74	0.023041311	0.5556791	0.0715819	0.1724608	0.0947285	0.009836505	0.2187805	0.0558339	0.1196447	0.0767508
75	0.023041311	0.5556791	0.1440528	0.1746246	0.1667499	0.010138177	0.2760585	0.1123612	0.1211458	0.1351039
76	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
77	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
78	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
79	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
80	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
81	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
82	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
83	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039

	Male smokers					Male former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
84	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
85	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
86	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
87	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
88	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
89	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
90	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
91	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
92	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
93	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
94	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
95	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
96	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
97	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
98	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
99	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039
100	0.023041311	0.5556791	0.1453599	0.1746246	0.1667499	0.010138177	0.2760585	0.1133808	0.1211458	0.1351039

Table A3.8. Prevalence of disease in COPD patients by smoking status – Female

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
18	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
19	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
20	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
21	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
22	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
23	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
24	0.000059513	0.0037777	0.014881	0	0.002458	0.000012498	0.0018768	0.0116072	0	0.0019915
25	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
26	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
27	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
28	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
29	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
30	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
31	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
32	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
33	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
34	0.000059105	0	0.0138981	0	0.0036701	0.000012412	0	0.0108405	0	0.0029736
35	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
36	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
37	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
38	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
39	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
40	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
41	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
42	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
43	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
44	0.000059645	0.0074697	0.0144884	0	0.0073423	0.000012525	0.0037109	0.011301	0	0.0059489
45	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
46	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
47	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
48	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
49	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
50	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
51	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
52	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
53	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
54	0.002132824	0.037668	0.0145132	0	0.0110292	0.000447893	0.0187133	0.0113203	0	0.008936
55	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
56	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
57	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
58	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
59	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
60	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
61	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
62	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
63	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
64	0.002405359	0.1159704	0.0146272	0.0424987	0.030946	0.000505125	0.0576135	0.0114093	0.0170919	0.0250731
65	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
66	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
67	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
68	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
69	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
70	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
71	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
72	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
73	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
74	0.010071292	0.209617	0.0743064	0.0928316	0.0684002	0.002114971	0.1041366	0.057959	0.0373344	0.0554191
75	0.011663695	0.4147753	0.1495357	0.0981106	0.1137658	0.002449376	0.2060583	0.1166379	0.0394575	0.0921752
76	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
77	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
78	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
79	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
80	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
81	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
82	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
83	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752

	Female smokers					Female former smokers				
Age	Lung Cancer	CHD	COPD	MI	Stroke	Lung Cancer	CHD	COPD	MI	Stroke
84	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
85	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
86	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
87	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
88	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
89	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
90	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
91	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
92	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
93	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
94	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
95	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
96	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
97	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
98	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
99	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752
100	0.011663695	0.4147753	0.1508927	0.0981106	0.1137658	0.002449376	0.2060583	0.1176963	0.0394575	0.0921752

12.0 Appendix 4: Model results

Table A4.1 provides an example of the impact on the results of using a 1.5% annual discount rate, instead of 3.5%. The results indicate that a lower discount rate implies that benefits occurring in the future (cost savings and QALYs gained) are less heavily discounted and therefore their present value (in absolute terms) is higher. As a result, the ICERs tend to be lower when a 1.5% discount rate is used than when a 3.5% rate is used. This means that a 1.5% rate makes the results more favourable.

Table A4.1. Results for interventions delivered in acute services: general patients (Miller et al, 1997)

Discount rate	Timeframe	Incremental effect at 12 months	Cost per person (£2011)	QALYs gained per person	Short-term health care cost savings (£2011)	Short-term productivity cost savings (£2011)	Short-term ICER (£2011)	Short-term total ICER (£2011)
3.5%	3 years	7%	£138	0.006	-£10	-£404	£24,065	£22,362
1.5%	3 years	7%	£138	0.006	-£10	-£415	£23,142	£21,441
3.5%	Lifetime	7%	£138	0.078	-£171	-£1,197	£1,776	Dominant
1.5%	Lifetime	7%	£138	0.118	-£237	-£1,365	£1,166	Dominant

Table A4.2 presents the productivity costs for alternative estimate of the working time individuals spent in smoking breaks.

Table A4.2. Productivity cost calculations with alternative estimates for smoking breaks.

Author	Short-term productivity cost savings (£2011) with 10 min smoking break per day	Short-term productivity cost savings (£2011) with 1 hour smoking break per day	Long-term productivity cost savings (£2011) with 10 min smoking break per day	Long-term productivity cost savings (£2011) with 1 hour smoking break per day
Hartmann (1996)	-£152	-£652	-£561	-£2,407
Walsh (1997)	-£120	-£514	-£471	-£2,023
Dornelas (2006)	-£256	-£1,098	-£883	-£3,793
Hegaard (2003)	-£65	-£278	-£222	-£953

Author	Short-term productivity cost savings (£2011) with 10 min smoking break per day	Short-term productivity cost savings (£2011) with 1 hour smoking break per day	Long-term productivity cost savings (£2011) with 10 min smoking break per day	Long-term productivity cost savings (£2011) with 1 hour smoking break per day
Ershoff (1989)	-£191	-£820	-£672	-£2,885
Higgins (2010)	-£348	-£1,494	-£1,151	-£4,943
Donatelle (2000)	-£276	-£1,186	-£862	-£3,701
Heil (2008)	-£378	-£1,625	-£1,198	-£5,146
McFall (2005)	-£224	-£962	-£664	-£2,850
McFall (2010)	-£110	-£470	-£325	-£1,394
George (2008)	-£178	-£763	-£215	-£922
George (2002)	-£308	-£1,324	-£455	-£1,953
Evins (2007)	-£281	-£1,208	-£438	-£1,880
Steinberg (2004)	-£138	-£591	-£147	-£629
Moller et al (2002)	-£569	-£2,442	-£1,507	-£6,470
Lindstrom et al (2008)	-£649	-£2,785	-£1,704	-£7,318
British Thoracic Society B (1990)	-£46	-£197	-£46	-£197
Tonnesen et al 2006	-£120	-£515	-£120	-£515
Borglykke 2008	-£223	-£958	-£223	-£958
De Busk (1994)	-£421	-£1,807	-£721	-£3,097
Quist-Paulsen (2003)	-£485	-£2,085	-£832	-£3,573
Taylor et al (1990)	-£748	-£3,210	-£1,281	-£5,502
Hennrikus (2010)	-£279	-£1,197	-£478	-£2,051
Miller et al (1997)	-£174	-£748	-£516	-£2,217

Author	Short-term productivity cost savings (£2011) with 10 min smoking break per day	Short-term productivity cost savings (£2011) with 1 hour smoking break per day	Long-term productivity cost savings (£2011) with 10 min smoking break per day	Long-term productivity cost savings (£2011) with 1 hour smoking break per day
Dalsgaro et al (2004)	-£483	-£2,075	-£893	-£3,837
Gadomski (2010)	-£1,081	-£4,641	-£2,644	-£11,356

13.0 Appendix 5: Sensitivity analysis

Table A5.1. Probabilistic sensitivity analysis distribution tables – interventions

	Costs distribution	Alpha	Beta	Effects distribution	Alpha	Beta
Hartmann 1996	Gamma	£12.50	£9.00	Beta	14.16548	92.83452
Walsh 1997	Gamma	£12.50	£2.36	Beta	10	117
Dornelas 2006	Gamma	£12.50	£33.39	Beta	9.928416	43.07158
Hegaard (2003)	Gamma	£12.50	£19.80	Beta	15.15177	311.8482
Ershoff 1989	Gamma	£12.50	£2.01	Beta	18.51574	107.4843
Higgins 2010	Gamma	£12.50	£20.91	Beta	19.13002	65.86998
Donatelle 2000	Gamma	£12.50	£21.23	Beta	21.63	81.37
Heil 2008	Gamma	£12.50	£53.81	Beta	8.88	28.12
British Thoracic Society B (1990)	Gamma	£12.50	£10.97	Beta	61	641
Tonnesen et al 2006	Gamma	£12.50	£25.88	Beta	16	79
Borglykke 2008	Gamma	£12.50	£23.39	Beta	36	85
De Busk (1994)	Gamma	£12.50	£13.44	Beta	205.771	87.22901
Quist-Paulsen (2003)	Gamma	£12.50	£6.57	Beta	44	74
Taylor et al (1990)	Gamma	£12.50	£8.78	Beta	53.52778	28.47222
Hennrikus (2010)	Gamma	£12.50	£29.66	Beta	10.27	50.73
Miller et al (1997)	Gamma	£12.50	£15.24	Beta	145.8	394.2
Dalsgaro et al (2004)	Gamma	£12.50	£10.45	Beta	30.94941	191.0506
Moller et al (2002)	Gamma	£12.50	£7.97	Beta	13	43
Lindstrom et al (2008)	Gamma	£12.50	£9.41	Beta	11.35	36.65
McFall (2005)	Gamma	£12.50	£19.54	Beta	3.96	29.04
McFall (2010)	Gamma	£12.50	£39.00	Beta	42.008	429.992
George (2008)	Gamma	£12.50	£9.81	Beta	0.58	28.42
George (2002)	Gamma	£12.50	£17.75	Beta	0.32	15.68
Evins (2007)	Gamma	£12.50	£30.04	Beta	0.5	24.5
Steinberg (2004)	Gamma	£12.50	£2.85	Beta	0.64	31.36
Gadomski 2010	Gamma	£12.50	£0.08	Beta	378.08	733.92

Table A5.2. Probabilistic sensitivity analysis distribution tables – comparators

	Costs distribution	Alpha	Beta	Effects distribution	Alpha	Beta
Hartmann 1996	Gamma	£12.50	£0.61	Beta	2.769231	97.23077
Walsh 1997	Gamma	£12.50	£1.56	Beta	1	124
Dornelas 2006	Gamma	£12.50	£6.28	Beta	9.741087	42.25891
Hegaard (2003)	Gamma	£12.50	£18.95	Beta	14.82742	305.1726
Ershoff 1989	Gamma	£12.50	£0.14	Beta	17.04624	98.95376
Higgins 2010	Gamma	£12.50	£2.30	Beta	18.22979	62.77021
Donatelle 2000	Gamma	£12.50	£19.02	Beta	6.12	95.88
Heil 2008	Gamma	£12.50	£28.86	Beta	1.2	38.8
British Thoracic Society B (1990)	Gamma	£12.50	£0.16	Beta	35	655
Tonnesen et al 2006	Gamma	£12.50	£11.33	Beta	5	83
Borglykke 2008	Gamma	£12.50	£0.09	Beta	13	89
De Busk (1994)	Gamma	£12.50	£2.77	Beta	154.4463	137.5537
Quist-Paulsen (2003)	Gamma	£12.50	£0.49	Beta	57	43
Taylor et al (1990)	Gamma	£12.50	£5.28	Beta	28.96552	55.03448
Hennrikus (2010)	Gamma	£12.50	£5.18	Beta	3.16	55.84
Miller et al (1997)	Gamma	£12.50	£4.19	Beta	188.4	753.6
Dalsgaro et al (2004)	Gamma	£12.50	£7.16	Beta	6.32	107.68
Moller et al (2002)	Gamma	£12.50	£0.25	Beta	2.08	49.92
Lindstrom et al (2008)	Gamma	£12.50	£0.32	Beta	0.72	53.28
McFall (2005)	Gamma	£12.50	£19.54	Beta	0.99	32.01
McFall (2010)	Gamma	£12.50	£5.35	Beta	21.195	449.805
George (2008)	Gamma	£12.50	£1.99	Beta	0.58	28.42
George (2002)	Gamma	£12.50	£12.53	Beta	0.32	15.68
Evins (2007)	Gamma	£12.50	£20.11	Beta	0.52	25.48
Steinberg (2004)	Gamma	£12.50	£0.38	Beta	0.68	33.32
Gadomski 2010	Gamma	£12.50	£0.08	Beta	22.24	1089.76