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Birthplace cost-effectiveness analysis of planned place of birth: decision analytic model. Birthplace in England research programme. Final report part 7.

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Glossary of abbreviations

BMI	Body mass index
CEA	Cost effectiveness analysis
CEMACE	Centre for maternal and child enquiries
CPAP	Continuous positive airway pressure
CS	Caesarean section
DAM	Decision analytic modelling
FMU	Freestanding midwifery unit
HB	Homebirth
HDU	High dependency unit
ICER	Incremental cost effectiveness ratio
ICU	Intensive care unit
MOB	Mode of birth
NB	Net benefit
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
NPEU	National Perinatal Epidemiology Unit
OPCS	Office of Population, Censuses and Surveys
OU	Obstetric unit
PSSRU	Personal Social Services Research Unit
QALY	Quality adjusted life year
RLM	Regional Lead Midwife (Birthplace)
SCBU	Special Care Baby Unit
SVB	Spontaneous vertex birth
TC	Total cost
UC	Unit cost

Glossary of terms

dominated	An intervention costs more and is less effective than a comparator
dominated by extension	The list of interventions will be ordered by effectiveness. Each intervention is compared to the next most effective alternative by calculating the incremental cost-effectiveness ratio

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Authors' contributions

For this report; Liz Schroeder led the study design and undertook all the analyses. Jennifer Hollowell and Stavros Petrou contributed to the drafting and revision of the different versions of the report. Maggie Redshaw and Peter Brocklehurst reviewed and commented on the report.

The decision analytic model reported here is developed from the research undertaken for the Birthplace Individual Level Cost-effectiveness Analysis. We acknowledge the contributions from the following researchers: Liz Schroeder undertook all the analyses. Nishma Patel collected the unit cost data. Stavros Petrou contributed to the study design and edited the different versions of the report. Jennifer Hollowell led the NPEU research team and contributed to the design, writing and collation of the report. Jennifer Hollowell and David Puddicombe were involved in the analyses of the effectiveness data and edited the different versions of the report. Maggie Redshaw edited different versions of the report. Louise Linsell prepared the templates for the analyses of the bootstrapped data. Professor Peter Brocklehurst was the chief investigator and supervised the project. All members of the Collaborator Group contributed to revisions of the report. Members of the Birthplace Co-investigators Group were involved in the conception and design of the study. The members of the Co-investigator Group are Professor Alison Macfarlane, Professor of Perinatal Health, City University London; Professor Neil Marlow, Professor of Neonatal Medicine, University College London; Professor Rona McCandlish, Midwifery Professional Advisor, Chief Nursing Officer's Professional Leadership Team, Department of Health (on secondment from NPEU); Professor Christine McCourt, Professor of Maternal and Child Health, City University London; Alison Miller, Programme Director and Midwifery Lead, CMACE; Mary Newburn, Head of Research and Information, NCT; Professor Stavros Petrou, Professor of Health Economics, The University of Warwick; Dr Maggie Redshaw, Social Scientist, NPEU; Professor Jane Sandall, Programme Director (Innovations), NIHR King's Patient Safety and Service Quality Research Centre, King's College, London; Louise Silverton, Deputy General Secretary, Royal College of Midwives.

Executive Summary

Background

The National Institute for Health and Clinical Excellence's (NICE) Intrapartum Care Guidelines included a review of the relevant cost-effectiveness literature in relation to planned place of birth and concluded that '*the poor quality of the UK data on health outcomes by place of birth makes it extremely difficult to make meaningful comparisons across different birth settings at the current time. These limitations in the data mean that good evidence-based conclusions about the relative cost-effectiveness of different birth settings in the UK cannot be made…'(2007)*

Birthplace is the largest programme of research ever conducted to fill important gaps in the evidence relating to the availability and configuration, safety, organisation and costs of intrapartum care provided for women in different birth settings. The Birthplace national prospective cohort study was commissioned to compare perinatal and maternal outcomes by planned place of birth at the start of care in labour in women eligible to be offered a choice of birth setting under current NICE intrapartum care guidelines. The study found that for 'low risk women', the incidence of adverse perinatal outcomes is low in all birth settings (4.3 primary outcome events per 1000 births). The benefits of planned birth at home or in a midwifery unit include fewer interventions, a substantially reduced incidence of intrapartum caesarean section and a higher likelihood of a 'normal birth'. For multiparous 'low risk' women there are no differences in adverse perinatal outcomes between settings but the risk of an adverse perinatal outcome appears to be higher for nulliparous women who plan to give birth at home (9.3 primary outcome events per 1000 births vs. 5.3 per 1000 births in an OU). For nulliparous 'low risk' women the intrapartum transfer rate is high in settings other than an OU (home 45%; FMU 36%, AMU 40%).

An individual level cost-effectiveness analysis of alternative planned places of birth in England was conducted alongside the cohort study and is reported in part 5 of the full Birthplace report. It found that the cost of intrapartum care is less for births planned at home, in a free standing midwifery unit or in an alongside midwifery unit compared with planned obstetric unit births. These costs included all NHS costs associated with the birth itself – for example midwifery care during labour and immediately after the birth, the cost of any medical care and procedures needed in

hospital, and the cost of any stay in hospital, midwifery unit, or neonatal unit immediately after the birth either by the mother or the baby. They also took account of interventions and treatment that a woman may receive if she is transferred into hospital during labour or after the birth. Total cost for women without complicating conditions at the start of care in labour approximated: OU £1,511, AMU £1,427, FMU £1,405 and home £1,027. Total mean costs per 'low risk' nulliparous woman without complicating conditions at the start of care in labour were: OU £1,940.4, AMU £1,932.5, FMU £1,880.7 and home £1,719.0. Total mean costs per 'low risk' multiparous woman without complicating conditions at the start of care in labour were: OU £1,076.9, AMU £978.3, FMU £953.7 and home £765.8.

Several cost effectiveness analyses were undertaken. Overall, and for multiparous women, planned birth at home generated the greatest mean net benefit with a 100% probability of being the optimal setting across all cost-effectiveness thresholds. However, an increased incidence of adverse perinatal outcome associated with planned birth at home in nulliparous 'low risk' women, resulted in the probability of planned home birth being the most cost-effective option at a £20,000 cost-effectiveness threshold declining to 63%, with planned birth in a FMU emerging as increasingly cost-effective. With regards to maternal outcomes, planned births in non-obstetric unit settings led to improvements in maternal outcomes and reductions in costs when compared to planned birth in an obstetric unit. The results of the individual level cost-effectiveness analysis showed costs, effectiveness and cost-effectiveness separately for the baby and mother and is limited to the duration of intrapartum and immediate after birth care. A decision analytic model was therefore designed to incorporate longer-term outcomes and to synthesise the data collected from Birthplace to look at combined cost-effectiveness outcomes for both the mother and baby in a single outcome metric.

Aims

The original aim of this study was to develop a decision analytic model, including longer term economic costs, to determine the life-long cost-effectiveness of planned place of birth in terms of a preference based measure that combined outcomes for both the mother and baby. It was intended to fill an important gap in the longer term costs and consequences of intrapartum care, but the paucity of available evidence meant that this model could not be populated with data on longer-term outcomes. The aims of this study were therefore revised. The model described in this report shows short-term cost-effectiveness for the mother and baby combined in a single outcome metric, and populated with data from the cohort study. It is

most relevant as a template for the design of future economic models about planned place of birth.The study additionally highlights the evidence that is currently available and the additional evidence needed to model the longer-term cost-effectiveness of alternative planned birth settings. The model's parameter inputs should be updated when data on longer-term costs and consequences become available.

Methods

The decision analytic model is designed to reflect 'pathways of care' experienced by 'low risk' women (and their babies) as they progress through the stages of intrapartum and after birth care. It draws upon the clinical pathways observed within the cohort study and the key resource inputs and unit costs estimated in the individual level cost-effectiveness analysis. In the individual level cost-effectiveness analysis, subgroup analyses by parity had been conducted as part of the pre-specified statistical analysis plan. Adjustments of total cost for parity in the individual level cost-effectiveness analysis resulted in sizable and significant cost differences, which overshadowed all other adjustments for confounding. Consequently, cost-effectiveness analyses within this modelling study were repeated by parity sub-group. For reasons discussed in the cohort study report, obstetric units unexpectedly contained more women with complicating conditions at the start of care in labour. To ensure that women with comparable risk status were compared, the model's analyses were therefore repeated for 'low risk' women without complicating conditions at the start of care in labour.

As adverse maternal and perinatal events can result in substantial longer term economic costs, reviews of the clinical effectiveness, epidemiological and economic literature to estimate longer term outcomes for intrapartum and after birth care were undertaken in order to populate this model. It was found that the paucity of evidence for the longer term consequences of adverse events following birth (as mentioned by NICE) remains and long term data were not available for the range of adverse outcomes that we measured. Consequently, the decision analytic model presented here is most relevant for the time horizon of the Birthplace national prospective cohort study.

Results

The model was designed to determine the cost-effectiveness of planned place of birth for women and babies at 'low risk' of complications prior to the onset of labour, in terms of incremental cost per healthy mother and baby, using data from the Birthplace national prospective cohort study. The effectiveness measure combined a composite measure of 'perinatal mortality and intrapartum related morbidity' avoided and 'maternal morbidity avoided'. For both 'low risk' nulliparous and multiparous women, overall and in those without complicating conditions at the start of care in labour, planned birth at home and in FMUs generated greater short-term cost-effectiveness when compared to OUs and dominated planned birth in OUs on the cost-effectiveness plane. Planned birth at home generally generated lower costs and a lower probability of effectiveness for combined outcomes when compared to planned births in FMUs. As both planned births at home and in FMUs were undominated, and planned births in AMUs were dominated (either absolutely or by extension), some combination of planned births at home and in FMUs is likely to offer the most short-term cost-effective arrangement. These findings can be compared with the individual level analysis, which found that planned birth at home generated the greatest mean net benefit for separate maternal and perinatal outcomes. The cohort study showed however that there was an increased incidence of adverse perinatal outcome associated with planned birth at home in nulliparous 'low risk' women and this important difference is not as obvious in this analysis using a combined mother-baby measure of effectiveness. Literature reviews conducted to obtain evidence on longer-term costs and consequences of the clinical outcomes measured in the cohort study found that longer-term data that could be translated into economic metrics and quality-adjusted life years (QALYs) were not available for the whole range of outcomes that we measured.

Conclusions

Planned birth at home and in FMUs emerged as cost-effective options in the short-term, so future research should assess the organisation, staffing, management, occupancy and financial viability of maternity units because the utilisation of broader maternity services is a complex issue. Occupancy rates in FMUs are lower than in other settings and units overheads were an important cost driver for FMUs. It may be that the findings of Birthplace may encourage women particularly women having a second or subsequent baby to request an 'out of hospital' birth, and the potential for cost savings could make offering women more choice an attractive option for the NHS, but the complex factors that encourage or discourage women to opt for birth in freestanding midwifery units are not yet fully understood. Capital costs in OUs will always be generated because of the need to have an OU in

place so that transfers can take place from non-OU to OU birth settings. The creation of more FMUs would generate greater capital costs for maternity services unless their occupancy rates (volume) increased dramatically to off-set the investment costs in the obstetric units which currently provide intrapartum care for the majority of women. This would be important and valuable research to undertake as it would inform commissioning and the appropriate configuration and provision of these services.

This short-term cost-effectiveness analysis fills a first gap in the evidence needed to model the longer-term cost-effectiveness of alternative planned birth settings. The paucity of evidence for the longer term consequences of adverse events and other health outcomes following birth for both mother and baby remains and further research on the life-time economic consequences of these adverse events should be a priority for research in this field. The short-term model presented here provides a framework which will need to be further developed into a full decision-analytic model that can estimate longer-term cost-effectiveness of alternative planned places of birth for 'low risk' women. We recommend longitudinal research which could quantify the longer-term costs and consequences of the short term outcomes measured in the Birthplace national prospective cohort study. For example, preference based measures (QALYs) for future health states associated with the short-term outcomes for mothers and babies assessed in the Birthplace study. In the absence of QALY data, decision makers may find the individual level analysis of short-term cost-effectiveness presented in the previous report more useful than the short-term analysis presented here since that analysis makes explicit the differences in the short-term costs of intrapartum care for mothers and babies separately.

The Report

1 Introduction

Since the early 1990s, government maternity care policy in England has moved towards policies designed to give women with straightforward pregnancies a choice of settings for birth.(1, 2) In this context, freestanding midwifery units, midwifery units co-located in the same building or on the same site as an obstetric unit (hereafter alongside midwifery units) and home birth services have increasingly become relevant to the configuration of maternity services under consideration in England.(3) The relative benefits and risks of birth in these alternative settings have been widely debated in recent years.(4-10) Lower rates of obstetric intervention and other positive maternal outcomes have been consistently found in planned births at home and in midwifery units, but clear conclusions regarding perinatal outcome have been lacking. Moreover, robust evidence on the cost-effectiveness of birth in alternative settings is a priority area for research in this area, as was highlighted by the recent National Institute for Health and Clinical Excellence (NICE) clinical guidance on intrapartum care.(11)The Birthplace in England research programme was designed to fill gaps in research evidence about the processes and outcomes, costs and cost-effectiveness associated with different settings for birth in the NHS in England. These gaps are important to fill as reliable evidence is needed by service commissioners and clinical managers, policy makers and service users for planning maternity services; health professionals for guiding practice; and by women and their families for making informed decisions about their planned place of birth. The results of the safety outcomes generated by the Birthplace national prospective cohort study (hereafter cohort study for brevity) are reported separately.(12)

An individual level cost-effectiveness analysis of alternative planned places of birth in England in women at 'low risk' of complications prior to the onset of labour was conducted alongside the cohort study.(13) It found that the cost of intrapartum and after birth care, and associated intrapartum-related complications, is less for births planned at home, in a free standing midwifery unit or in an alongside midwifery unit compared with planned obstetric unit births. Cost differences between alternative planned places of birth narrowed when the study population was restricted to nulliparous women. With regards to perinatal outcomes, for 'low risk' women overall, planned births in non-obstetric unit settings generated lower costs, but with no significant differences in adverse perinatal outcomes with the exception

of planned birth at home for nulliparous 'low risk' women. Overall, and for multiparous women, planned birth at home generated the greatest mean net benefit with a 100% probability of being the optimal setting across all cost-effectiveness thresholds for short-term cost-effectiveness. However, an increased incidence of adverse perinatal outcome associated with planned birth at home in nulliparous 'low risk' women, resulted in the probability of it being the most cost-effective option at a £20,000 cost-effectiveness threshold declining to 63%. This means that there is a 0.63 probability of home birth being the most cost-effective option for low-risk women having their first babies if decision makers set the willingness to pay threshold for avoiding an adverse perinatal outcome at £20,000.

With regards to maternal outcomes, planned births in non-obstetric unit settings led to better maternal outcomes and lower costs when compared to planned birth in an obstetric unit. Planned births in non-obstetric unit settings were associated with significant increases in 'normal birth' and significant reductions in costs when compared to planned birth in obstetric units. Planned birth at home generated the greatest mean net benefit for maternal outcomes with a 100% probability of being the optimal setting across all short-term cost-effectiveness thresholds.

The individual level cost-effectiveness analysis conducted alongside the cohort study was limited by the time horizon of the cohort study, which meant that the follow up of outcomes for both the mother and the baby did not extend beyond the time period of labour care and immediate after birth care, or higher level postnatal or neonatal care when this was required. Serious adverse perinatal outcomes can result in associated life-long economic costs and loss of quality of life, as shown by the size of damages paid in obstetric litigation cases, which represent a substantial cost to the NHS. For the mother, more common outcomes such as caesarean section and other adverse outcomes can result in higher 'NHS' costs in future pregnancies that may affect later quality of life. Furthermore, the analytical strategy was not designed to link the effectiveness outcomes for the baby and the mother. In keeping with the cohort study report, those results show cost-effectiveness separately for the baby or the mother separately according to planned place of birth, but not both together in the same analysis. A decision analytic model was therefore planned to synthesise the data collected from Birthplace to look at combined cost-effectiveness outcomes for both the mother and baby in a single analysis.

2 Model aims

The original aim of this study was to develop a decision analytic model, including longer term economic costs, to determine the life-long cost-effectiveness of planned place of birth in terms of a preference based measure that combined outcomes for both the mother and baby. It was intended to fill an important gap in the evidence relating to the longer term costs and consequences of intrapartum care. As shown below, the paucity of available evidence meant that this model could not be populated with data on longer-term costs and consequences. The aims of this study were therefore revised. The model described in this report shows short-term cost-effectiveness for the mother and baby combined in a single outcome metric, and populated with data from the cohort study. It is most relevant as a template for the design of future economic models about planned place of birth.The study additionally highlights the evidence that is currently available and the additional evidence needed to model the longer-term cost-effectiveness of alternative planned birth settings. The model's parameter inputs should be updated when data on longer-term costs and consequences become available.

3 Methods

3.1 Model structure

The structure of the decision model is shown as a decision tree. It is designed to reflect 'pathways of care' experienced by women as they progress through the stages of labour, and mirrors clinical experience observed within the cohort study and the parallel costing components of the individual level cost-effectiveness analysis. This design is similar, though more detailed, than the decision tree developed by the National Institute for Health and Clinical Excellence (NICE) Intrapartum Care Guidelines Group.(11) It includes all planned places of birth originally described by the NICE intrapartum care cost-effectiveness model and those subsequently identified by the maternity care review conducted by the Healthcare Commission in 2007; namely those at home, and those in alongside midwifery units (AMU), freestanding midwifery units (FMU) and obstetric units (OU).(14) The model explores planned place of birth at the start of care in labour for women at 'low risk' of complications and measures the combined outcomes for both the mother and baby in one analysis. An overview of the model developed can be viewed in table 1 and

figure 1, and the structure of the decision analytic model can be seen in the following decision tree.

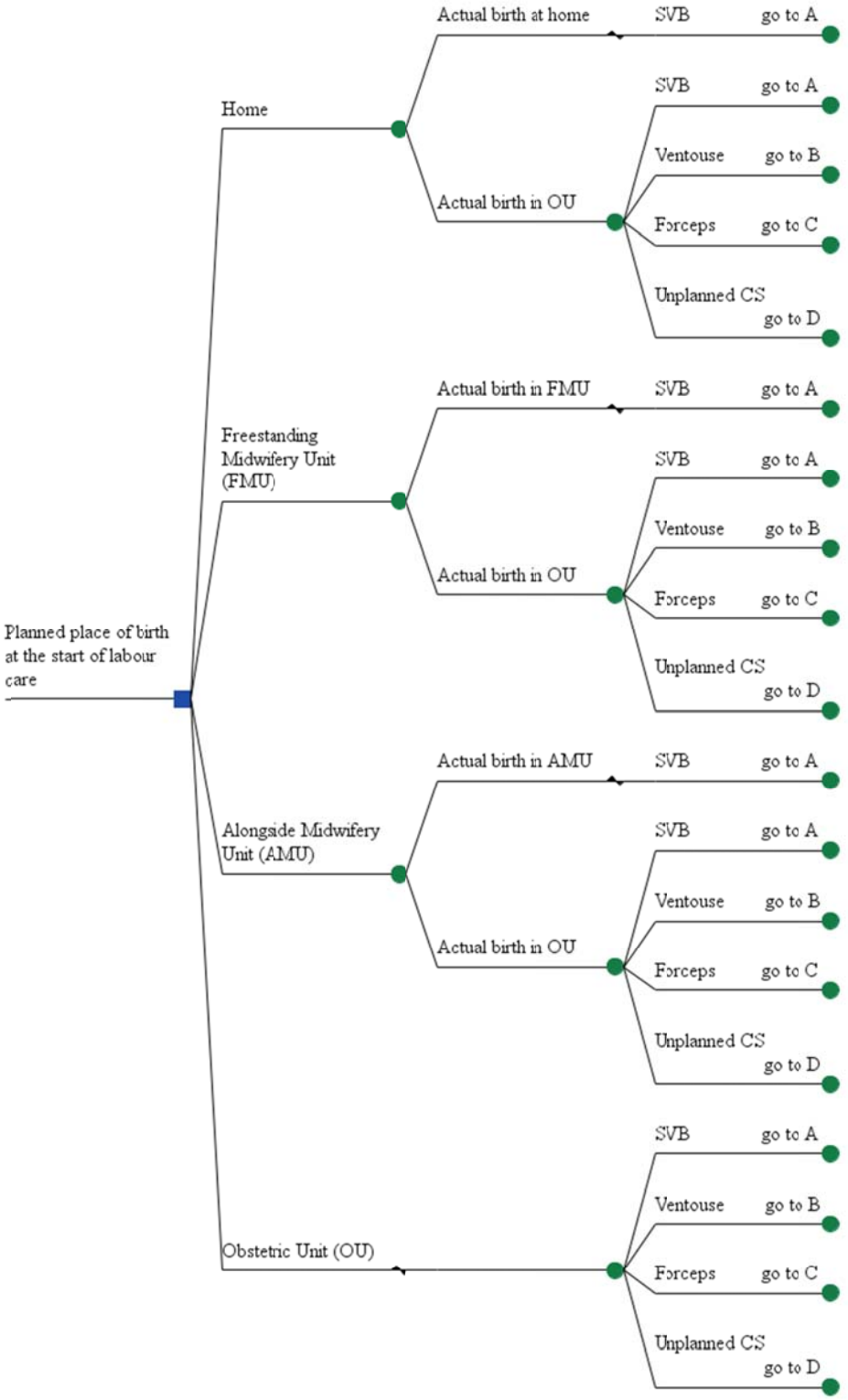
Table 1. Overview of the decision model

Decision	**Branch (1)** **Planned birth setting**	**Branch (2)** **Intrapartum labour care**	**Branch (3)** **Mode of birth**	**Branch (4)** **Post birth outcomes for mother and baby dyad**
Planned place of birth at the start of care in labour	Home Alongside midwifery unit Freestanding midwifery unit Obstetric Unit	Actual birth in planned setting, or with transfer after birth to Obstetric unit Actual birth in Obstetric unit, with transfer prior to birth	Spontaneous vertex birth Birth with ventouse Birth with forceps Unplanned caesarean section	Mother well[1] baby well[2] Mother well baby not well Mother not well baby well Mother not well baby not well

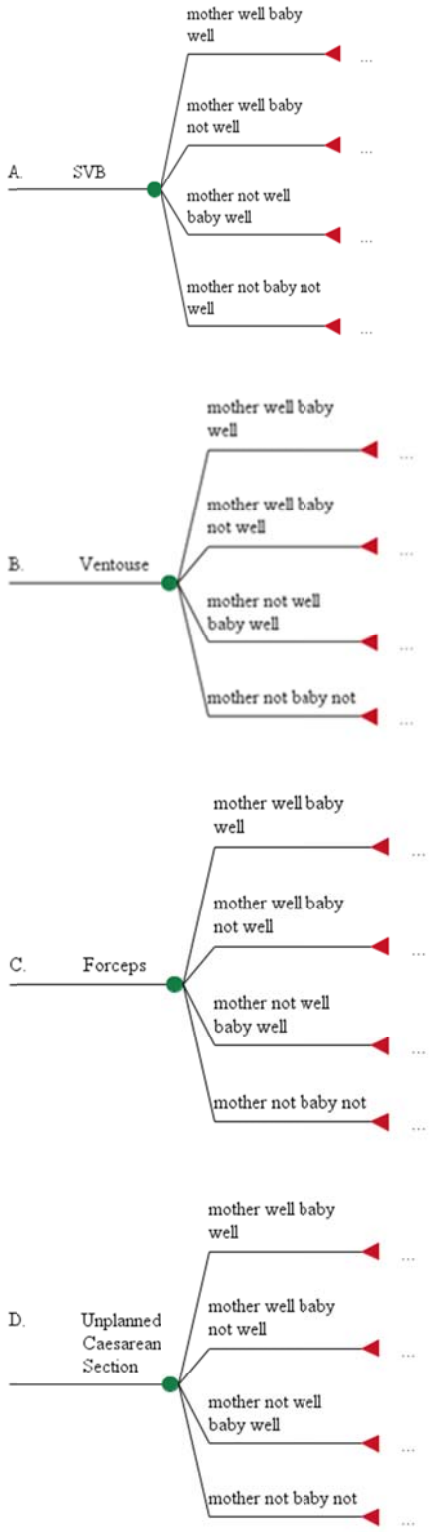
[1] Defined as having none of the following: general anaesthetic; instrumental birth; caesarean section, third or fourth degree perineal trauma; blood transfusion; admission to an intensive therapy unit, high dependency unit or specialist unit; or maternal death (within 42 days of giving birth). This is a composite measure and was the secondary outcome of interest in the Birthplace individual level cost-effectiveness analysis.

[2] Defined as having none of the following: stillbirth after the start of care in labour, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, or fractured clavicle. This is a composite measure of perinatal mortality and specified neonatal morbidities and was the primary outcome of interest in the Birthplace prospective cohort study.

Figure 1. Decision tree, from labour onset to completion of intrapatum care episode



Decision tree, from labour onset to completion of intrapatum care episode continued



3.2 Care pathways for planned place of birth as depicted in the decision tree

Decision trees tend to represent chains of events because of their explicit systematic framework. They are oriented from left to right, with the decision to be analyzed on the left, the probable events in the centre and the clinical (and related economic) outcomes on the right. The tree itself is made up of nodes, branches and outcomes. The decision node (depicted here as a blue square) occurs on the left hand side of the tree, identifying the primary decision to be addressed. The pathways that follow each planned place of birth represent a series of logically-ordered events, denoted by branches emanating from chance nodes (drawn here as green circular symbols). The alternatives at each chance node must be mutually exclusive and their probabilities should sum exactly to one. The endpoints of each pathway are denoted by terminal nodes (drawn here as red triangular symbols) to which values or payoffs, such as costs and outcomes, are assigned.

The **decision node** represents the choice for a decision-maker, in this case, where a woman who is at 'low risk' of complications prior to the onset of labour plans to give birth.

Chance nodes are located on care pathways at points when uncertain events may occur. Branches issue from each chance node and represent the possible events that patients may experience at that point in the pathway. The likelihood of an event occurring is represented by a probability attached to the branch. In general, these are informed by relevant primary or secondary evidence. The scale for probability estimates ranges from 0 (impossible) to 1.0 (absolutely certain). Probabilities are assigned to each branch following a chance node, and the sum of probabilities following a chance node must add to 1.0.

This decision tree in our study is populated with data derived from the cohort study. The model shows all of the options that may be available to women of 'low risk' given the different configurations of services in trusts and government maternity care policy support for offering women with straightforward pregnancies a choice of settings for birth.(1, 2) These women can plan to have their baby in an obstetric unit, where diagnostic and medical services including obstetric, neonatal and anaesthetic care are available on site; in midwifery units co-located in the same building or on the same site as an obstetric unit (alongside midwifery units); on a site geographically separate from an obstetric unit (freestanding midwifery units); or at home. If a woman who plans her birth at home or in a midwifery unit then requires obstetric services she will need to transfer to

the obstetric unit either by ambulance or car (for planned births at home or in a freestanding midwifery unit) or if physically transferred, by wheelchair, bed or trolley (for births planned in an alongside midwifery unit). All 'low risk' births completed in 'out of hospital' (non-obstetric unit) settings would result in a spontaneous vertex birth. The model did not include births that resulted in a breech delivery. Transfers for additional medical care may be required following birth for the mother, baby or both. This additional care pathway for transfer after birth is not made explicit in the model although the costs of transfer are included, because the model addresses the cost-effectiveness of planned place of birth, modelled by whether the actual birth occurred in the planned setting or not. If women transfer to an obstetric unit prior to birth then an instrumental (ventouse or forceps) or operative (unplanned caesarean section) delivery becomes an option in the model.

Terminal nodes represent the final endpoints of the model. Values or payoffs, such as costs, life years or quality-adjusted life years (QALYs), are usually assigned to terminal nodes. Once the probabilities and payoffs have been entered, the decision tree is 'averaged out' and 'folded back' (or rolled back), allowing the expected values of each option (here each planned place of birth) to be calculated.

Four possible composite clinical outcome measures are shown in the decision tree for the mother-baby dyad at the time of discharge after birth or immediate post-natal care or higher level care where this is needed. These are 'mother well baby well', 'mother well baby not well', 'mother not well baby well' and finally, 'mother not well baby not well'. The components of the composite outcomes for the mother and baby can be viewed in appendix 2 and are also briefly defined in a footnote after table 1. With regards to the cost payoffs, analyses of the economic data collected as part of the cohort study were conducted by 'intention to treat', so the final costs incurred are attributed to the setting where the woman planned to give birth at the start of care in labour and included costs when she transferred care.

For reasons discussed in the cohort study report, obstetric units unexpectedly contained more women where complicating conditions at the start of care in labour, which suggests that the risk profile of 'low risk women' varied between the settings. (12) To ensure that women with comparable risk status were compared, the model's analyses were repeated for 'low risk' women without complicating conditions at the start of care in labour.

The model design does not reflect two potential clinical pathways for 'low risk' women. In the first instance, a transfer from home to a midwifery unit and then to an obstetric unit (multiple transfer) may occur, though this happened infrequently (less than 20 events) during the period of data collection for the cohort study. Second, unsuccessful vaginal delivery may lead to an attempted ventouse or forceps delivery, and finally to an unplanned caesarean section. These multiple modes of delivery are not reflected in this model as the data were not collected for the cohort study; however, small scale studies have previously been published that attempted to identify risk factors that increase the likelihood of perinatal morbidities following failed instrumental delivery during the second stage of labour and unplanned caesarean sections. (15, 16)

The model presents the results by parity. It is replicated for nulliparous and multiparous women. In the individual level cost-effectiveness analysis, subgroup analyses by parity had been conducted as part of the pre-specified statistical analysis plan. Logistic regression had also been used to adjust for maternal age, ethnic group, understanding of English, marital or partner status, body mass index (BMI) in pregnancy, Index of Multiple Deprivation (IMD) score, parity and gestational age at birth. Adjustments of total cost for parity in the individual level cost-effectiveness analysis resulted in sizable and significant cost differences, which overshadowed all other adjustments for confounding. Consequently, in the individual level analyses, all analyses were repeated by parity sub-group for cost-effectiveness purposes. We replicated this strategy in the modelling work, and present results for nulliparous and multiparous women separately.

3.2.1 Time horizon and study perspective

The analysis is conducted from a health system perspective and consequently only direct costs to the NHS are included. The time horizon primarily mirrors the duration of follow-up of the cohort study, which identified women at the start of their care in labour and was completed when the intrapartum, after birth and immediate postnatal care for both mother and baby ended, be it at home or discharge from an FMU, AMU or OU. Typically, this might be anytime between a few hours or a few days after the birth of the baby, but could be weeks or months in the case of a serious adverse outcome. If higher level care following the birth was required for either the mother or the baby, or both, this was reflected in the model.

Adverse perinatal events can result in associated longer term health and broader societal costs as shown by the size of damages paid in obstetric

litigation cases, which represent a substantial cost to the NHS. The Kings Fund estimates around sixty percent of all litigation payments to be for obstetric and gynaecological cases.(17) Cost estimates which include follow up data over weeks or longer to monitor recovery may differ from more limited costs associated with the intrapartum and immediate postnatal period. Reviews of the clinical effectiveness, epidemiological and economic literature to estimate longer term outcomes for maternity care were undertaken. Our searches concentrated on the adverse clinical outcomes measured in the cohort study such as neonatal encephalopathy (typically following cerebral hypoxia-ischaemia during labour), or post-partum haemorrhage; to obtain evidence on longer-term outcomes which could be reflected as lifetime costs or quality-adjusted life years (QALYs). The full literature searches can be viewed in appendix 3. They investigated all adverse perinatal events which were included in the composite primary outcome and the subset of maternal morbidity outcomes that were included in the Birthplace individual level cost-effectiveness analysis. Our searches confirm the paucity of evidence for longer term consequences of adverse events following birth for both mother and baby, previously noted in the NICE 2007 guidelines. NICE reported that “the poor quality of the UK data on health outcomes by place of birth makes it extremely difficult to make meaningful comparisons across different birth settings at the current time. These limitations in the data mean that good evidence-based conclusions about the relative cost-effectiveness of different birth settings in the UK cannot be made.”(11) The studies we identified and evaluated for suitability were typically small, with design limitations and the interventions and outcomes reported were followed up to different clinical endpoints, typically measured two to five years after birth. Furthermore, they tended to depict the natural history and prevalence of an adverse health outcome or a case diagnosis of an isolated adverse event.

In addition to searches of available evidence, we attempted to locate primary data that might inform a longer term cost-effectiveness model. Within the National Perinatal Epidemiology Unit archives we assessed data that came from the PROGRAMS trial (Prophylactic Granulocyte-Macrophage Colony Stimulating Factor to reduce sepsis in growth restricted preterm neonates) for longer term consequences of sepsis; TOBY (Whole Body Hypothermia for the Treatment of Perinatal Asphyxial Encephalopathy) for longer term consequences of Perinatal Asphyxial Encephalopathy; the INIS trial (Treatment of Neonatal Sepsis with Intravenous Immune Globulin); and in-house registers for the prevalence and severity of cerebral palsy by birthweight. (18-23) In none of these studies were the outcomes for babies assessed over a sufficient time period to inform longer term outcomes for our model. We also concluded that the economic information contained in the Oxford Record Linkage Study was out of date for this study. We attempted to locate sources of Hospital Episode Statistics data for the baseline diagnostic variables for the linked mother and baby dyad but a

clean dataset containing these variables (from the HES maternity 'mother tails' and 'baby tails') is currently not available. Consequently, given these data limitations, we concluded that it was not feasible to populate a longer-term model. Instead, we decided to construct a short-term cost-effectiveness model for planned place of birth populated by the robust evidence collected from the cohort study which would represent the most appropriate model design. The model presented here can be further developed into a decision analytic model estimating the longer-term cost effectiveness of planned placed of birth informed by observational data when the evidence for longer-term outcomes becomes available.

3.3 Model parameters

Parameters in the model have been derived from the Birthplace individual level cost-effectiveness analysis and the definitions of birth settings, clinical outcomes and other terminology are consistent with those reported in the cohort study report. (12) The probabilities that populate the branches of the model are derived from the cohort study.

The cohort study included 79,774 eligible women, 64,538 of whom were at 'low risk' of complications prior to the onset of labour. All women attended by a NHS midwife during labour in their planned place of birth, for any amount of time, were eligible for inclusion with the exception of women who had an elective caesarean section or caesarean section before the onset of labour, presented in preterm labour (<37 weeks gestation), had a multiple pregnancy, or who were 'unbooked' (i.e. had received no antenatal care). Stillbirths occurring prior to the start of care in labour were excluded. The women were recruited from 142 of 147 trusts providing home birth services, 53 of 56 freestanding midwifery units, 43 of 51 alongside midwifery units and a stratified random sample of 36 of 180 obstetric units in England. Participating units/trusts collected data for varying periods of time within the study period 1 April 2008 to 30 April 2010. Weighting accounted for each unit's duration of study participation and took into account the clustered nature of the data within the cohort study. Probability weights were incorporated in the analysis to adjust for the probability of selection of each woman. The weight applied to each observation was inversely proportional to the probability of selection of the unit and the duration of data collection in that unit. Weighted probabilities for intrapartum events are included in this model for women with and without complicating conditions at the start of care in labour. Subgroup analysis by parity was used to estimate the separate models parameter inputs, costs, effectiveness and cost-effectiveness. The differences in the weighted

probabilities for the models care pathways for 'low risk' nulliparous and multiparous women can be viewed in appendix 4.

3.3.1 Resource Use

Individual data collection forms, designed as part of the individual level cost-effectiveness analysis, documented duration of labour, mode of delivery, some forms of pain relief, active management of the third stage of labour, whether an episiotomy was performed, clinical complications, length of stay for both mother and infant by type of ward and level of care, and transfers by duration and mode.

In order to estimate additional resource use not captured, supplemental data collection forms were developed following five focus groups held with midwives from all parts of England early in the project timeline. The supplemental data collection forms were designed to capture the pathways of care experienced by individual women progressing through the stages of labour and after birth care, and their associated resource inputs. For the purposes of this economic evaluation, the forms were initially used in a related study funded by the National Institute of Health Research (NIHR) Research for Patient Benefit programme, 'Assessing the impact of a new birth centre on choice and outcome of maternity care in an inner city area', which will be reported in full elsewhere, comparing the costs of care in a free standing midwifery unit with care in an obstetric unit in the same trust.(24) The data collected included details of staffing levels, treatments, surgeries, diagnostic imaging tests, scans, medications and other resource inputs associated with each stage of the pathway through intrapartum and after birth care. Interviews with senior midwives from different geographic regions in England were then conducted to standardise the supplemental resource profiles.

Appendix 5 shows the key resource items, episodes or procedures and their related unit cost attributable to care pathways/components of the model.

3.3.2 Unit cost data

A detailed account of the collection of unit costs applied to key resource items, episodes or procedures contained within the care pathways/components of the model is available in the Birthplace individual cost-effectiveness report.(13) Unit cost estimation involved a combination of bottom-up and top-down costing methods and followed guidance on

costing health care services as part of economic evaluation.(25, 26) Detailed unit costs, derived from the finance departments of participating trusts and information provided by senior midwives, were estimated for resource inputs into the following components of intrapartum and after birth care for all settings: homebirth delivery packs; NHS re-imbursement for midwifery travel; some forms of pain relief; alternative modes of delivery; active management of the third stage of labour; suturing for episiotomy; suturing third and fourth degree perineal tear; blood transfusions; and care following a stillbirth or neonatal death.

Unit overheads were estimated through the same finance departments for all settings and covered management and administrative costs, operational costs (including heating and lighting, training, building maintenance), indirect overheads (including personnel and finance functions), and capital costs based on the new build and land requirements of NHS facilities, accounting for unit occupancy rates. These data were used to generate an overheads cost per place of birth per hour. Midwifery staffing and attributable on-costs, with the addition of Clinical Negligence Scheme for Trust (CNST) contributions, were derived from national sources, and were weighted for length of labour care. (26, 27) These midwifery costs were considered to be a major cost driver across all settings for birth, and were allocated directly to the duration (hours) of the labour episode per woman. This included the midpoint salary for a Band 6 or 7 midwife, including salary on-costs, direct and indirect overheads and contributions to qualifications, adjusted for working hours per week, study leave, sick leave and and other leave days. Medication costs were supplemented with data from the British National Formulary, version 61.(28) Similarly, the costs of medical supplies were supplemented with data from the NHS Supply Chain Catalogue, April 2009 version.(29) Per diem costs for each level of neonatal care, as well as high dependency or intensive care for the mother, were derived from national Department of Health reference costs.(30) Costs of emergency and non-emergency transfers were derived from secondary sources, but weighted by individual-level data on duration and mode of transport. (30) All unit costs in this study were expressed in pounds sterling and valued at 2009-10 prices. The detailed bottom up costing and results can be viewed in Appendix 6 of the Birthplace individual level cost-effectiveness report. (13)

Combined unit cost and resource use data was used to calculate cost payoffs in the model, following the care pathways within the decision tree. The detailed model data, shown by parity, reflects weighted average probabilities for all documented maternity procedures or events, as well as overall cost-effectiveness and cost pay-offs, and can be viewed in appendix 6 of this report. This information may be of interest to maternity managers and commissioners as it shows the likelihood of events and procedures (such as transfer, epidural use, management of the third stage of labour

and perineal trauma) on all the key pathways modelled from the cohort study.

3.4 Representation of cost-effectiveness in decision analytic modelling

The costs and effectiveness payoffs shown in appendix 6 and 7 were attached to each terminal node within the model. The decision tree was then 'averaged out' and 'folded back' (or rolled back), allowing the expected values of each planned place of birth to be calculated. The process of averaging out and folding back is performed twice, first for cost and then effectiveness data. These are then synthesised in incremental cost effectiveness ratios.

An incremental cost-effectiveness ratio (ICER) represents the additional cost of achieving an additional unit of outcome through a healthcare intervention or course of action, when compared to the next best alternative, mutually exclusive intervention or strategy. This is simply the difference in costs divided by the difference in effects:

ICER = (change in costs) / (change in effects)

In the individual level cost-effectiveness analysis, the incremental costs and incremental effectiveness of planned birth at home, in an AMU or in a FMU were compared with a reference birth setting, namely an OU. The OU group contained the largest number of eligible births in the cohort study so using it as a reference group maximised statistical efficiency. Within this decision analytic modelling framework, the comparator for cost-effectiveness analysis is the least costly setting, determined by computational modelling when the expected value of each planned place of birth is calculated. The ICERs are calculated from the least costly setting to the most costly setting, with the least costly setting shown as the referent. All alternative settings for birth are represented together on the north east quadrant of the cost-effectiveness plane; the y-axis shows increasing cost and the x-axis increasing effectiveness, with the origin of the 'graph' set to (0.0). In this analysis, an attempt was made to fit all the vertical and horizontal axes to the same scale (x axis: +0.0, y axis: +£2500), but this caused several ICER estimates to shrink out of view, so the axes were individually adjusted to maximise presentation. They have been standardised to common scales (x axis: +0.076 to +0.99, y axis: +£750 to +£2500).

In the absence of QALY data, effectiveness in the model was measured on a scale of 0 to 1 where '1' translates to ' a healthy mother and baby dyad' outcome and 1 translates to 'a healthy mother and baby dyad' outcome, and '0' translates to all other states where there is not a 'healthy mother and baby dyad' outcome. A change in effectiveness is then interpreted as a

unit change in probability on the 0 to 1 scale. The ICER thus reflects the incremental cost per unit increase on the effectiveness scale. The statistical complexity of this modelling presents a challenge for the interpretation of the numeric results, and would be clearer (for policy purposes) were one to have QALY data. However, standard principles of dominance can be applied to the results of the analyses for cost-effectiveness purposes.

When the cost-effectiveness analyses are presented graphically, the analyst applies a principle of 'dominance', so an option is said to be dominated if it costs more and is less effective than a comparator. It is absolutely dominated if it lies above and to the left of its alternative on the cost-effectiveness plane. If more than one alternative is under consideration, then a principle of 'extended dominance' may also be applied. In this case, the list of interventions will be ordered by effectiveness. Each intervention is compared to the next most effective alternative by calculating the incremental cost-effectiveness ratio. The decision maker prefers the more effective intervention with a lower incremental cost-effectiveness ratio. If the cost-effectiveness plane includes more than one option that is not dominated, these are connected by a line called the 'cost-effectiveness frontier', showing a set of possibly optimal choices. The lowest cost option will always form part of the frontier and if it reflects 'strong' dominance over all its comparators, then the graph will not have a frontier. With more than one optimal option however, a frontier will be presented.

3.5 Dealing with uncertainty

In the individual level cost-effectiveness analysis, sensitivity analyses were performed on key cost variables using bootstrapping techniques. Uncertainty had remained about the modelled overheads costs, identified as the main generic cost driver relevant to all unit-based settings for birth. Estimates of effects (adverse perinatal or maternal outcomes) were held constant when adjusted in sensitivity analyses around overheads. Occupancy rates, which were modelled from secondary data sources and were very variable in FMUs and AMUs were both increased and decreased to assess how this affected cost differences between the settings. Higher throughput in these units showed cost-savings due to improved 'efficiency'. Assumptions based on primary research had been made about midwifery staff to woman ratios during labour across different settings. This had been recorded as either intermittent or continuous midwifery support. It is impossible to comment on the 'quality of care' impact that these proportional changes in dedicated staff time could have, but this would be valuable to ascertain in future research. The findings were generally robust to the sensitivity analyses which shed more light on the nature of the main cost drivers defined as overheads, occupancy rates and midwifery support

during labour. We concluded that the cost-effectiveness results responded to changes in these variables in a manner consistent with our expectations. The detailed sensitivity analyses and all analyses undertaken regarding cost estimates are reported previously, and can be viewed in the Birthplace individual-level cost-effectiveness analysis report. (13)

For the purposes of this study, we report on the analyses undertaken regarding uncertainty surrounding the new combined effectiveness estimates. In this modelling work, deterministic sensitivity analyses were conducted on the effectiveness payoffs in the model by adjusting the expected probabilities of the mother-baby dyad in each final health state ('mother well baby well', 'mother well baby not well', 'mother not well baby well', 'mother not well baby not well'). We used the upper and lower 95% confidence limits derived from the cohort data to generate new estimates of effectiveness payoffs for both 'low risk' nulliparous and multiparous women. These sensitivity analyses explored the implications of uncertainty surrounding the final health states in the models. Cost-effectiveness estimates were recalculated following the sensitivity analyses.

All analyses for obtaining the model parameters were performed using Stata version 11 and Microsoft Excel (Microsoft, Seattle, WA) 2010 software. The decision analytic modelling was performed using Treeage Pro, version 1988-2010 (TreeAge Software, Inc).

4 Results

4.1 Probabilities of care pathways

Ninety-four percent of 'low risk' multiparous women who planned to give birth at home actually gave birth at home compared with sixty-five percent of nulliparous 'low risk' women. Of those who were transferred prior to birth, seventy-three percent of multiparous 'low risk' women subsequently had a spontaneous vertex birth in an OU compared with forty percent of nulliparous 'low risk' women. These estimates of transfer and completed birth events were similar to estimates for the midwifery units. Ninety-five percent of multiparous women compared with seventy two percent of nulliparous women completed their second stage of labour as planned in FMUs. Ninety-percent of multiparous women completed the second stage of labour in AMUs compared with sixty-six percent of nulliparous women.

On average, twenty two percent of nulliparous women who transfer into the OU prior to birth had an unplanned caesarean section, twenty-percent a forceps delivery and seventeen percent a ventouse delivery. With regards to multiparous women who transferred into the OU, on average eleven percent had an unplanned caesarean section, and instrumental births with forceps varied between 11% (AMU) and with a ventouse between 7% (FMU and home), and 11% (AMU).

4.2 Costs and effectiveness payoffs

Ninety-four percent of nulliparous women who planned birth at home and who did not transfer prior to birth had a spontaneous vertex birth with both mother and baby outcomes defined as 'well'. The average cost attributed to this whole pathway of care was £925.75. Similar estimates were generated for nulliparous women who planned birth in a FMU and an AMU and were not transferred prior to birth, though the average cost attributed to this pathway of care was higher [95.8%, £1,272.07(FMU) and 94.6%, £1,215.82 (AMU)], and slightly higher again (94.5%, £1,334.25) for an OU. For multiparous women, estimates of these combined 'mother well baby well' outcomes following a completed birth in the planned setting for birth were home (98.5%, £675.95), FMU (98.6%, £848.94), AMU (97.8%, £823.6) and OU (97.7%, £901.52).

The costs of a birth resulting in an adverse outcome for both mother and baby varied broadly, with the most costly being approximately £14,700 for a nulliparous 'unwell' mother-baby dyad transferred from home and having an unplanned caesarean section and £11,900 for a multiparous 'unwell' mother-baby dyad who also transferred from home and had an unplanned caesarean section.

4.3 Cost-effectiveness results

4.3.1 Cost-effectiveness for 'low risk' nulliparous women

The individual level cost-effectiveness analysis provides a complete profile of cost-effectiveness data for the mother and baby separately. (13) In those analyses, the cost differences between the different settings influenced cost-effectiveness. With regards to the baby, a change from planned place of birth in an OU to a non-OU setting generated lower costs, but with generally no significant effect on adverse perinatal outcomes. Overall, and for multiparous women, planned birth at home generated the greatest mean net benefit with a 100% probability of being the optimal setting across all cost-effectiveness thresholds when perinatal outcomes were considered. However, there was an increased incidence of adverse perinatal outcomes associated with planned birth at home in nulliparous 'low risk' women, resulting in the probability of it being the most cost-effective option at a £20,000 cost-effectiveness threshold declining to 63%. With regards to the mother, a change from planned place of birth in an OU to a non-OU setting generated incremental cost savings and improved health outcomes.

In comparison with these findings, Table 2 summarises the combined costs, effects and incremental cost-effectiveness for mothers and babies together for 'low risk' nulliparous women by planned place of birth generated by the decision analytic model. Planned birth at home acted as the referent for incremental cost-effectiveness because it reflected the least costly option. The costs shown here are weighted average values for all resource inputs and associated costs estimated within the model. Using the cost of planned birth at home as the referent, the weighted incremental costs are estimated at FMU (£91.5), AMU (£254.2) and OU (£394.8). For 'low risk nulliparous women', births planned in FMUs (0.89) and AMUs (0.86) were more effective for combined mother-baby outcomes, with births planned at home (0.81) and in OUs (0.77) less effective when measured on the 0-1 effectiveness scale. The combined outcome measure reflected here however masks an increased incidence of adverse perinatal outcomes associated with planned birth at home in nulliparous 'low risk' women, previously identified in the cohort study and the individual level cost-

effectiveness analysis. For comparison, the costs presented in the model resemble the costs estimated in the individual level analysis which used individual-level estimates of resource use and associated costs and approximated as follows: home £1,793.7, FMU £1,912.5, AMU £1,983.1 and OU £2,075.2. In this model, average costs are estimated as home £1,573.07, FMU £1,664.61, AMU £1,918.83 and OU £2,059.5.

As stated previously, when comparative cost-effectiveness analyses are presented, the analyst applies a principle of 'dominance', so an option is said to be dominated if it costs more and is less effective than a comparator. It is absolutely dominated if it lies above and to the left of its alternative on the cost-effectiveness plane. If more than one alternative is under consideration, then a principle of 'extended dominance' may also be applied. In that case, the list of interventions will be ordered by effectiveness. Each intervention is compared to the next most effective alternative by calculating the incremental cost-effectiveness ratio. If the cost-effectiveness plane includes more than one option that is not dominated, these are connected by a line called the 'cost-effectiveness frontier', showing a set of possibly optimal choices.

Table 2. Costs, effects and cost-effectiveness ratios for combined mother-baby outcomes for 'low risk' nulliparous women by planned place of birth

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	1573.07	0.806	1951.53	referent	referent	referent
FMU	1664.61	0.887	1874.76	91.53	0.081	1130.00
AMU	1918.83	0.861	2226.64	345.76	0.055	6286.55
OU	2059.46	0.779	2640.35	486.39	-0.027	-18014.44

Table 2 shows that planned births in AMUs generate greater costs and an increased probability of effectiveness than planned births at home; they are dominated by extension by planned births at home and in FMUs. Note that a section of the cost-effectiveness frontier between the FMU square symbol and a point linking the frontier and an imaginary vertical line to the AMU triangle symbol represents absolute dominance over planned births in AMUs (figure 2). Planned births in OUs show higher costs and lower effectiveness outcomes than all the other alternatives and so they are 'absolutely dominated'. FMUs show both higher costs and higher effectiveness than the referent, planned home birth.

Figure 2. Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women by planned place of birth

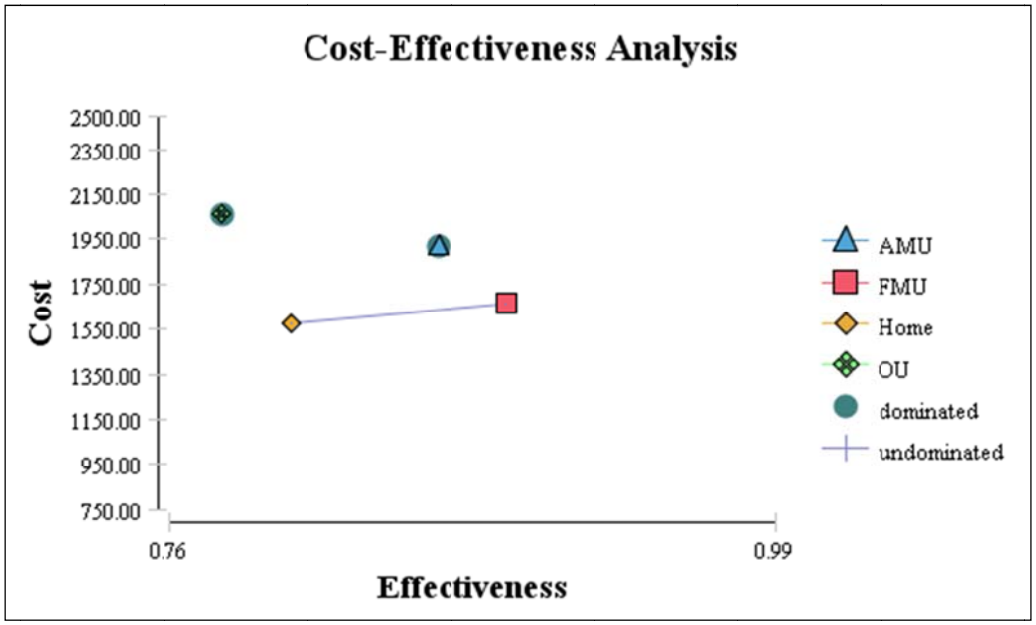


Figure 2 represents these cost-effectiveness outcomes graphically on the north-east quadrant of the cost-effectiveness plane. Births planned at home and in FMUs generated lower costs combined with greater effectiveness compared to births planned in OUs as shown in table 2. In the graph the cost-effectiveness frontier is shown as the line segment connecting the non-dominated treatment alternatives. Their alternatives are considered dominated if they have both higher costs and lower effectiveness relative to the frontier. Constructed in this way, planned birth in OUs lies above and to the left of the cost-effectiveness frontier and is considered to be inefficient (dominated). Planned births in AMUs are however dominated by extension (called 'weak dominance'), because a combination of planned births at home and FMUs (lying on a section of the frontier) is less costly and more effective in comparison. A combination of planned birth at home and in FMUs is thus considered the optimal option for cost-effectiveness purposes, although the individual level analysis showed an increased incidence of adverse perinatal outcomes associated with planned birth at home in nulliparous 'low risk' women .

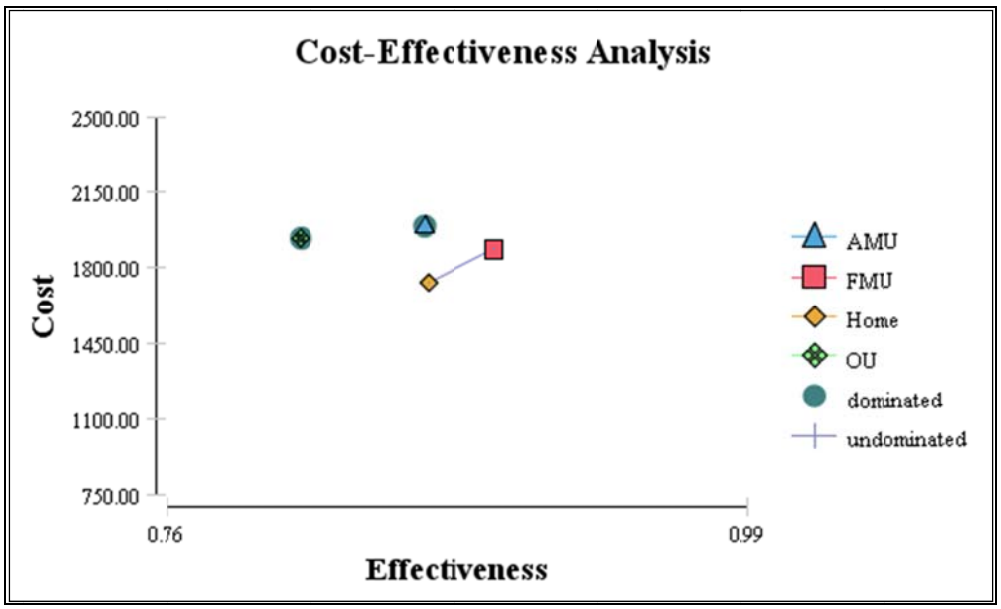
4.3.2 Cost-effectiveness for 'low risk' nulliparous women without complicating conditions at the start of care in labour

When women with complicating conditions at the start of care in labour are removed from the analysis, modelled cost data shows the average total cost to be £56 less for births planned in an obstetric unit (than in an AMU), such that planned birth in an obstetric unit is shown to be less costly on average than planned birth in an AMU. This confirms additional calculations in the individual level analysis, which showed that when nulliparous women with complicating conditions were removed from the analyses, the costs between OUs, FMUs and AMUs narrowed; hence this finding is not surprising. Furthermore, this analysis reflects weighted modelled data, which is based on the average probable events and costs attached to the care pathways and it is similar but less precise than estimates generated by the individual level cost-effectiveness analysis. Planned birth at home and in a FMU are still shown to be the cheapest options however, with planned birth at home once again the referent for the analysis. When compared with planned home birth, planned births in FMUs were both more costly and more effective as shown graphically below (figure 3).

Table 3. Costs, effects and cost-effectiveness ratios for 'low risk' nulliparous women without complicating conditions at the start of care in labour

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	1735.95	0.863	2010.57	referent	referent	referent
FMU	1887.09	0.890	2120.95	151.14	0.026	5813.08
AMU	1992.20	0.862	2311.95	256.25	-0.001	-265250.00
OU	1936.93	0.813	2382.49	200.98	-0.05	-4019.60

Figure 3. Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women without complicating conditions at the start of care in labour



4.3.3 Cost-effectiveness for 'low risk' multiparous women

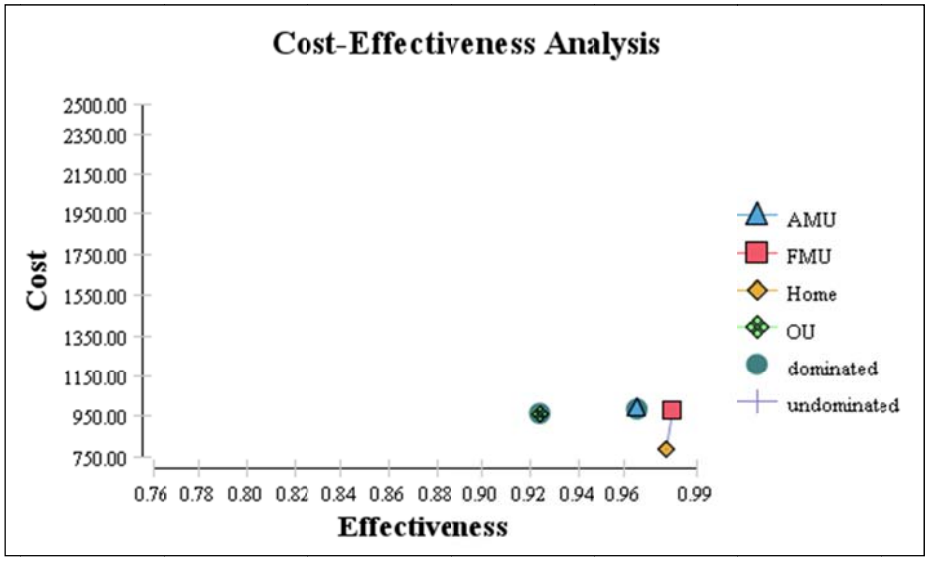
The weighted average costs constructed within the model broadly reflect the costs estimated in the individual level cost-effectiveness analysis. Total mean costs per 'low risk' multiparous woman were much lower than for nulliparous 'low risk women'. Total mean costs for multiparous women were estimated as OU £964.9, AMU £986.3, FMU £979.4 and home £784.8. Modelled costs show very little cost difference between the planned OU, FMU and AMU settings but are generally less precise than estimates generated by the individual level cost-effectiveness analysis which combined individual-level resource use and unit cost data. Births planned at home (0.98) and in FMUs (0.98) were shown to be more effective for combined mother-baby outcomes, than births planned in AMUs (0.97) and in OUs (0.92) (probabilities of outcomes on the effectiveness scale shown in parentheses). For comparison, in the in the individual level analysis, total mean costs approximated as follows: OU £1,142.4, AMU £991.3, FMU £968.9 and home £780.4.

Table 4. Costs, effects and cost-effectiveness ratios for 'low risk' multiparous women by planned place of birth

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	784.81	0.977	803.09	referent	referent	referent
FMU	979.32	0.979	999.53	194.51	0.002	97255.00
AMU	986.27	0.965	1021.90	201.46	-0.012	-16788.33
OU	964.94	0.923	1044.40	180.13	-0.054	-3335.74

Planned birth at home and in FMUs both generated greater effectiveness compared to births planned in OUs as shown in table 4. Although the cost estimates for planned births in maternity unit settings (FMU, AMU and OU) were similar, planned birth at home and in FMUs dominated in cost-effectiveness terms largely because of their increased probability of effectiveness. When compared to the referent, planned home birth, planned birth in FMUs was on average both more costly and more effective.

Figure 4. Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' multiparous women by planned place of birth



4.3.4 Cost-effectiveness for 'low risk' multiparous women without complicating conditions at the start of care in labour

As stated earlier, for reasons discussed in the cohort study report, obstetric units contained more women where complicating conditions were an unexpected observation, which suggests that the risk profile of 'low risk women' at the start of care in labour varied between the settings. (12) To ensure that women with comparable risk status were compared, women with complicating conditions at the start of care in labour were removed in a repeat analysis. The results shown here confirm that there was little difference between the initial and restricted analyses for probability estimates of effectiveness for non-OU settings, which approximate as follows: home (0.977 compared with 0.979), FMU (0.979 compared with 0.980) and AMU (0.965 compared with 0.967). There is however a marked increase in the probability of effectiveness for planned births in obstetric units when a restricted analysis is applied to all 'low risk' multiparous women. The probability of effectiveness for planned birth in obstetric units was shown to be 0.923 for all 'low risk' multiparous women, but this increased to 0.938 when the analysis was restricted to 'low risk' multiparous women without complicating conditions at the start of care in labour.

Table 5. Cost-effectiveness analysis for 'low risk' multiparous women without complicating conditions at the start of care in labour

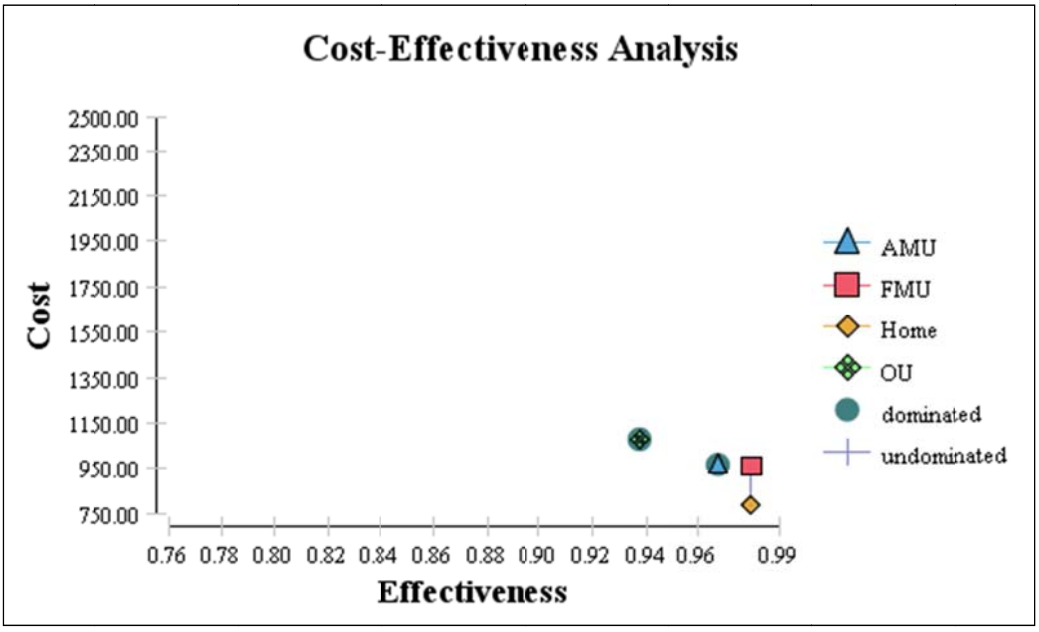
Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	787.35	0.979	804.10	referent	referent	referent
FMU	962.21	0.980	982.30	174.86	0.001	174860.00
AMU	967.28	0.967	1000.04	179.93	-0.012	-14994.17
OU	1079.71	0.938	1151.67	292.36	-0.041	-7130.73

With regards to costs, the individual level cost-effectiveness analysis showed that obstetric units generated the highest average total cost which was largely attributable to higher overheads and running costs. Thereafter, overheads and running costs were higher in FMUs than AMUs as a result of greater estate costs and substantially lower occupancy rates, but the contribution to total cost per woman for overheads and staffing was higher in AMUs than FMUs because women in AMUs had longer labour episodes on

average, more transfers to the OU and more medical intervention during birth than women planning birth in FMUs.

Planned birth at home and in FMUs dominated cost-effectiveness for combined mother-baby outcomes because of their greater probability of effectiveness and lower cost. For 'low risk' multiparous women without complicating conditions at the start of care in labour, planned birth in FMUs were more costly and more effective on average when compared to the referent, planned home birth. The differences between these settings in combined mother-baby outcomes were very small; however these are magnified in the incremental cost-effectiveness ratio calculations, as the mean differences in effects are used as the denominators of the incremental cost-effectiveness ratios generating a sizable ICER estimate. The following graph shows these cost and effectiveness estimates and the 'cost-effectiveness frontier', showing the two possibly optimal choices. As both planned births at home and in FMUs were undominated, some combination of planned births at home and in FMUs is likely to offer the most cost-effective arrangement.

Figure 5. Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' multiparous women without complicating conditions at the start of care in labour, by planned place of birth



In all analyses generated by the decision analytic model, planned birth at home and in FMUs dominated cost-effectiveness for combined mother-baby outcomes

because of their greater probability of effectiveness and lower costs, though in some cases the AMUs were dominated by extension implying that some combination of planned births at home and in FMUs is likely to offer the most cost-effective arrangement.

4.4 Sensitivity Analyses

4.4.1 Deterministic sensitivity analyses

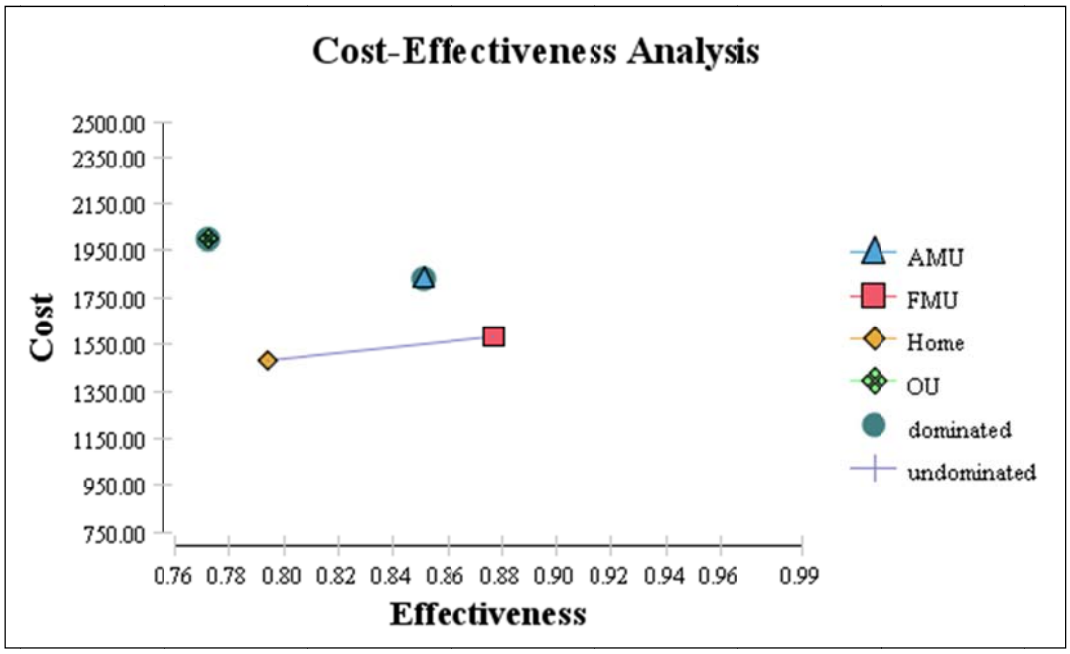
As stated earlier, sensitivity analyses to explore the implications of uncertainty surrounding key cost drivers were applied in the individual level analysis. In this modelling work, deterministic sensitivity analyses were conducted on the effectiveness payoffs in the model by adjusting the expected probabilities of the mother-baby dyad in each final health state.

When lower confidence interval estimates were used to estimate the combined mother-baby outcomes in each final health state, as shown in table 6, both costs and probabilities of effectiveness of the planned settings for birth reduced in comparison to the average estimates generated for 'low risk' nulliparous women (see table 2 and figure 2). The scale of differences in incremental cost and incremental effects between the planned settings remained broadly similar, and so there was little change in the graphical presentation of cost-effectiveness between the alternative settings for planned birth.

Table 6. Sensitivity Analyses: Costs, effects and cost-effectiveness ratios for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness

Strategy name	Cost	Effectiveness	Average cost effectiveness	Incremental cost	Incremental effect	Incremental cost effectiveness
Home	1481.66	0.794	1866.04	referent	referent	referent
FMU	1581.91	0.877	1803.59	100.25	0.083	1207.83
AMU	1831.75	0.851	2152.75	350.09	0.057	6141.93
OU	1998.16	0.772	2587.99	516.50	-0.022	-23477.27

Figure 6. Sensitivity Analysis: Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness

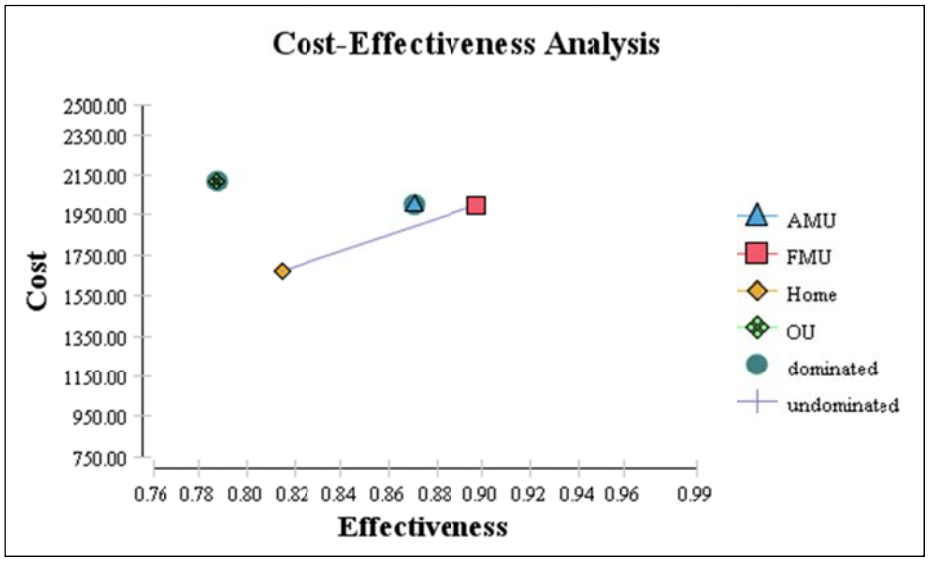


When upper confidence interval estimates were used to estimate the combined mother-baby outcomes in each final health state, as shown in table 7, both costs and probabilities of effectiveness of the planned settings for birth increased in comparison to the average estimates generated for 'low risk' nulliparous women (see table 2). The scale of differences in incremental cost and incremental effects between the planned settings remained broadly similar, and so there was little change in the graphical presentation of the difference in cost-effectiveness between the alternative settings. The AMUs are however dominated by extension called 'weak dominance', because a combination of planned births at home and in FMUs (lying on a segment of the cost-effectiveness frontier) is less costly and more effective in comparison.

Table 7. Sensitivity Analyses: Costs, effects and cost-effectiveness ratios for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental cost	Incremental effect	Incremental cost effectiveness
Home	1668.07	0.815	2047.16	referent	referent	referent
FMU	1997.80	0.897	2225.97	329.73	0.083	3972.65
AMU	2000.74	0.871	2298.22	332.67	0.056	5940.54
OU	2119.04	0.787	2691.13	450.97	-0.028	-16106.07

Figure 7. Sensitivity Analysis: Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness



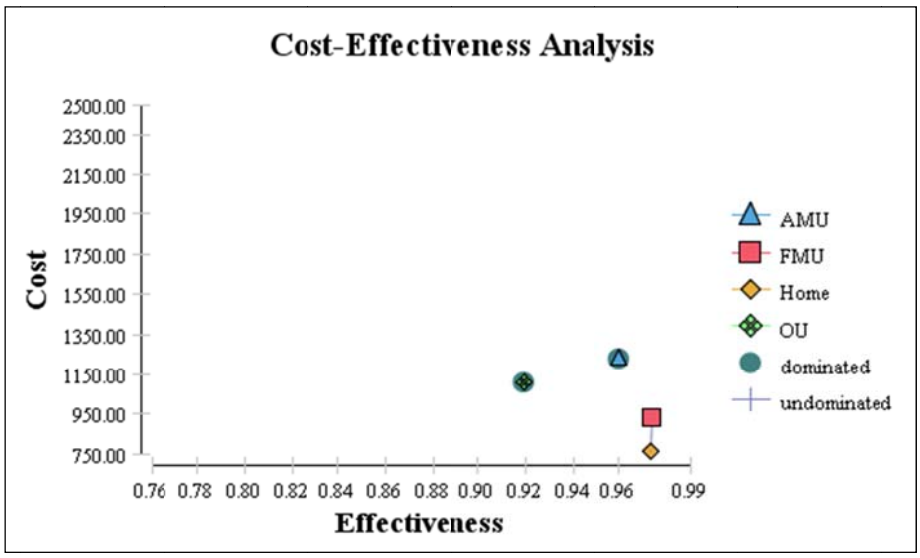
When lower confidence interval estimates were used to estimate the combined mother-baby outcomes in each final health state, as shown in table 8, both costs and probabilities of effectiveness of the planned settings for birth reduced in comparison to the average estimates generated for 'low risk' multiparous women (see table 2 and figure2). The scale of differences in incremental cost and incremental effects between the planned settings remained broadly similar, and so there was little change in the graphical presentation of cost-effectiveness between the alternative settings. A combination of planned birth at home and in FMUs (lying on a segment of the cost-effectiveness frontier) would dominate cost-effectiveness for

combined mother-baby outcomes because of the greater probability of its effectiveness and lower costs.

Table 8. Sensitivity Analyses: Costs, effects and cost-effectiveness ratios for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	762.73	0.973	783.84	referent	referent	referent
FMU	934.99	0.974	960.07	172.26	0.001	172260.00
AMU	1228.71	0.960	1280.23	465.98	-0.013	-35844.62
OU	1110.78	0.919	1208.57	348.05	-0.054	-6445.37

Figure 8. Sensitivity Analysis: Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women using lower confidence interval estimates for effectiveness



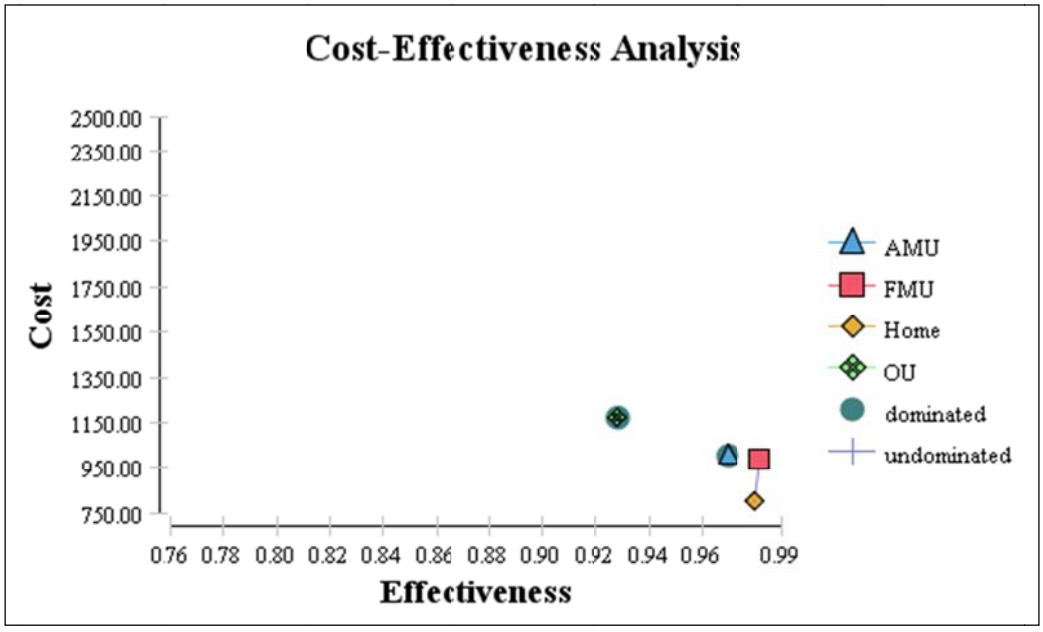
When lower confidence interval estimates were used to estimate the combined mother-baby outcomes in each final health state, as shown in table 9, both costs and probabilities of effectiveness of the planned settings for birth reduced in comparison to the average estimates generated for 'low risk' multiparous women (see table 2 and figure2). The scale of differences in incremental cost and incremental effects between the planned settings

remained broadly similar, and so there was little change in the graphical presentation of cost-effectiveness between the alternative settings. A combination of planned birth at home and in FMUs (lying on a segment of the cost-effectiveness frontier) would dominate cost-effectiveness for combined mother-baby outcomes because of its greater probability of effectiveness and lower costs.

Table 9. Sensitivity Analyses: Costs, effects and cost-effectiveness ratios for combined mother-baby outcomes for 'low risk' multiparous women using upper confidence interval estimates for effectiveness

Strategy Name	Cost	Effectiveness	Average cost effectiveness	Incremental Cost	Incremental effect	Incremental cost effectiveness
Home	805.70	0.980	821.97	referent	referent	referent
FMU	989.62	0.982	1007.93	183.92	0.002	91960.00
AMU	1004.36	0.970	1035.95	198.66	-0.01	-19866.00
OU	1172.11	0.928	1262.45	366.41	-0.052	-7046.35

Figure 9. Sensitivity Analysis: Incremental cost-effectiveness for combined mother-baby outcomes for 'low risk' nulliparous women using upper confidence interval estimates for effectiveness



4.4.2 Probabilistic sensitivity analyses

Probabilistic sensitivity analyses are usually performed on decision analytic models where model parameters are assigned distributions. Parameter uncertainty is then propagated through the model allowing the robustness of base-case results to be assessed. In view of the paucity of evidence however, only probability data from the cohort study was used to populate this model. These were weighted point estimates from an observational study. Should maternity data be routinely collected as has been recommended by the cohort study report, then prevalence and other data could be used to populate and generate a probabilistic model. Probabilistic sensitivity analyses could then be performed to assess the uncertainty surrounding the input parameters.

5 Discussion

5.1.1 Summary of findings

The model was designed to determine the cost-effectiveness of planned place of birth for women and babies at 'low risk' of complications prior to the onset of labour, in terms of incremental cost per healthy mother and baby, using data from the Birthplace national prospective cohort study. The effectiveness measure combined a composite measure of 'perinatal mortality and intrapartum related morbidity' avoided and 'maternal morbidity avoided'. For both 'low risk' nulliparous and multiparous women, overall and in those without complicating conditions at the start of care in labour, planned birth at home and in FMUs generated greater short-term cost-effectiveness when compared to OUs and dominated planned birth in OUs on the cost-effectiveness plane. Planned birth at home generally generated lower costs and a lower probability of effectiveness for combined outcomes when compared to planned births in FMUs. As both planned births at home and in FMUs were undominated, and planned births in AMUs were dominated (either absolutely or by extension), some combination of planned births at home and in FMUs is likely to offer the most short-term cost-effective arrangement. These findings can be compared with the individual level analysis, which found that planned birth at home generated the greatest mean net benefit for separate maternal and perinatal outcomes. The cohort study showed however that there was an increased incidence of adverse perinatal outcome associated with planned birth at home in nulliparous 'low risk' women and this important difference is not as obvious in this analysis using a combined mother-baby measure of effectiveness.

The very detailed breakdown of parameter inputs, shown by parity, may be of interest to maternity managers and commissioners. These included the likelihood of events, such as the average duration of labour, the rates of transfer before birth, epidural use, augmentation, mode of birth, the use of syntometrine for the active management of the third stage of labour, medical interventions required and admissions to postnatal and neonatal care. They vary substantially between birth settings and by parity and can now be compared between the birth settings.

5.1.2 Strengths and weaknesses

A strength of this study is that it is based on a rigorously-conducted cohort study of sufficient size to detect clinically important differences in adverse perinatal outcomes and with data on a wide range of intrapartum related outcomes. It achieved a very high participation by midwifery units and trusts in England and had a low risk of selection bias through the achievement of a high response rate and absence of self-selection bias due to non-consent; and was able to compare groups that were similar in terms of identified clinical risk.(31)

The effectiveness data used in the cost-effectiveness analysis were summarised as a composite of perinatal and maternal outcomes. Although necessary for this study, the use of a composite measure does not capture the differences in the relative importance of individual components. Maternal and perinatal outcomes are not equally severe; and this is a problem if different places of birth are associated with a higher proportion of more or less severe outcomes. A key limitation of the decision analytic model is that the measure of effectiveness combined common but not necessarily life-threatening maternal outcomes with uncommon but more serious outcomes for the baby, including death and complications such as neonatal encephalopathy. This approach therefore gives each of these outcomes equal weight and is unable to capture differences which would have importance to decision-makers.

In an ideal world a quality adjusted life year (QALY) metric would have been used to capture the health related quality of life of both the mother and baby, which in turn would have increased the utility of the model outputs for cost-effectiveness comparative purposes. In the absence of QALY data, the ICERs generated by the modelling were statistically complex to interpret. Given that the cohort study relied on anonymised data from maternity service providers, no individual-level QALY data were collected. Were a standardised instrument measuring preference-based health-related quality of life outcomes to be available in a maternity context, then a single index value for health status could be calculated and compared between the alternative planned birth settings. The need for this type of analysis is illustrated by the findings of the individual patient level cost-effectiveness analysis which showed that the perinatal and maternal outcomes moved in different directions (higher perinatal adverse events at home relative to planned OUs, but reduced maternal adverse events and increased normal births). Thus any QALY measure would have to capture negative and positive effects on mothers and babies.

A second key limitation of this study is the time horizon covered by the model. Adverse perinatal events can result in substantial longer term health and broader societal costs. Consequently, cost estimates which include follow up data over weeks, months or years may differ from more limited costs associated with the intrapartum and immediate postnatal period covered here. A model which could measure longer term cost-effectiveness would be very informative of the true incremental cost-effectiveness of planned birth to clinical and service decision-makers. Extensive literature searches were undertaken to provide data on longer-term outcomes but no other data sources proved useful for inclusion in this model. Robust decision analytic modelling should rely on more evidence than one observational data source to predict care pathways and payoffs. The lack of prevalence and other statistical data to inform this model meant that all probability estimates were obtained from this one data source. This model is therefore potentially most useful as a template for the design of future longer-term cost-effectiveness models about planned place of birth; model parameter inputs should be updated when this information becomes available.

Litigation costs potentially reflect the future costs associated with adverse outcomes and the loss of quality of life, but these are not a source of data that can be used as proxies for QALYs in the modelling of longer term outcomes of intrapartum care. Modeling longer-term cost-effectiveness will require evidence on all longer-term costs and health consequences for both the mother and the baby in the study population. Long term data are not available for the full range of adverse outcomes that we included in the model. Although we possess some information about the costs associated with neonatal encephalopathy, for example cerebral palsy, costs are not currently available for all of the consequences of the outcomes that we measured. In addition, the numbers of babies born with neonatal encephalopathy is relatively small with no statistically significant differences between the different groups, and only a small proportion of these babies will develop cerebral palsy. Also, other outcomes, such as caesarean section, were much more frequent than encephalopathy (over 40 times more frequent overall) and these can have major long term implications for subsequent pregnancies (including uterine rupture with neonatal encephalopathy and cerebral palsy). Once again, these long term consequences are just beginning to be quantified and we have no information about the costs associated with these later events. The cohort study did not find evidence of any significant differences in perinatal outcome by planned place of birth for multiparous women; thus, the intrapartum cost-effectiveness analyses are relevant even though limited to a short-term time horizon. The intrapartum care costs documented for multiparous women do therefore have some value to decision makers despite the lack of long term data. For example, the findings capture the fact that the higher intervention rates in obstetric units contribute to the

higher overall costs of OU births and, for multiparous women, these higher costs are not associated with better outcomes for the mother or baby.

Although the model's composite clinical outcomes were rigorously collected, outcomes which are also of importance to women and decision-makers, such as the quality of care offered, women's experiences and support with breastfeeding were not addressed in the analysis. A broader economic approach to the measurement of outcomes, such as stated preference discrete choice modelling might have provided more information to decision makers. Additional information such as this could be included in the commissioning practices of local maternity service configurations.

5.1.3 Implications of findings

The findings presented here are most relevant for the time horizon of the cohort study and the context of the NHS maternity service for that time period and both costs and cost-effectiveness may change if maternity services are reconfigured. At the time of the study, an obstetric unit was the most common form of maternity provision, with staff in OUs caring for more than 95% of women giving birth in an institutional setting (for the year ending 31 March 2007), with 1% in FMUs and 3% in AMUs. (32) Although this configuration has been changing over time to provide women of 'low risk' with more choice, a change in the provision of maternity settings will not necessarily result in immediate cost-savings. Should changes to maternity service configuration be planned to maximise cost-effectiveness, then commissioners would have to consider the resource use and related cost implications on the maternity service as a whole. This would require economic modelling and forecasting of occupancy rates, overheads, patient safety and transfer in view of fixed and variable costs, and the relative disinvestment in one form of maternity service provision in preference for another. The key cost drivers in the individual level analysis were found to be overheads and staffing, adjusted by occupancy rates. Overheads were the greatest cost driver in the obstetric unit, and obstetric units carry the highest cost burden of service delivery due to the more costly hospital services they provide for obstetric and other maternity care support, such as pharmacy, theatre, high care observation and pathology. In addition, they provide the more costly medical interventions, procedures and staffing for women of 'high risk' and for women of 'low risk' whose labours become more complex. Capital costs in OUs will always be generated because of the need to have an OU in place so that transfers can take place from non-OU to OU birth settings. The creation of more FMUs would generate greater capital costs for maternity services unless their occupancy rates (volume) increased dramatically to off-set the investment costs in the obstetric units which currently provide intrapartum care for the majority of women. Occupancy rates in FMUs were generally more varied

and substantially lower than in OUs and AMUs, but should these increase they would probably become more cost-effective.

Because FMUs have emerged as a cost-effective option, future research should assess the organisation, staffing, management, occupancy and financial viability of freestanding-maternity units as the utilisation of broader maternity services is a complex issue. Occupancy rates in FMUs are lower than in other settings and units overheads were an important cost driver for FMUs. It may be that the findings of Birthplace may encourage women particularly women having a second or subsequent baby to request an 'out of hospital' birth, and the potential for cost savings could make offering women more choice an attractive option for the NHS, but the complex factors that encourage or discourage women to opt for birth in freestanding midwifery units are not yet fully understood. This would be important and valuable research to undertake as it would inform commissioning and the appropriate configuration and provision of these services.

This short-term cost-effectiveness analysis fills a first gap in the evidence needed to model the longer-term cost-effectiveness of alternative planned birth settings. The study highlights the evidence that is currently available and the additional evidence needed to model the longer-term cost-effectiveness of alternative planned birth settings. Our study finds the paucity of evidence for the longer term consequences of adverse events and other health outcomes following birth for both mother and baby remains and further research on life-time economic estimates for the linked mother-baby dyad should be a priority for research in this field. Owing to the lack of data with which to populate this model the economic study presented here can be used to inform discussion and further research.

5.1.4 Conclusion

Robust data required to model longer-term outcomes are currently lacking. This study found that some combination of planned births at home and in FMUs is likely to offer the most cost-effective arrangement over the short term. However, because the safety of maternity settings depends on the availability of an OU to which women can transfer, OUs are an essential component of maternity services. The model presented here provides a framework which can be further developed into a full decision-analytic model that can compare longer-term cost-effectiveness of alternative planned place of birth. Its use to decision-makers may be limited in its current form.

In the absence of QALY data, decision makers may find the individual level analysis presented in the previous report more useful since that analysis makes explicit the impact of the separate effectiveness measures for the mother and the baby on the cost-effectiveness of different planned birth settings.

5.1.5 Recommendations for research

The follow topics would merit further research:

Research to document longer-term outcomes for decision-analytic modelling

- Further modelling is required to document the longer-term cost-effectiveness of alternative planned birth settings.
- Data which could be converted into a quality adjusted life year (QALY) metric would be most relevant for future modelling research. This measure could cover the range of maternal and perinatal outcomes including common but not necessarily life-threatening maternal outcomes with uncommon but more serious outcomes for the baby, including death and complications.

Research to model potential changes in configuration of services

- Further work is required to assess the financial impact on maternity services as a whole if more non-OU settings were utilised for intrapartum care.
- Average costs conceal the local variability in occupancy rates in different settings. The development of a trust-based forecasting model to quantify the costs and benefits of service reconfiguration is recommended. Forecasting cost-effectiveness at a local level could include the safety, risk of transfer, occupancy rates, overheads, geographical access, diverse population's needs, staffing capacity and related skills and training issues relevant to each local trust.

Additional research recommendations are reported previously in part 5 of the Birthplace Research Programme.

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Appendix 1: Definitions for alternative settings for planned place of birth

Definitions for planned place of birth (33)	
Home	Birth at home in which midwives take primary professional responsibility for care for the woman in established labour, and a midwife will stay at home with her. Often a second midwife will arrive shortly before the birth. During labour and birth diagnostic and treatment medical services including obstetric, neonatal and anaesthetic care, are not immediately available but are located on a separate site should they be needed. Transfer will normally involve car or ambulance. The term relates to women who receive care from a NHS midwife during established labour at home, regardless of where the woman actually gives birth. This includes women who make their final decision about planned place of birth during labour.
Alongside Midwifery Unit	An NHS clinical location offering care to women with straightforward pregnancies during labour and birth in which midwives take primary professional responsibility for care. During labour and birth diagnostic and treatment medical services, including obstetric, neonatal and anaesthetic care are available, should they be needed, in the same building, or in a separate building on the same site. Transfer will normally be by trolley, bed or wheelchair.
Free-standing Midwifery Unit	An NHS clinical location offering care to women with straightforward pregnancies during labour and birth in which midwives take primary professional responsibility for care. General Practitioners may also be involved in care. During labour and birth diagnostic and treatment medical services including obstetric, neonatal and anaesthetic care, are not immediately available but are located on a separate site should they be needed. Transfer will normally involve car or ambulance.
Obstetric Unit	An NHS clinical location in which care is provided by a team, with obstetricians taking primary professional responsibility for women at high risk of complications during labour and birth. Midwives offer care to all women in an OU, whether or not they are considered at high or low risk, and take primary responsibility for women with straightforward pregnancies during labour and birth. Diagnostic and treatment medical services including obstetric, neonatal and anaesthetic care are available on site, 24 hours a day.

Appendix 2: Components of clinical outcome measure for mother and baby

Combined maternal and neonatal outcomes (13)	
Mother not well baby well	
Mother: any of the following	third or fourth degree perineal trauma unplanned caesarean section blood transfusion admission to an intensive therapy unit, high dependency unit or specialist unit maternal death (within 42 days of giving birth)
Baby: none of the following	stillbirth after presentation in labour early neonatal death (< 7 days) 'neonatal encephalopathy' a clinical diagnosis of neonatal encephalopathy admission to a neonatal unit within 48 hours of birth for at least 48 hours with evidence of feeding difficulties or respiratory distress meconium aspiration syndrome brachial plexus injury fractured humerus fractured clavicle fractured skull apgar score less than seven at five minutes cephalohaematoma cerebral haemorrhage early onset neonatal sepsis (within 48 hours of birth) kernicterus (severe bilirubin encephalopathy) seizures
Mother not well baby not well	
Mother: any of the following	third or fourth degree perineal trauma unplanned caesarean section blood transfusion admission to an intensive therapy unit, high dependency

	unit or specialist unit maternal death (within 42 days of giving birth)
Baby: any of the following	stillbirth after presentation in labour early neonatal death (< 7 days) 'neonatal encephalopathy' a clinical diagnosis of neonatal encephalopathy admission to a neonatal unit within 48 hours of birth for at least 48 hours with evidence of feeding difficulties or respiratory distress meconium aspiration syndrome brachial plexus injury fractured humerus fractured clavicle fractured skull apgar score less than seven at five minutes cephalohaematoma cerebral haemorrhage early onset neonatal sepsis (within 48 hours of birth) kernicterus (severe bilirubin encephalopathy) seizures
Mother well baby not well	
Mother: none of the following	third or fourth degree perineal trauma unplanned caesarean section blood transfusion admission to an intensive therapy unit, high dependency unit or specialist unit maternal death (within 42 days of giving birth)
Baby: any of the following	stillbirth after presentation in labour early neonatal death (< 7 days) 'neonatal encephalopathy' a clinical diagnosis of neonatal encephalopathy admission to a neonatal unit within 48 hours of birth for at least 48 hours with evidence of feeding difficulties or respiratory distress meconium aspiration syndrome brachial plexus injury fractured humerus fractured clavicle fractured skull apgar score less than seven at five minutes cephalohaematoma cerebral haemorrhage

	early onset neonatal sepsis (within 48 hours of birth) kernicterus (severe bilirubin encephalopathy) seizures
Mother well baby well	
Mother: none of the following	third or fourth degree perineal trauma unplanned caesarean section blood transfusion admission to an intensive therapy unit, high dependency unit or specialist unit maternal death (within 42 days of giving birth)
Baby: none of the following	stillbirth after presentation in labour early neonatal death (< 7 days) 'neonatal encephalopathy' a clinical diagnosis of neonatal encephalopathy admission to a neonatal unit within 48 hours of birth for at least 48 hours with evidence of feeding difficulties or respiratory distress meconium aspiration syndrome brachial plexus injury fractured humerus fractured clavicle fractured skull apgar score less than seven at five minutes cephalohaematoma cerebral haemorrhage early onset neonatal sepsis (within 48 hours of birth) kernicterus (severe bilirubin encephalopathy) seizures

Appendix 3: Literature searches to inform the decision analytic model

A comprehensive literature search strategy was developed in 2007 and was undertaken between October and December 2007 and again from September 2011 to December 2011. The strategy was applied to a number of bibliographic databases. Published reports in the search included original data on the outcomes of interest. Exclusion criteria included papers from developing countries, as their national maternity service configuration was considered to be too different to the UK to merit research in this study. Non-English language papers were also excluded. Ovid Alert systems were then created in 2007 with monthly emailed alerts to update the literature search and any new and relevant data was obtained for the study.

Search strategy for data relevant to planned place of birth

The following electronic databases were searched from 1980 onwards or the start of the database if after 1980:

Medline

EMBASE

Cochrane Libarary

OVID: Maternity and Infant Care

Health Economic Evaluations Database (HEED)

Biomed Central

British Nursing Index (BNI)

RCN Journals Database

Health Management Information Consortium (HMIC)

Cumulative Index to Nursing and Allied Health Literature (CINAHL)

The search terms included:

1. maternity
2. cost$ maternity
3. cost-effectiveness maternity
4. efficiency maternity

5. models of care (citation + abstract)

6. care pathways maternity

7. data envelopment analysis maternity

8. service configuration maternity

Current OVID search terms for monthly alerts:

Maternity OVID

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid

Ovid MEDLINE(R) Corrections (updates since 2010-03-31)

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid

Ovid MEDLINE(R) <2006 to April Week 3 2010> (updates since 2010-03-31)

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <April 30, 2010> (updates since 2010-03-31)

MaternityEMB

EMBASE <1996 to 2010 Week 17>

EMBASE (updates since 2010-03-25)

MaternityGLO

Global Health <1973 to March 2010>

Global Health (updates since 2010-03-03)

Following the design of the decision-analytic model, literature searches were then conducted on Pubmed for each of the variables or probable events recorded in table 7. Detailed research on the references contained in the NICE Intrapartum Care Guidelines was also conducted. Birthplace has its own Endnote database of relevant references which were also searched. The following table shows the studies reviewed by category.

Key words / topics addressed	Number of outlines / abstracts scanned	No of papers read
Duration of labour maternity, aspects of the clinical pathway	194	2
Midwife-led staffing – care during labour	488	4
Cost-effectiveness analysis birth	855	1
Home birth – safety, economics	23	4
Birth centres	156	2
Home versus hospital birth	110	3
NHS maternity statistics England	26	0
Reconfiguration of maternity units, models of maternity care	4	2
Augmentation	1428	2
Use of gas and air (entonox)	58	0
Fetal monitoring labour human	3966	1
Immersion water labour birth	31	1
Epidural analgesia	1927	2
Meconium staining	367	0
Perineal trauma	224	1
Postpartum haemorrhage human birth	636	2
Unplanned caesarean section human	31	8
Kernicterus newborn neonate	873	1
Saving mother's lives	7	1
Neonatal care – costs, staffing, resuscitation, near miss	20	5
Critical audit perinatal maternal morbidity	6	1
Brachial plexus injury obstetric newborn	282	3
Maternal morbidity postpartum obstetric	275	1
Neonatal morbidity term obstetric England	28	0
Life expectancy newborn england	36	0
Clinical negligence maternity litigation	9	1

The following literature search histories show the abstracts scanned and final number of papers read for longer terms cost-effectiveness data. Searches were undertaken for the following clinical outcomes in Pubmed, Embase and the Cochrane Collaboration.

Searches conducted for adverse maternal outcomes

Postpartum Haemorrhage

Search History

PUBMED

Search	Most Recent Queries	Time	Result
#23	Search #22 AND #9	09:33:49	4
#22	Search #20 AND #21	09:33:18	333
#21	Search hysterectomy[MeSH Terms]	09:32:39	22213
#20	Search postpartum haemorrhage[MeSH Terms]	09:31:09	4027
#18	Search longer term followup [MeSH Terms]	09:29:49	0
#17	Search economic evaluation[MeSH Terms]	09:29:07	0
#9	Search cost* OR cost-saving* OR cost-effect*[MeSH Terms]	07:02:33	315115
#8	Search outcome*[MeSH Terms]	07:01:49	0
#7	Search outcomes[MeSH Terms]	07:01:21	0
#3	Results: 4	06:47:29	1083747

COCHRANE LIBRARY

Cochrane Reviews [35]
Other Reviews [12]
Clinical Trials [351]
Methods Studies [0]
Technology Assessments [5]
Economic Evaluations [5]
Cochrane Groups [0]

EMBASE

Searches	Results	Search	Type
1	(cost* or cost-saving or cost-effect*).xs.	0	Advanced
2	limit 1 to english language [Limit not valid in Econlit; records were retained]	0	Advanced
3	limit 2 to humans [Limit not valid in Econlit; records were retained]	0	Advanced
4	(cost* or cost-saving or cost-effect*).kw.	15200	Advanced
5	(cost* or cost-saving or cost-effect*).ab.	624679	Advanced
6	((cost* or cost-saving or cost-effect*) and postpartum haemorrhage).kw.	2	Advanced

Vaginal birth after caesarean section

PUBMED

Search History

Search	Most Recent Queries	Time	Result
#10	Search #9 AND #7	10:45:28	7
#12	Search #10 AND #3	10:44:59	0
#11	Search #10 AND #2	10:44:29	0
#9	Search #1 AND #5 AND #4	10:42:31	17
#8	Search #1 AND #7	10:41:50	506
#7	Search cost* OR cost-saving* OR cost-effect*[MeSH Terms]	10:41:04	315115
#6	Search follow-up studies	10:40:24	567077
#5	Search outcomes	10:38:58	293585
#4	Search economic evaluation	10:38:43	70075
#3	Search vaginal birth after caesarean section	10:38:16	1636
#2	Search vaginal birth after caesarean section[MeSH Terms]	10:37:56	0
#1	Search caesarean section[MeSH Terms]	10:37:24	31441

COCHRANE COLLABORATION

Cochrane Reviews [10]
Other Reviews [0]
Clinical Trials [22]
Methods Studies [2]
Technology Assessments [0]
Economic Evaluations [1]
Cochrane Groups [0]

EMBASE

Searches	Results	Search	Type
1	(caesarean section and (cost* or cost-saving or cost-effect*)).kw.	4	Advanced
2	((cost* or cost-saving or cost-effect*) and vaginal birth after caesarean section).kw.	0	Advanced

Perineal Trauma

PUBMED		
Search History		
Search	Most Recent Queries	Time	Result
#19	Search #18 AND #6	09:28:15	3
#18	Search ("Vaginal Birth after Cesarean"[Mesh] AND "Cesarean Section"[Mesh]) AND ("Morbidity"[Mesh] OR "Epidemiology"[Mesh])	09:25:30	41
#13	Search #6 AND #11 AND #9	09:19:01	3
#6	Search cost*	09:18:24	314731
#11	Search birth injuries	09:17:58	6923
#10	Search birth	09:16:07	222265
#9	Search perineum	09:15:43	8143
#8	Search #6 AND #5	09:14:51	0
#7	Search #6 OR #5	09:14:39	314739
#5	Search (("Perineum"[Mesh]) AND ("Parturition"[Mesh] OR "Term Birth"[Mesh] OR "Birth Injuries"[Mesh])) AND "Outcome Assessment (Health Care)"[Mesh]		

Searches conducted for adverse perinatal outcomes

Stillbirth

Search	Stillbirth	Time	Result
#11	Search #10 AND #9	07:04:03	8
#10	Search #3 AND #4	07:03:26	451
#9	Search cost* OR cost-saving* OR cost-effect*[MeSH Terms]	07:02:33	315115
#8	Search outcome*[MeSH Terms]	07:01:49	0
#7	Search outcomes[MeSH Terms]	07:01:21	0
#4	Search Stillbirth/economics OR Stillbirth/epidemiology[MeSH Terms]	06:48:34	580
#3	Search Search newborn OR neonat* OR infant OR birth OR childbirth[MeSH Terms]	06:47:29	1083747
#2	Search newborn OR neonate OR infant OR birth OR childbirth[MeSH Terms]	06:46:33	1110122
#1	Search newborn OR neonat OR infant OR birth OR childbirth[MeSH Terms]	06:46:32	1107562

Meconium Aspiration Syndrome

Search	Meconium Aspiration Syndrome	Time	Result
#17	Search #15 and #10	12:16:17	0
#16	Search #14 and #10	12:15:43	1
#15	Search #12 and #9	12:14:50	36
#14	Search #12 and #8	12:14:11	50
#13	Search #12 AND #7	12:13:37	2
#12	Search #11 AND #6	12:13:09	827
#11	Search #2 and #5	12:12:46	827
#10	Search cost* OR cost-saving OR cost-effect*[MeSH Terms]	12:12:13	315115
#9	Search follow up	12:11:31	764909
#8	Search outcomes	12:11:08	293585
#7	Search economic evaluation	12:10:53	70075
#6	Search newborn OR neonat* OR infant OR birth OR childbirth[MeSH Terms]	12:10:26	1147411
#5	Search Neonatal aspiration of meconium	12:09:22	1334
#2	Search "Meconium Aspiration Syndrome"[Mesh]	12:06:06	827

Neonatal Encephalopathy

Search	Neonatal Encephalopathy	Time	Result
#13	Search #8 AND #11 AND #12	11:03:36	36
#12	Search cost*	11:03:03	314907
#11	Search #9 OR #10	11:02:21	44441
#10	Search encephalopathy	11:01:56	33232
#9	Search hypoxia-ischemia, brain OR asphyxia neonatorum	11:01:21	12536
#8	Search hypoxia-ischemia, brain OR asphxia neonatorum	11:01:20	6382
#7	Search neonat* OR newborn* OR birth OR childbirth	10:59:55	742685
#6	Search infant	10:58:53	895440

Neonatal Encephalopathy cont..

Search	Neonatal Encephalopathy	Time	Result
#26	Search #16 AND #21 AND #25	07:09:09	593
#25	Search #23 OR #24	07:08:43	53682
#24	Search cooling OR hypothermia	07:08:18	53682
#23	Search "Hypothermia, Induced"[Mesh]	07:07:57	15088
#21	Search #19 OR #20	07:07:24	40938
#20	Search encephalopathy	07:07:09	33113
#19	Search ("Hypoxia-Ischemia, Brain"[Mesh]) OR "Asphyxia Neonatorum"[Mesh]	07:06:58	8964
#16	Search #14 OR #15	07:06:00	1191888
#15	Search neonat* OR newborn* OR infant* OR birth OR childbirth	07:05:46	1191888
#14	Search "Infant"[Mesh]	07:05:16	854421

Birth-related Injury

Search History

Search	Most Recent Queries	Time	Result
#16	Search fractured skull	17:15:16	17752
#14	Search #6 and #5 and #11	17:02:19	2
#13	Search "Birthplace in England Collaborative Group"[Corporate Author]	17:01:21	1
#11	Search fractured clavicle	17:00:59	1761
#10	Search #9 and #6 and #5	16:58:54	2
#9	Search fractured humerus	16:58:31	4641
#8	Search #7 AND #6 and #5	16:52:18	16
#7	Search brachial plexus injury	16:51:53	7893
#6	Search cost* OR cost-saving OR cost-effect*	16:49:20	315115
#5	Search newborn OR neonat* OR birth OR childbirth OR infant[MeSH Terms]	16:48:40	1126153

Sepsis

Search History

Search	Most Recent Queries	Time	Result
#20	Search #19 and #8	13:55:00	19
#21	Search #20 and #9	13:54:44	1
#19	Search #7 and #18	13:53:46	208
#18	Search #6 and #16	13:53:26	17529
#16	Search newborn OR neonat* OR infant OR childbirth OR birth	13:51:43	1151900
#9	Search economic evaluation	13:43:40	70075
#8	Search outcomes	13:40:18	293585
#7	Search sepsis[MeSH Terms]	13:30:10	80169
#6	Search cost* OR cost-saving OR cost-effect*[MeSH Terms]	13:27:32	315115

Cerebral palsy

Search History

Search	Most Recent Queries	Time	Result
#26	Search #22 AND #19	18:44:20	1
#25	Search "Costs and Cost Analysis"[Mesh] AND "Health Care Costs"[Mesh] AND "Cost of Illness"[Mesh] AND "Cost-Benefit Analysis"[Mesh] AND "Cost Allocation"[Mesh] AND "Hospital Costs"[Mesh] AND "Employer Health Costs"[Mesh] AND "Cost Savings"[Mesh] 18:43:58 0		
#23	Search #22 OR #19	18:42:57	331
#22	Search cost*	18:42:00	137
#19	Search #17	18:40:25	195
#17	Search #16 OR #15	18:39:40	195
#16	Search #11 18:38:20 4		
#15	Search #14 OR #12	18:37:43	191
#14	Search infant	18:36:47	34
#12	Search neonat* OR newborn OR infant OR birth OR childbirth	18:34:42	191
#11	Search cerebral palsy		

Appendix 4: Weighted probabilities and distributions for the model's care pathways

Nulliparous women			Multiparous women		
Probability	**Weighted estimate nulliparous women**	**Distribution**	**Weighted estimate multiparous women**	**Distribution**	**Source**
Planned birth at home					
Actual birth at home	0.650	Point estimate	0.938	Point estimate	Birthplace (31)
Actual birth in OU	0.349	Point estimate	0.061	Point estimate	Birthplace (31)
SVB	0.395	Point estimate	0.734	Point estimate	Birthplace (31)
Ventouse	0.172	Point estimate	0.077	Point estimate	Birthplace (31)
Forceps	0.191	Point estimate	0.067	Point estimate	Birthplace (31)
Unplanned CS	0.235	Point estimate	0.100	Point estimate	Birthplace (31)
Planned birth in an FMU					
Actual birth in FMU	0.727	Point estimate	0.950	Point estimate	Birthplace (31)
Actual birth in OU	0.272	Point estimate	0.049	Point estimate	Birthplace (31)
SVB	0.391	Point estimate	0.624	Point estimate	Birthplace (31)
Ventouse	0.174	Point estimate	0.069	Point estimate	Birthplace (31)
Forceps	0.200	Point estimate	0.143	Point estimate	Birthplace (31)
Unplanned CS	0.228	Point estimate	0.129	Point estimate	Birthplace (31)
Planned birth in an AMU					
Actual birth at home	0.662	Point estimate	0.904	Point estimate	Birthplace (31)
Actual birth in OU	0.337	Point estimate	0.095	Point estimate	Birthplace (31)
SVB	0.346	Point estimate	0.946	Point estimate	Birthplace (31)
Ventouse	0.202	Point estimate	0.117	Point estimate	Birthplace (31)
Forceps	0.220	Point estimate	0.113	Point estimate	Birthplace (31)
Unplanned CS	0.221	Point estimate	0.110	Point estimate	Birthplace (31)
Planned birth in an OU					
Actual birth in OU	1.0	Point estimate	1.0	Point estimate	Birthplace (31)
SVB	0.612	Point estimate	0.886	Point estimate	Birthplace (31)
Ventouse	0.117	Point estimate	0.036	Point estimate	Birthplace (31)
Forceps	0.107	Point estimate	0.020	Point estimate	Birthplace (31)
Unplanned CS	0.159	Point estimate	0.053	Point estimate	Birthplace (31)

Appendix 4 continued: Weighted probabilities and distributions for the model's care pathways repeated for women without complicating conditions at the start of care in labour

Nulliparous women			Multiparous women		
Probability	**Weighted estimate nulliparous women**	**Distribution**	**Weighted estimate multiparous women**	**Distribution**	**Source**
Planned birth at home					
Actual birth at home	0.681	Point estimate	0.947	Point estimate	Birthplace (31)
Actual birth in OU	0.318	Point estimate	0.052	Point estimate	Birthplace (31)
SVB	0.389	Point estimate	0.729	Point estimate	Birthplace (31)
Ventouse	0.179	Point estimate	0.082	Point estimate	Birthplace (31)
Forceps	0.193	Point estimate	0.088	Point estimate	Birthplace (31)
Unplanned CS	0.237	Point estimate	0.099	Point estimate	Birthplace (31)
Planned birth in an FMU					
Actual birth in FMU	0.745	Point estimate	0.956	Point estimate	Birthplace (31)
Actual birth in OU	0.254	Point estimate	0.043	Point estimate	Birthplace (31)
SVB	0.377	Point estimate	0.605	Point estimate	Birthplace (31)
Ventouse	0.185	Point estimate	0.112	Point estimate	Birthplace (31)
Forceps	0.204	Point estimate	0.156	Point estimate	Birthplace (31)
Unplanned CS	0.229	Point estimate	0.125	Point estimate	Birthplace (31)
Planned birth in an AMU					
Actual birth at home	0.681	Point estimate	0.919	Point estimate	Birthplace (31)
Actual birth in OU	0.318	Point estimate	0.080	Point estimate	Birthplace (31)
SVB	0.336	Point estimate	0.636	Point estimate	Birthplace (31)
Ventouse	0.211	Point estimate	0.128	Point estimate	Birthplace (31)
Forceps	0.237	Point estimate	0.118	Point estimate	Birthplace (31)
Unplanned CS	0.215	Point estimate	0.117	Point estimate	Birthplace (31)
Planned birth in an OU					
Actual birth in OU	1.0	Point estimate	1.0	Point estimate	Birthplace (31)
SVB	0.656	Point estimate	0.905	Point estimate	Birthplace (31)
Ventouse	0.115	Point estimate	0.034	Point estimate	Birthplace (31)
Forceps	0.098	Point estimate	0.021	Point estimate	Birthplace (31)
Unplanned CS	0.129	Point estimate	0.039	Point estimate	Birthplace (31)

Appendix 5: Unit costs per resource item (£ sterling, 2009/10 prices)

Resource item (unit)	Unit cost or range	Source of unit cost
COSTS INCURRED FOR A PLANNED BIRTH AT HOME		
Homebirth packs	34.3	Primary cost data collection
Staff travel to homebirth – distance 23 miles return trip	23.2	Primary cost data collection
COSTS INCURRED FOR PLANNED 'NON-OU BIRTHS' IF TRANSFERRED TO AN OU		
Mode of transfer (per hour)		
Ambulance	402.0	PSSRU Unit Costs of Health and Social care 2010 DH reference costs
Private car	0.0	Cost not attributed to NHS
Wheelchair or trolley	0.01	PSSRU Unit Costs of Health and Social care 2010
Bed	0.01	PSSRU Unit Costs of Health and Social care 2010
Rapid response ambulance car	214	PSSRU Unit Costs of Health and Social care 2010 DH reference costs
Helicopter	144.5	Primary data collection (NHS staff costs only)
Taxi	0.0	Cost not attributed to NHS
No physical transfer	0.0	Cost not attributed to NHS

Appendix 5 continued : Unit costs per resource item (£ sterling, 2009/10 prices)

COSTS INCURRED FOR CARE DURING LABOUR AND BIRTH		
Mode of birth		
Spontaneous vertex birth		
OU	26.3	Primary cost data collection
Home	28.5	Primary cost data collection
FMU	29.3	Primary cost data collection
AMU	29.3	Primary cost data collection
Vaginal breech birth	99.1	Primary cost data collection
Ventouse	429.2	Primary cost data collection
Forceps	569.9	Primary cost data collection
Caesarean section	1052.6	Primary cost data collection

Resource item (unit)	Unit cost or range	Source of unit cost
Procedures related to intrapartum care		
Augmentation	159.1	Primary cost data collection
Epidural/Spinal	311.1	Primary cost data collection
General Anaesthetic	846.5	Primary cost data collection
Active Management of the third stage of labour	4.1	Primary cost data collection
Episiotomy	24.6	Primary cost data collection
Perineal trauma	595.3	Primary cost data collection
ECMO	1651.0	Primary cost data collection
Total body cooling	2110.0	Primary cost data collection
Care following a stillbirth	644	Primary cost data collection
Care following a neonatal death	644	Primary cost data collection

Resource item (unit)	Unit cost or range	Source of unit cost
POST NATAL AND HIGHER LEVEL CARE FOR THE MOTHER		
Postnatal care (days)	95	DH reference costs
High dependency care following birth provided within the labour ward (per 4 hours)	80	DH reference costs
Admission to intensive care unit (days)	560	DH reference costs
Admission to high dependency unit (days)	1525	DH reference costs
Admission to specialist care (days)	400	DH reference costs
HIGHER LEVEL OF CARE FOR THE BABY		
Admission to neonatal intensive care unit (days)	1081	DH reference costs
Admission to neonatal high dependency unit (days)	759	DH reference costs
Admission to neonatal specialist care (days)	429	DH reference costs

Appendix 6: Model Payoffs: combined unit cost and resource use data

Planned birth at home and actual birth at home 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**unit cost (£)**	**sum (£)**
average duration of labour (hrs)*	7.30		
Midwifery care	1	674.8	674.8
Overheads	0		0
Entonox	1	111.6	111.6
Homebirth pack	1	34.3	34.3
Midwifery travel	1	23.2	23.2
Birth	1	28.5	28.5
Syntometrine	0.579	4.1	2.3
Episiotomy	0.034	24.6	0.8
Transfer	0.131	201.6	26.5
Assessment by Consultant in OU by those transferred in	0.967	194.7	188.4
Epidural	0.04	311.1	12.4
General Anaesthetic	0.004	846.5	3.7
Perineal repair	0.037	595.3	22.2
Blood transfusion	0.008	720.71	6.3
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	0.009	80	0.7
Postnatal care	0.131	95	12.5
ITU mother	0.0008	1525	1.2
Special care mother	0.0008	400	0.3
NICU baby	0.022	1081	24.5
HDU baby	0.0022	759	1.6
SCBU baby	0.068	429	29.4
ECMO	0	0	0
Cooling	0.0003	2110	0.7
Baby died	0.0007	644	0.4
Effectiveness and Cost payoffs			
mother well baby well	**0.949**		**925.8**
mother well baby not well	**0.006**		**6709.3**
mother not well baby well	**0.044**		**2113.2**
mother not well baby not well	**0**		**0.0**
*Estimated from the start of care in labour until the end of the third stage of labour			

Planned birth at home Actual birth in obstetric unit with spontaneous vertex birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**unit cost (£)**	**sum (£)**
average duration of labour (hrs)	14.81		
Midwifery care	1	499.9	499.9
Overheads			0
entonox	1	94.0	94.0
homebirth pack	1	34.3	34.3
midwifery travel	1	23.2	23.2
Transfer	1	192.7	192.7
OU overheads	1	537.1	537.1
OU midwifery costs	1	445.6	445.6
OU consultant assessment	0.585	194.7	113.9
Augmentation	0.382	159.1	60.8
Epidural	0.279	311.1	86.7
General Anaesthetic	0.008	846.5	7.02
Birth	1	26.3	26.3
Syntometrine	0.876	4.1	3.59
Episiotomy	0.223	24.6	5.50
Perineal repair	0.048	595.3	28.8
Blood transfusion	0.013	910	12.1
Stillbirth	0.001	644	1.2
Higher level postnatal observation on labour ward	0.013	80	1.0
Postnatal care	0.938	100.7	94.5
ITU mother	0.003	1525	4.8
HDU mother	0.009	560	5.2
Special care mother	0.003	400	1.2
NICU baby	0.038	1081	41.4
HDU baby	0.015	759	12.0
SCBU baby	0.145	429	62.5
ECMO	0	0	0
Cooling	0.002	2110	5.4
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.922**		**2256.4**
mother well baby not well	**0.017**		**7741.8**
mother not well baby well	**0.060**		**3636.4**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with ventouse 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**unit cost (£)**	**sum (£)**
average duration of labour (hrs)	15.34		
Midwifery care	1	554.2	554.2
Overheads			0
entonox	1	104.3	104.3
homebirth pack	1	34.3	34.3
midwifery travel	1	23.2	23.2
Transfer	1	185.8	185.8
OU overheads	1	512.7	512.7
OU midwifery costs	1	425.3	425.3
OU consultant assessment	0.93	194.7	181.3
Augmentation	0.46	159.1	74.3
Epidural	0.488	311.1	151.8
General Anaesthetic	0.006	846.5	5.4
Birth	1	429.2	429.2
Syntometrine	0.947	4.1	3.8
Episiotomy	0.70	24.6	17.2
Perineal repair	0.041	595.3	27.4
Blood transfusion	0.009	535.5	4.8
Stillbirth	0	0	0
Higher level postnatal observation on labour ward	0.009	80	0.7
Postnatal care	0.97	132.3	128.5
ITU mother	0	1525	0
HDU mother	0.003	560	2.0
Special care mother	0	400	0
NICU baby	0.063	1081	68.8
HDU baby	0.015	759	11.5
SCBU baby	0.168	429	72.3
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0.003	644	2.2
Effectiveness and Cost payoffs			
mother well baby well	**0.922**		**2993.9**
mother well baby not well	**0.019**		**5654.5**
mother not well baby well	**0.058**		**3567.0**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with forceps 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**unit cost (£)**	**sum (£)**
average duration of labour (hrs)	16.81		
Midwifery care	1	589.2	589.2
Overheads			0
entonox	1	104.3	104.3
homebirth pack	1	34.3	34.3
midwifery travel	1	23.2	23.2
Transfer	1	193.1	193.1
OU overheads	1	590.1	590.1
OU midwifery costs	1	489.5	489.5
OU consultant assessment	0.913	194.7	177.8
Augmentation	0.562	159.1	89.4
Epidural	0.784	311.1	244.0
General Anaesthetic	0	0	0
Birth	1	569.9	569.9
Syntometrine	0.966	4.1	3.9
Episiotomy	0.948	24.6	23.3
Perineal repair	0.114	595.3	68.3
Blood transfusion	0.005	479.8	2.6
Stillbirth	0.005	644	3.2
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.948	152.09	144.2
ITU mother	0	1525	0
HDU mother	0.003	560	1.9
Special care mother	0	400	0
NICU baby	0.012	1081	13.6
HDU baby	0.006	759	5.2
SCBU baby	0.18	429	80.5
ECMO	0	0	0
Cooling	0.001	2110	3.7
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.866**		**3498.6**
mother well baby not well	**0.012**		**7752.2**
mother not well baby well	**0.120**		**4122.0**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with an unplanned caesarean section 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**unit cost (£)**	**sum (£)**
average duration of labour (hrs)	17.76		
Midwifery care	1	574.7	574.7
Overheads			0
entonox	1	108.1	108.1
homebirth pack	1	34.3	34.3
midwifery travel	1	23.2	23.2
Transfer	1	208.9	208.9
OU overheads	1	660.5	660.5
OU midwifery costs	1	547.9	547.9
OU consultant assessment	0.98	194.7	192.3
Augmentation	0.57	159.1	91.2
Epidural	0.93	311.1	291.9
General Anaesthetic	0.071	846.5	60.6
Birth	1	1052.6	1052.6
Syntometrine	0.904	4.1	3.7
Episiotomy	0	24.6	0
Perineal repair	0	595.3	0
Blood transfusion	0.015	647.1	10.0
Stillbirth	0.003	644	2.3
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.95	239.38	228.1
ITU mother	0.013	1525	20.2
HDU mother	0.011	560	6.3
Special care mother	0.013	400	5.3
NICU baby	0.067	1081	73.0
HDU baby	0.073	759	55.5
SCBU baby	0.234	429	100.5
ECMO	0	0	0
Cooling	0.002	2110	5.0
Baby died	0.007	644	4.7
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.986**		**4350.3**
mother not well baby not well	**0.011**		**14693.8**

Planned birth in an Freestanding Midwifery Unit Actual birth in Freestanding Midwifery Unit with transfer after birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	7.39		
Midwifery care	1	600.9	600.9
Overheads	1	409.4	409.4
Birth	1	29.3	29.3
Syntometrine	0.730	4.1	3.0
Episiotomy	0.059	24.6	1.5
Postnatal stay in FMU	0.961	143.1	137.6
Transfer	0.083	249.5	20.9
Assessment by consultant	0.013	194.7	2.5
Epidural	0.045	311.1	14.1
General anaesthetic	0.002	846.5	2.0
Perineal repair	0.034	595.3	20.7
Blood transfusion	0.004	663.8	3.3
Stillbirth	0.000	0.0	0.0
Higher level care postnatal observation in labour ward	0.004	80.0	0.4
Postnatal care	0.080	190.9	15.3
ITU mother	0.0004	1525.0	0.7
HDU mother	0.001	560.0	0.8
Special care mother	0.0004	400.0	0.2
NICU baby	0.004	1081.0	5.2
HDU baby	0.007	759.0	5.5
SCBU baby	0.048	429.0	20.8
ECMO	0.000	1651.0	0.0
Cooling	0.000	2110.0	1.2
Baby died	0.0009	644.0	0.5
Effectiveness and Cost payoffs			
mother well baby well	**0.957**		**1272.1**
mother well baby not well	**0.002**		**5921.2**
mother not well baby well	**0.039**		**2500.9**
mother not well baby not well	**0.0005**		**4489.1**

Planned birth in an Freestanding Midwifery Unit Actual birth in Obstetric Unit with a spontaneous vertex birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	6.64		
Midwifery care	1	540.1	540.1
Overheads	1	368.7	368.7
Transfer	1	235.5	235.5
Obstetric Unit overheads	1	428.9	428.9
Obstetric Unit midwifery care	1	355.8	355.8
Consultant assessment in the Obstetric Unit	0.719	194.7	140.2
Augmentation	0.403	159.1	64.2
Epidural	0.310	311.1	96.7
General anaesthetic	0.002	846.5	2.4
Birth	1	26.3	26.3
Syntometrine	0.937	4.1	3.8
Episiotomy	0.244	24.6	6.0
Perineal repair	0.068	595.3	41.0
Blood transfusion	0.009	605.3	5.7
Stillbirth	0.002	644.0	1.7
Higher level care postnatal observation in labour ward	0.009	80.0	0.8
Postnatal care	0.968	171.8	166.5
ITU mother	0.0009	1,525.0	1.4
HDU mother	0.0009	560.0	0.5
Special care mother	0.0009	400.0	0.4
NICU baby	0.020	1,081.0	22.5
HDU baby	0.043	759.0	32.8
SCBU baby	0.070	429.0	30.4
ECMO	0	0.0	0.0
Cooling	0	2,110.0	0.0
Baby died	0	644.0	0.0
Effectiveness and Cost payoffs			
mother well baby well	**0.919**		**2509.8**
mother well baby not well	**0.007**		**9451.5**
mother not well baby well	**0.072**		**3464.4**
mother not well baby not well	**0**		**0.0**

Planned birth in an Freestanding Midwifery Unit Actual birth in Obstetric Unit with a ventouse birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	7.06	574.2	574.2
Midwifery care	1	574.2	574.2
Overheads	1	392.0	392.0
Transfer	1	247.9	247.9
Obstetric Unit overheads	1	434.5	434.5
Obstetric Unit midwifery care	1	360.5	360.5
Consultant assessment in the Obstetric Unit	0.945	194.7	184.0
Augmentation	0.498	159.1	79.2
Epidural	0.440	311.1	137.0
General anaesthetic	0.007	846.5	6.0
Birth	1	429.2	429.2
Syntometrine	0.969	4.1	4.0
Episiotomy	0.793	24.6	19.5
Perineal repair	0.033	595.3	20.1
Blood transfusion	0.009	479.8	4.4
Stillbirth	0	0.0	0.0
Higher level care postnatal observation in labour ward	0.009	80.0	0.7
Postnatal care	0.939	185.2	174.1
ITU mother	0	1,525.0	0.0
HDU mother	0	560.0	0.0
Special care mother	0	400.0	0.0
NICU baby	0.039	1,081.0	42.2
HDU baby	0.031	759.0	23.5
SCBU baby	0.122	429.0	52.6
ECMO	0.007	1,651.0	12.5
Cooling	0	2,110.0	0.0
Baby died	0	644.0	0.0
Effectiveness and Cost payoffs			
mother well baby well	**0.957**		**3364.2**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.042**		**4078.1**
mother not well baby not well	**0**		**0.0**

Planned birth in an Freestanding Midwifery Unit Actual birth in Obstetric Unit with a forceps birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	7.79		
Midwifery care	1	634.0	634.0
Overheads	1	432.8	432.8
Transfer	1	237.6	237.6
Obstetric Unit overheads	1	532.3	532.3
Obstetric Unit midwifery care	1	441.6	441.6
Consultant assessment in the Obstetric Unit	0.964	194.7	187.7
Augmentation	0.5586	159.1	88.9
Epidural	0.7662	311.1	238.4
General anaesthetic	0.0038	846.5	3.2
Birth	1	569.9	569.9
Syntometrine	0.9812	4.1	4.0
Episiotomy	0.8961	24.6	22.0
Perineal repair	0.1081	595.3	64.4
Blood transfusion	0.022	500.7	11.3
Stillbirth	0	0.0	0.0
Higher level care postnatal observation in labour ward	1	80.0	80.0
Postnatal care	0.93	202.7	189.3
ITU mother	0.002	1,525.0	4.5
HDU mother	0.012	560.0	6.9
Special care mother	0.002	400.0	1.2
NICU baby	0	1,081.0	0.0
HDU baby	0.0174	759.0	13.2
SCBU baby	0.06	429.0	27.2
ECMO	0	0.0	0.0
Cooling	0	2,110.0	0.0
Baby died	0	644.0	0.0
Effectiveness and Cost payoffs			
mother well baby well	**0.8704**		**3,690.5**
mother well baby not well	**0.0035**		**6,163.6**
mother not well baby well	**0.1261**		**4,881.7**
mother not well baby not well	**0**		**0.0**

Planned birth in an Freestanding Midwifery Unit Actual birth in Obstetric Unit with a unplanned caesarean section 'Low risk' nulliparous women Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	7.28		
Midwifery care	1	591.7	591.7
Overheads	1	403.9	403.9
Transfer	1	232.7	232.7
Obstetric Unit overheads	1	567.0	567.0
Obstetric Unit midwifery care	1	470.4	470.4
Consultant assessment in the Obstetric Unit	0.94	194.7	183.7
Augmentation	0.57	159.1	91.5
Epidural	0.926	311.1	288.1
General anaesthetic	0.09	846.5	80.9
Birth	1	1,052.6	1,052.6
Syntometrine	0.95	4.1	3.9
Episiotomy	0.0071	24.6	0.2
Perineal repair	0	595.3	0.0
Blood transfusion	0.0109	702.9	7.7
Stillbirth	0	0.0	0.0
Higher level care postnatal observation in labour ward	1	80.0	80.0
Postnatal care	0.96	261.3	251.1
ITU mother	0	1,525.0	0.0
HDU mother	0.009	560.0	5.0
Special care mother	0	400.0	0.0
NICU baby	0.03	1,081.0	38.5
HDU baby	0.27	759.0	207.1
SCBU baby	0.29	429.0	128.7
ECMO	0	0.0	0.0
Cooling	0.0029	2,110.0	6.1
Baby died	0	644.0	0.0
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9768**		**4432.0**
mother not well baby not well	**0.0232**		**9722.5**

Planned birth in an Alongside Midwifery Unit Actual birth in Alongside Midwifery Unit with transfer after birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	7.77		
Midwifery care	1	632.4	632.4
Overheads	1	423.1	423.1
Birth	1	29.3	29.3
Syntometrine	0.816	4.1	3.3
Episiotomy	0.07	24.6	1.8
Postnatal stay in AMU	0.95	102.4	97.5
Transfer	0.07	80.3	6.2
Consultant assessment	0.005	194.7	0.9
Epidural	0.05	311.1	17.8
General Anaesthetic	0.0017	846.5	1.4
Perineal repair	0.04	595.3	26.7
Blood transfusion	0.0062	582.3	3.6
Stillbirth	0	644	0
Higher level postnatal observation in labour ward	0.0062	80	0.4
Postnatal care	0.0798	3.39	0.2
ITU mother	0.00155	1525	2.3
HDU mother	0.004	560	2.2
Special care mother	0.0015	400	0.6
NICU baby	0.011	1081	12.3
HDU baby	0.004	759	3.5
SCBU baby	0.075	429	32.1
ECMO	0.0003	1651	0.6
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.946**		**1215.8**
mother well baby not well	**0.003**		**12496.8**
mother not well baby well	**0.051**		**2310.9**
mother not well baby not well	**0.00019**		**13385.2**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a spontaneous vertex birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.08		
Midwifery care	1	492.9	492.9
Overheads	1	330.4	330.4
Transfer	1	71.2	71.2
Overheads OU	1	449.3	449.3
Midwifery care OU	1	372.7	372.7
Consultant assessment OU	0.6596	194.7	128.4
Augmentation	0.3854	159.1	61.3
Epidural	0.3092	311.1	96.1
General Anaesthetic	0.002	846.5	1.69
Birth	1	26.3	26.3
Syntometrine	0.9635	4.1	3.9
Episiotomy	0.2432	24.6	5.9
Perineal repair	0.0582	595.3	34.6
Blood transfusion	0.0042	521.6	2.1
Stillbirth	0.0013	644	0.8
Higher level postnatal observation in labour ward	0.0042	80	0.336
Postnatal care	0.966	129.4	125.1
ITU mother	0.0005	1525	0.78
HDU mother	0.0025	560	1.44
Special care mother	0.0005	400	0.20
NICU baby	0.007	1081	7.5
HDU baby	0.0075	759	5.6
SCBU baby	0.0706	429	30.3
ECMO	0	0	0
Cooling	0.0010	2110	2.17
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.934**		**2161.4**
mother well baby not well	**0.003**		**10518.0**
mother not well baby well	**0.063**		**3050.1**
mother not well baby not well	**0**		**0.0**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a ventouse birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	14.29	574.2	574.2
Midwifery care	1	559.4	559.4
Overheads	1	375.0	375.0
Transfer	1	64.31	64.3
Overheads OU	1	462.4	462.4
Midwifery care OU	1	383.6	383.6
Consultant assessment OU	0.9365	194.7	182.3
Augmentation	0.5193	159.1	82.6
Epidural	0.5076	311.1	157.9
General Anaesthetic	0.0022	846.5	1.8
Birth	1	429.2	429.2
Syntometrine	0.9733	4.1	3.9
Episiotomy	0.7946	24.6	19.5
Perineal repair	0.0431	595.3	25.6
Blood transfusion	0.0182	601.47	10.9
Stillbirth	0	0	0
Higher level postnatal observation in labour ward	0.0182	80	1.4
Postnatal care	0.970	150.94	146.5
ITU mother	0.0027	1525	4.17
HDU mother	0.005	560	3.3
Special care mother	0.0019	400	0.78
NICU baby	0.0253	1081	27.3
HDU baby	0.011	759	8.34
SCBU baby	0.05	429	23.08
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9353**		**2873.8**
mother well baby not well	**0.002**		**8503.3**
mother not well baby well	**0.063**		**3898.5**
mother not well baby not well	**0**		**0.0**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a forceps birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	15.64		
Midwifery care	1	626.1	626.1
Overheads	1	419.7	419.7
Transfer	1	68.01	68.01
Overheads OU	1	505.6	505.6
Midwifery care OU	1	419.5	419.5
Consultant assessment OU	0.90	194.7	177.0
Augmentation	0.62	159.1	99.8
Epidural	0.76	311.1	238.3
General Anaesthetic	0.0034	846.5	2.8
Birth	1	569.9	569.9
Syntometrine	0.9725	4.1	3.9
Episiotomy	0.9552	24.6	23.4
Perineal repair	0.1299	595.3	77.3
Blood transfusion	0.0194	549.5	10.6
Stillbirth	0	644	0
Higher level postnatal observation in labour ward	1	80	80
Postnatal care	0.96	173.2	167.5
ITU mother	0	1525	0
HDU mother	0.0007	560	0.43
Special care mother	0	400	0
NICU baby	0.008	1081	9.2
HDU baby	0.0091	759	6.9
SCBU baby	0.16	429	71.5
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0.001	644	1.06
Effectiveness and Cost payoffs			
mother well baby well	**0.831**		**3414.2**
mother well baby not well	**0.011**		**4812.9**
mother not well baby well	**0.155**		**4217.5**
mother not well baby not well	**0.003**		**5116.4**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a unplanned caesarean section 'Low risk' nulliparous women Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	17.14		
Midwifery care	1	605.9	605.9
Overheads	1	406.2	406.2
Transfer	1	67.9	67.9
Overheads OU	1	606.2	606.2
Midwifery care OU	1	502.9	502.9
Consultant assessment OU	0.9362	194.7	182.2
Augmentation	0.6042	159.1	96.1
Epidural	0.9583	311.1	298.1
General Anaesthetic	0.0896	846.5	75.8
Birth	1	1052.6	1052.6
Syntometrine	0.967	4.1	3.9647
Episiotomy	0.005	24.6	0.123
Perineal repair	0	595.3	0
Blood transfusion	0.0218	591.3	12.8
Stillbirth	0	644	0
Higher level postnatal observation in labour ward	1	80	80
Postnatal care	0.96	249.0	239.8
ITU mother	0.004	1525	6.36
HDU mother	0.017	560	9.7
Special care mother	0.0046	400	1.84
NICU baby	0.012	1081	13.1
HDU baby	0.006	759	4.554
SCBU baby	0.15	429	68.1
ECMO	0	0	0
Cooling	0.0016	2110	3.5
Baby died	0.0016	644	1.07
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.991**		**4315.4**
mother not well baby not well	**0.01**		**6873.2**

Planned birth in an Obstetric Unit with a spontaneous vertex birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
Average duration of labour (hrs)	9.19		
Midwifery care	1	485.8	485.8
Overheads	1	585.6	585.6
Augmentation	0.2091	159.1	33.3
Epidural	0.205	311.1	63.8
General anaesthetic	0.002	846.5	1.7
Birth	1	26.3	26.3
Syntometrine	0.9307	4.1	3.8
Episiotomy	0.1602	24.6	3.9
Perineal repair	0.0446	595.3	26.6
Blood transfusion	0.0079	606.2	4.8
Stillbirth	0	644.0	0.0
Higher level postnatal observation	0.0079	80.0	0.6
Postnatal care	0.971	120.4	116.9
ITU mother	0.0015	1525.0	2.3
HDU mother	0.004	560.0	2.6
Special care mother	0.001	400.0	0.6
NICU baby	0.00782	1081.0	8.5
HDU baby	0.012	759.0	9.3
SCBU baby	0.071	429.0	30.5
ECMO	0	1651.0	0.0
Cooling	0.0003	2110.0	0.7
Baby died	0.0007	644.0	0.2
Effectiveness and Cost payoffs			
mother well baby well	**0.9448**		**1334.3**
mother well baby not well	**0.0023**		**4954.5**
mother not well baby well	**0.0526**		**2345.3**
mother not well baby not well	**0.003**		**4133.9**

Planned birth in an Obstetric Unit with a ventouse birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	12.49		
Midwifery care	1	660.2	660.2
Overheads	1	795.9	795.9
Augmentation	0.47	159.1	75.3
Epidural	0.54	311.1	168.7
General anaesthetic	0.0044	846.5	3.7
Birth	1	429.2	429.2
Syntometrine	0.9856	4.1	4.0
Episiotomy	0.7776	24.6	19.1
Perineal repair	0.0474	595.3	28.2
Blood transfusion	0.0197	532.6	10.5
Stillbirth	0.0008	644.0	0.6
Higher level postnatal observation	0.0197	80.0	1.6
Postnatal care	0.9679	151.0	146.1
ITU mother	0.00445	1525.0	6.8
HDU mother	0.012	560.0	6.9
Special care mother	0.00445	400.0	1.8
NICU baby	0.011	1081.0	12.6
HDU baby	0.026	759.0	20.3
SCBU baby	0.167	429.0	71.8
ECMO	0	1651.0	0.0
Cooling	0	2110.0	0.0
Baby died	0.0008	644.0	0.6
Effectiveness and Cost payoffs			
mother well baby well	**0.9315**		**2351.3**
mother well baby not well	**0.0051**		**5261.0**
mother not well baby well	**0.0624**		**3334.2**
mother not well baby not well	**0.0009**		**3713.1**

Planned birth in an Obstetric Unit with a forceps birth 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	14.42		
Midwifery care	1	762.3	762.3
Overheads	1	918.8	918.8
Augmentation	0.5906	159.1	94.0
Epidural	0.7983	311.1	248.4
General anaesthetic	0.0043	846.5	3.6
Birth	1	569.9	569.9
Syntometrine	0.9837	4.1	4.0
Episiotomy	0.9398	24.6	23.1
Perineal repair	0.1075	595.3	64.0
Blood transfusion	0.0435	618.5	26.9
Stillbirth	0	644.0	0.0
Higher level postnatal observation	1	80.0	80.0
Postnatal care	0.964	165.6	159.8
ITU mother	0.008	1525.0	13.5
HDU mother	0.019	560.0	10.8
Special care mother	0.008	400.0	3.5
NICU baby	0.023	1081.0	24.9
HDU baby	0.008	759.0	6.1
SCBU baby	0.099741176	429.0	42.8
ECMO	0	1651.0	0.0
Cooling	0.0028	2110.0	5.9
Baby died	0.0009	644.0	0.6
Effectiveness and Cost payoffs			
mother well baby well	**0.8478**		**2850.3**
mother well baby not well	**0.0048**		**5705.7**
mother not well baby well	**0.1434**		**3981.6**
mother not well baby not well	**0.0039**		**7145.1**

Planned birth in an Obstetric Unit with an unplanned caesarean section 'Low risk' nulliparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	14.31		
Midwifery care	1	756.4	756.4
Overheads	1	911.8	911.8
Augmentation	0.6073	159.1	96.6
Epidural	0.9167	311.1	285.2
General anaesthetic	0.1009	846.5	85.4
Birth	1	1052.6	1052.6
Syntometrine	0.9132	4.1	3.7
Episiotomy	0.0058	24.6	0.1
Perineal repair	0.0006	595.3	0.4
Blood transfusion	0.0182	535.6	9.7
Stillbirth	0	644.0	0.0
Higher level postnatal observation	1	80.0	80.0
Postnatal care	1	95.0	236.1
ITU mother	0.003	1525.0	5.6
HDU mother	0.012	560.0	7.0
Special care mother	0.003	400.0	1.5
NICU baby	0.401	1081.0	434.3
HDU baby	0.029	759.0	22.5
SCBU baby	0.261	429.0	114.3
ECMO	0.0006	1651.0	1.0
Cooling	0.0014	2110.0	3.0
Baby died	0	644.0	0.0
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9869**		**3633.2**
mother not well baby not well	**0.0131**		**8656.0**

Planned birth at home Actual birth at home 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	4.81		
Midwifery care	0.932	473.1	442.9
Overheads			0
entonox	0.93	73.7	69.0
homebirth pack	1	34.32	34.3
midwifery travel	1	23.2	23.2
Birth	1	28.5	28.5
Syntometrine	0.6553	4.1	2.6
Episiotomy	0.0074	24.6	0.18
Transfer	0.0543	205.3	11.1
Consultant assessment	0.0206	194.7	4.0
Epidural	0.0134	311.1	4.1
General anaesthetic	0.0015	846.5	1.2
Perineal repair	0.0094	595.3	5.5
Blood transfusion	0.0023	581.3	1.3
Stillbirth	0.00008	644	0.05
Higher level postnatal observation on labour ward	0.0023	80	0.184
Postnatal care	0.0025	52.2	0.1
ITU mother	0.0005	1525	0.76
HDU mother	0.003	560	1.8
Special care	0.0005	400	0.2
NICU baby	0.003	1081	3.7
HDU baby	0.002	759	2.2
SCBU baby	0.02898	429	12.4
ECMO	0.0002	1651	0.4
Cooling	9.18189E-05	2110	0.19
Baby died	0.0004	644	0.29
Effectiveness and Cost payoffs			
mother well baby well	**0.985**		**676.0**
mother well baby not well	**0.002**		**5542.8**
mother not well baby well	**0.013**		**1795.0**
mother not well baby not well	**0.000091**		**4931.6**

Planned birth at home Actual birth in obstetric unit with spontaneous vertex birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	10.03		
Midwifery care home	1	361.8	361.8
Overheads			0
entonox	1	68.1	68.1
homebirth pack	1	34.3	34.32
midwifery travel	1	24.2	24.2
Birth	1	28.5	28.5
Transfer	1	196.3	196.3
OU overheads	1	339.8	339.8
OU midwifery staffing	1	281.9	
Consultant assessment	0.4	194.7	88.5
Augmentation	0.12	159.1	20.6
Epidural	0.13	311.1	41.8
General anaesthetic	0.001	846.5	1.1
Syntometrine	0.9089	4.1	3.7
Episiotomy	0.0464	24.6	1.1
Perineal repair	0.0119	595.3	7.08
Blood transfusion	0.0051	580.1	2.9
Stillbirth	0.0014	644	0.9016
Higher level postnatal observation on labour ward	0.005	80	0.4
Postnatal care	0.9261	67.06	62.1
ITU mother	0.00085	1525	1.2
HDU mother	0.0054	560	3.024
Special care	0.0054	400	2.16
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.08	429	38.5
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9758**		**1593.5**
mother well baby not well	**0.0053**		**3797.2**
mother not well baby well	**0.0189**		**3091.7**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with ventouse 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	11.68		
Midwifery care home	1	433.2	433.2
Overheads			0
entonox	1	81.5	81.5
homebirth pack	1	34.32	34.32
midwifery travel	1	24.2	24.2
Birth	1	429.2	429.2
Transfer	1	159.3	159.3
OU overheads	1	339.8	339.8
OU midwifery staffing	1	281.9	
Consultant assessment	0.4546	194.7	88.5
Augmentation	0.1298	159.1	20.6
Epidural	0.1345	311.1	41.8
General anaesthetic	0.0014	846.5	1.1
Syntometrine	0.9089	4.1	3.7
Episiotomy	0.0464	24.6	1.1
Perineal repair	0.0449	595.3	26.7
Blood transfusion	0	0	0
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	0	0	0
Postnatal care	0.9057	89.7	81.2
ITU mother	0.0008	1525	1.2
HDU mother	0.0054	560	3.02
Special care	0.0054	400	2.16
NICU baby	0.0744	1081	80.4
HDU baby	0	759	0
SCBU baby	0.1336	429	57.3
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9217**		**2397.0**
mother well baby not well	**0.0334**		**6211.8**
mother not well baby well	**0.0449**		**4054.9**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with forceps 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	12.33		
Midwifery care home	1	463.8	463.8
Overheads			0
entonox	1	87.2	87.2
homebirth pack	1	34.3	34.32
midwifery travel	1	24.2	24.2
Birth	1	569.9	569.9
Transfer	1	203.0	203.0
OU overheads	1	397.9	397.9
OU midwifery staffing	1	330.1	330.1
Consultant assessment	0.9826	194.7	191.3
Augmentation	0.3876	159.1	61.6
Epidural	0.7394	311.1	230.0
General anaesthetic	0.0471	846.5	39.8
Syntometrine	0.9802	4.1	4.0
Episiotomy	0.8811	24.6	21.6
Perineal repair	0.138	595.3	82.1
Blood transfusion	0.0315	647.1	20.3
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.9207	134.0	123.3
ITU mother	0	1525	0
HDU mother	0	560	0
Special care	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.3843	429	164.8
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.8081**		**3089.1**
mother well baby not well	**0.0225**		**1860.9**
mother not well baby well	**0.1695**		**3702.0**
mother not well baby not well	**0**		**0.0**

Planned birth at home Actual birth in obstetric unit with an unplanned caesarean section 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.51		
Midwifery care home	1	403.1	403.1
Overheads			0
entonox	1	75.8	75.8
homebirth pack	1	34.3	34.32
midwifery travel	1	24.2	24.2
Birth	1	1052.6	1052.6
Transfer	1	178.6	178.6
OU overheads	1	500.6	500.6
OU midwifery staffing	1	415.3	415.3
Consultant assessment	0.9638	194.7	187.6
Augmentation	0.3385	159.1	53.8
Epidural	0.8914	311.1	277.3
General anaesthetic	0.1184	846.5	100.2
Syntometrine	0.8633	4.1	3.5
Episiotomy	0.0099	24.6	0.2
Perineal repair	0	0	0
Blood transfusion	0.0666	613.6	40.8
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.9663	230.6	222.8
ITU mother	0.00955	1525	14.5
HDU mother	0.0382	560	21.3
Special care	0.00955	400	3.8
NICU baby	0.0435	1081	47.0
HDU baby	0.161	759	122.9
SCBU baby	0.423	429	181.6
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9855**		**3869.5**
mother not well baby not well	**0.0145**		**11878.9**

Planned birth in an Freestanding Midwifery Unit Actual birth in Freestanding Midwifery Unit 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	5.01		
Midwifery care	1	407.4	407.4
Overheads	1	277.6	277.6
Birth	1	29.3	29.3
Syntometrine	75.06	4.1	307.7
Episiotomy	0.01	24.6	0.2
Postnatal stay FMU	0.96	98.3	94.7
Transfer	0.04	236.8	9.6
Assessment by Consultant in OU	0.006	194.7	1.1
Epidural	0.01	311.1	5.1
General Anaesthetic	0.001	846.5	1.4
Perineal repair	0.008	595.3	5.1
Blood transfusion	0.0027	702.8	1.8
Stillbirth	0.0001	644	0.1
Higher level postnatal observation in labour ward	0.0027	80	0.2
Postnatal care	0.0409	168.5	6.8
ITU mother	0.0006	1525	0.9
HDU mother	0.002	560	1.2
Special care mother	0.0006	400	0.25
NICU baby	0.004	1081	4.7
HDU baby	0.003	759	2.8
SCBU baby	0.03	429	13.3
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0.0004	644	0.2
Effectiveness and Cost payoffs			
mother well baby well	**0.9866**		**848.9**
mother well baby not well	**0.0019**		**6968.6**
mother not well baby well	**0.0114**		**2499.5**
mother not well baby not well	**0**		**0.0**

Planned birth in a Freestanding Midwifery Unit Actual birth in Obstetric Unit with a sponteneous vertex birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	9.62		
Midwifery care	1	343.3	343.3
Overheads	1	233.9	233.9
Transfer	1	250.9	250.9
OU running costs	1	315.7	315.7
OU midwifery costs	1	261.9	261.9
OU consul asst	0.6222	194.7	121.1
Augmentation	0.1814	159.1	28.8
Epidural	0.1816	311.1	56.4
General Anaesthetic	0	846.5	0
Birth	1	26.3	26.3
Syntometrine	0.9329	4.1	3.8
Episiotomy	0.0527	24.6	1.2
Perineal repair	0.0137	595.3	8.1
Blood transfusion	0.0089	647.1	5.7
Stillbirth	0.0059	644	3.7
Higher level postnatal observation in labour ward	0.0059	80	0.472
Postnatal care	0.9793	115.6	113.2
ITU mother	0	1525	0
HDU mother	0.005	560	2.8
Special care mother	0	400	0
NICU baby	0.04	1081	44.5
HDU baby	0.015	759	11.7
SCBU baby	0.02	429	9.7
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9746**		**1845.8**
mother well baby not well	**0.0029**		**1573.6**
mother not well baby well	**0.0226**		**2349.1**
mother not well baby not well	**0**		**0.0**

Planned birth in an Freestanding Midwifery Unit Actual birth in an Obstetric Unit with a ventouse 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.05		
Midwifery care	1	518.1	518.1
Overheads	1	353.0	353.0
Transfer	1	234.5	234.5
OU running costs	1	405.6	405.6
OU midwifery costs	1	336.5	336.5
OU consul asst	1	194.7	194.7
Augmentation	0.5395	159.1	85.8
Epidural	0.2963	311.1	92.1
General Anaesthetic	0	846.5	0
Birth	1	429.2	429.2
Syntometrine	1	4.1	4.1
Episiotomy	0.7974	24.6	19.6
Perineal repair	0.0273	595.3	16.2
Blood transfusion	0	0.03	0
Stillbirth	0	0	0
Higher level postnatal observation in labour ward	0	80	0
Postnatal care	1	164.2	164.2
ITU mother	0	1525	0
HDU mother	0	560	0
Special care mother	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.1164	429	49.9
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9727**		**2955.8**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.0273**		**2826.9**
mother not well baby not well	**0**		**0.0**

Planned birth in a Freestanding Midwifery Unit Actual birth in an Obstetric Unit with forceps 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.58		
Midwifery care	1	512.0	512.0
Overheads	1	348.9	348.9
Transfer	1	232.2	232.2
OU running costs	1	479.5	479.5
OU midwifery costs	1	397.8	397.8
OU consul asst	0.9527	194.7	185.4
Augmentation	0.5641	159.1	89.7
Epidural	0.7545	311.1	234.7
General Anaesthetic	0	846.5	0
Birth	1	569.9	569.9
Syntometrine	0.9473	4.1	3.8
Episiotomy	0.9401	24.6	23.1
Perineal repair	0.0254	595.3	15.1
Blood transfusion	0	0	0
Stillbirth	0	0	0
Higher level postnatal observation in labour ward	1	80	80
Postnatal care	0.9566	180.0	172.2
ITU mother	0	1525	0
HDU mother	0.0726	560	40.6
Special care mother	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.0322	429	13.8
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9746**		**3521.9**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.0254**		**2410.3**
mother not well baby not well	**0**		**0.0**

Planned birth in an Freestanding Midwifery Unit Actual birth in an Obstetric Unit with an unplanned caesarean section 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.57		
Midwifery care	1	445.0	445.0
Overheads	1	303.2	303.2
Transfer	1	215.9	215.9
OU running costs	1	522.3	522.3
OU midwifery costs	1	433.3	433.3
OU consul asst	0.9823	194.7	191.2
Augmentation	0.3107	159.1	49.4
Epidural	0.9392	311.1	292.1
General Anaesthetic	0.1313	846.5	111.1
Birth	1	1052.6	1052.6
Syntometrine	0.9075	4.1	3.7
Episiotomy	0	24.6	0
Perineal repair	0	595.3	0
Blood transfusion	0.0177	312.5	5.5
Stillbirth	0	0	0
Higher level postnatal observation in labour ward	1	80	80
Postnatal care	0.9121	278.9	254.3
ITU mother	0.008	1525	13.4
HDU mother	0.0177	560	9.9
Special care mother	0.008	400	3.54
NICU baby	0.136	1081	147.0
HDU baby	0.136	759	103.2
SCBU baby	0.3	429	141.8
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9456**		**4199.8**
mother not well baby not well	**0.0544**		**7559.7**

Planned birth in an Alongside Midwifery Unit Actual birth in Alongside Midwifery Unit with transfer after birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	5.11		
Midwifery care	1	415.5	415.5
Overheads	1	278.08	278.0
Birth	1	29.3	29.3
Syntometrine	0.8335	4.1	3.4
Episiotomy	0.0181	24.6	0.4
Postnatal stay AMU	0.9518	71.0	67.5
Transfer	0.0389	77.7	3.0
Consultant assessment	0.0048	194.7	0.9
Epidural	0.0218	311.1	6.7
General Anaesthetic	0.0016	846.5	1.3
Perineal repair	0.0146	595.3	8.6
Blood transfusion	0.0044	554.7	2.4
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	0.0044	80	0.3
Postnatal care	0.0482	146.6	7.0
ITU mother	0.0006	1525	1.0
HDU mother	0.00285	560	1.5
Special care mother	0.0006	400	0.2
NICU baby	0.009	1081	10.5
HDU baby	0.006	759	5.2
SCBU baby	0.025	429	10.7
ECMO	0.0008	1651	1.3
Cooling	0.0005	2110	1.1
Baby died	0.0002	644	0.1
Effectiveness and Cost payoffs			
mother well baby well	**0.978**		**823.6**
mother well baby not well	**0.002**		**5307.7**
mother not well baby well	**0.02**		**1997.9**
mother not well baby not well	**0.00014**		**1578.9**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a spontaneous vertex birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	9.58		
Midwifery care	1	369.5	369.5
Overheads	1	247.7	247.7
Transfer	1	64.9	64.9
OU running costs	1	332.9	332.9
OU midwifery costs	1	276.1	276.1
Assessemnt by consultant	0.5505	194.7	107.1
Augmentation	3.1902	159.1	507.5
Epidural	0.2954	311.1	91.8
General Anaesthetic	0.0026	846.5	2.2
Birth	1	26.3	26.3
Syntometrine	0.9676	4.1	3.9
Episiotomy	0.0787	24.6	1.9
Perineal repair	0.0099	595.3	5.8
Blood transfusion	0.0052	898.0	4.6
Stillbirth	0	644	0
Higher level postnatal observation on labour ward	0.0052	80	0.4
Postnatal care	0.9743	100.1	97.5
ITU mother	0	1525	0
HDU mother	0.0046	560	2.5
Special care mother	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.076	429	32.9
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9792**		**1646.3**
mother well baby not well	**0.0011**		**2095.3**
mother not well baby well	**0.0196**		**3119.6**
mother not well baby not well	**0**		**0.0**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a ventouse birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	11.59		
Midwifery care	1	412.6	412.6
Overheads	1	276.5	276.5
Transfer	1	78.8	78.8
OU running costs	1	393.5	393.5
OU midwifery costs	1	326.5	326.5
Assessemnt by consultant	0.98	194.7	190.8
Augmentation	0.28	159.1	45.1
Epidural	0.34	311.1	108.0
General Anaesthetic	0	846.5	0
Birth	1	429.2	429.2
Syntometrine	1	4.1	4.1
Episiotomy	0.4703	24.6	11.5
Perineal repair	0.0145	595.3	8.6
Blood transfusion	0	0	0
Stillbirth	0	0	0
Higher level postnatal observation on labour ward	0	80	0
Postnatal care	0.9709	133.4	129.5
ITU mother	0	1525	0
HDU mother	0.0147	560	8.2
Special care mother	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.023	429	9.8
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9647**		**2398.6**
mother well baby not well	**0.0062**		**2158.3**
mother not well baby well	**0.0291**		**3139.5**
mother not well baby not well	**0**		**0.0**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a forceps birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	14.59		
Midwifery care	1	582.0	582.0
Overheads	1	390.1	390.1
Transfer	1	72.1	72.1
OU running costs	1	472.0	472.0
OU midwifery costs	1	391.5	391.5
Assessemnt by consultant	0.9846	194.7	191.7
Augmentation	0.4724	159.1	75.1
Epidural	0.7933	311.1	246.7
General Anaesthetic	0.0227	846.5	19.2
Birth	1	569.9	569.9
Syntometrine	0.9687	4.1	3.9
Episiotomy	0.8701	24.6	21.4
Perineal repair	0.0898	595.3	53.4
Blood transfusion	0.0457	479.8	21.9
Stillbirth	0	0	0
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.9128	141.9	129.6
ITU mother	0.0076	1525	11.5
HDU mother	0.0198	560	11.1
Special care mother	0.0076	400	3.04
NICU baby	0.0152	1081	16.4
HDU baby	0	759	0
SCBU baby	0.08	429	37.2
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.8617**		**3132.3**
mother well baby not well	**0.0067**		**3209.6**
mother not well baby well	**0.1315**		**4768.4**
mother not well baby not well	**0**		**0.0**

Planned birth in an Alongside Midwifery Unit Actual birth in Obstetric Unit with a unplanned caesarean section 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	13.04		
Midwifery care	1	448.6	448.6
Overheads	1	300.7	300.7
Transfer	1	73.6	73.6
OU running costs	1	495.9	495.9
OU midwifery costs	1	411.4	411.4
Assessment by consultant	0.95	194.7	185.6
Augmentation	0.38	159.1	61.3
Epidural	0.93	311.1	290.7
General Anaesthetic	0.12	846.5	107.7
Birth	1	1052.6	1052.6
Syntometrine	0.95	4.1	3.9
Episiotomy	0	24.6	0
Perineal repair	0	595.3	0
Blood transfusion	0.015	312.5	4.8
Stillbirth	0	0	0
Higher level postnatal observation on labour ward	1	80	80
Postnatal care	0.97	240.8	233.9
ITU mother	0	1525	0
HDU mother	0.01	560	8.68
Special care mother	0	400	0
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.18	429	78.5
ECMO	0	0	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9845**		**3782.4**
mother not well baby not well	**0.0155**		**6373.1**

Planned birth in an Obstetric Unit Actual spontaneous vertex birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	6.24		
Midwifery care	1	330.2	330.2
Overheads	1	420.5	420.5
Augmentation	0.07	159.1	11.3
Epidural	0.09	311.1	30.9
General anaesthetic	0.001	846.5	1.0
Birth	1	26.3	26.3
Syntometrine	0.9	4.1	3.8
Episiotomy	0.04	24.6	1.0
Perineal repair	0.01	595.3	9.2
Blood transfusion	0.004	622.4	2.6
Stillbirth	0	644	0
Higher level postnatal observation after birth	0.004	80	0.3
Postnatal care	0.9	95	86.2
ITU mother	0.0006	1525	0.9
HDU mother	0.001	560	0.8
Special care mother	0.0006	400	0.2
NICU baby	0.006	1081	6.7
HDU baby	0.006	759	4.8
SCBU baby	0.05	429	24.0
ECMO	0	1651	0
Cooling	0.0003	2110	0.8
Baby died	0.0001	644	0.08
Effectiveness and Cost payoffs			
mother well baby well	**0.97**		**901.5**
mother well baby not well	**0.002**		**7835.7**
mother not well baby well	**0.02**		**1956.3**
mother not well baby not well	**0**		**0.0**

Planned birth in an Obstetric Unit Actual ventouse birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	9.79		
Midwifery care	1	517.4	517.4
Overheads	1	658.9	658.9
Augmentation	0.25	159.1	40.8
Epidural	0.52	311.1	162.7
General anaesthetic	0	846.5	0
Birth	1	429.2	429.2
Syntometrine	0.96	4.1	3.9
Episiotomy	0.48	24.6	11.8
Perineal repair	0.01	595.3	6.4
Blood transfusion	0.005	479.8	2.6
Stillbirth	0.003	644	1.9
Higher level postnatal observation after birth	0.005	80	0.4
Postnatal care	1.23	95	117.1
ITU mother	0	1525	0
HDU mother	0	560	0
Special care mother	0	400	0
NICU baby	0.02	1081	27.2
HDU baby	0.01	759	8.9
SCBU baby	0.14	429	64.3
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.9776**		**1961.5**
mother well baby not well	**0.006**		**8332.0**
mother not well baby well	**0.0139**		**2904.1**
mother not well baby not well	**0.0025**		**7856.5**

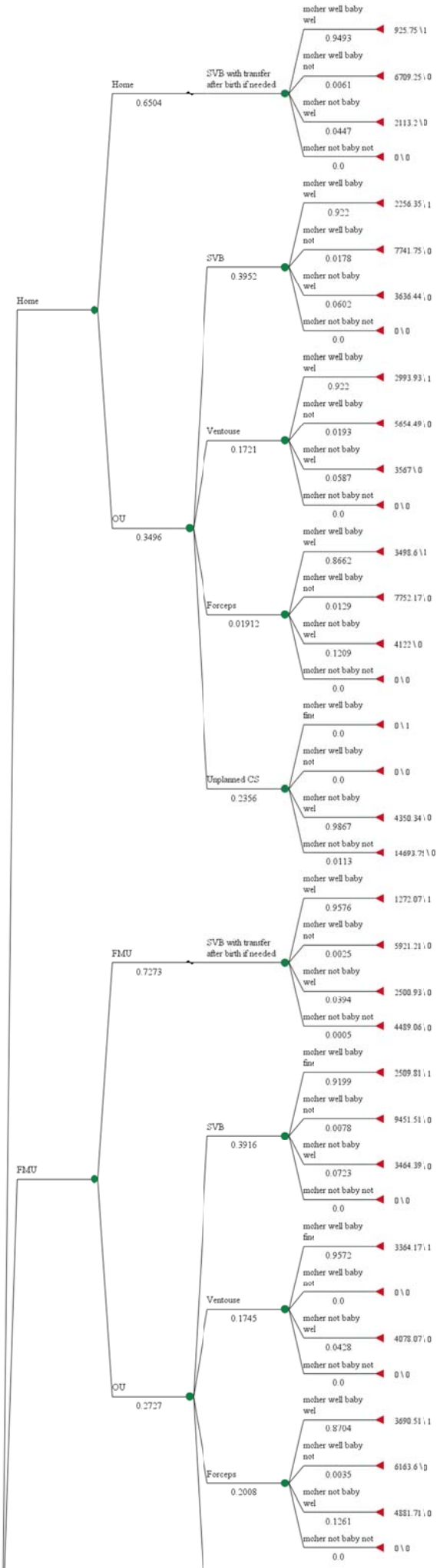
Planned birth in an Obstetric Unit Actual forceps birth 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	11.14		
Midwifery care	1	589.1	589.1
Overheads	1	750.2	750.2
Augmentation	0.41	159.1	65.1
Epidural	0.71	311.1	222.1
General anaesthetic	0.006	846.5	5.4
Birth	1	569.9	569.9
Syntometrine	0.9	4.1	3.9
Episiotomy	0.8	24.6	21.8
Perineal repair	0.06	595.3	41.4
Blood transfusion	0.03	513.26	15.5
Stillbirth	0	644	0
Higher level postnatal observation after birth	1	80	80
Postnatal care	1.5	95	145.3
ITU mother	0.006	1525	9.9
HDU mother	0.009	560	5.4
Special care mother	0.006	400	2.6
NICU baby	0	1081	0
HDU baby	0	759	0
SCBU baby	0.1	429	79.1
ECMO	0	1651	0
Cooling	0	2110	0
Baby died	0	644	0
Effectiveness and Cost payoffs			
mother well baby well	**0.8995**		**2403.2**
mother well baby not well	**0.0067**		**9472.1**
mother not well baby well	**0.0938**		**3456.6**
mother not well baby not well	**0**		**0.0**

Planned birth in an Obstetric Unit Actual unplanned caesarean section 'Low risk' multiparous women			
Detailed breakdown of cost variables			
key resource episodes or procedures	**weighted average probability**	**average unit cost (£)**	**sum (£)**
average duration of labour (hrs)	11.83		
Midwifery care	1	625.3	625.3
Overheads	1	796.3	796.3
Augmentation	0.31	159.1	50.6
Epidural	0.8	311.1	265.2
General anaesthetic	0.1	846.5	127.8
Birth	1	1052.6	1052.6
Syntometrine	0.9	4.1	3.7
Episiotomy	0.008	24.6	0.2
Perineal repair	0	595.3	0
Blood transfusion	0.04	680.5	28.4
Stillbirth	0.002	644	1.3
Higher level postnatal observation after birth	1	80	80
Postnatal care	0.96	240.2	230.8
ITU mother	0.0005	1525	0.8
HDU mother	0.04	560	22.5
Special care mother	0.012	400	5.0
NICU baby	0.0213	1081	23.0
HDU baby	0.027	759	20.8
SCBU baby	0.22	429	96.9
ECMO	0	1651	0
Cooling	0.0029	2110	6.119
Baby died	6.34573E-06	644	0.004
Effectiveness and Cost payoffs			
mother well baby well	**0**		**0.0**
mother well baby not well	**0**		**0.0**
mother not well baby well	**0.9816**		**3330.8**
mother not well baby not well	**0.0184**		**7120.5**

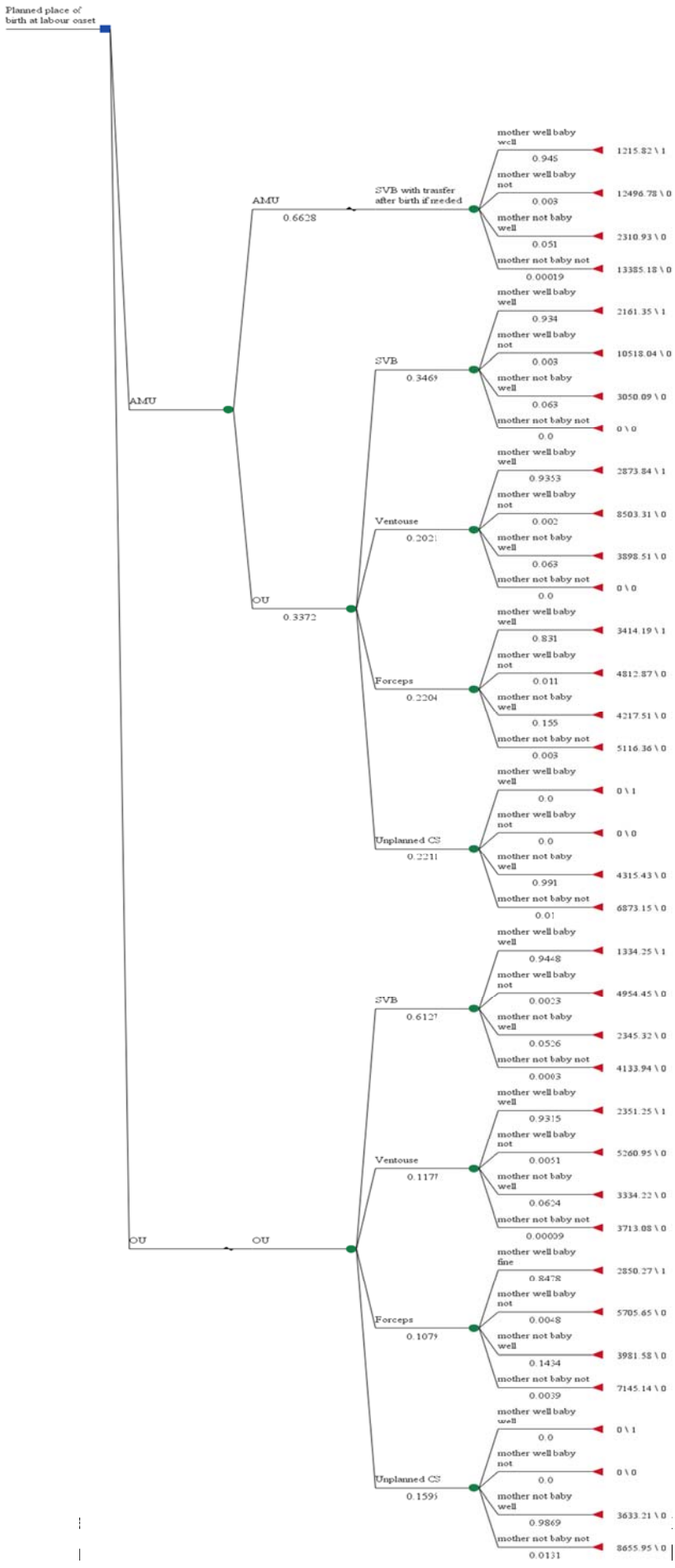
Appendix 7: Populated decision trees

See overleaf..

Appendix 7: Decision analytic model for 'low risk' nulliparous women

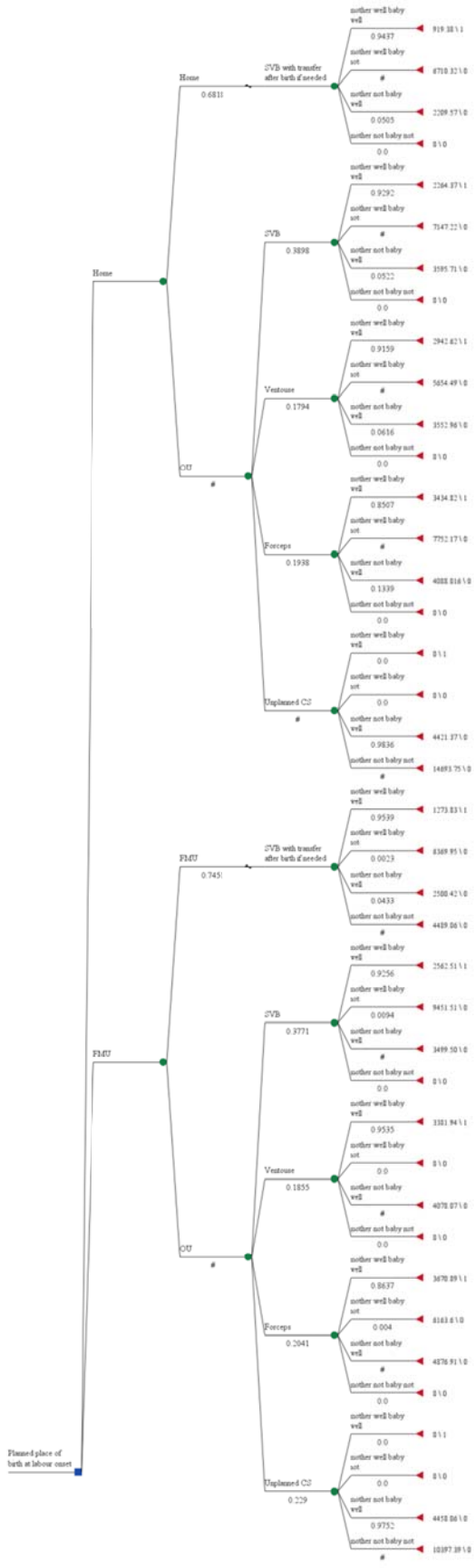


Appendix 7: Decision analytic model for 'low risk' nulliparous women continued

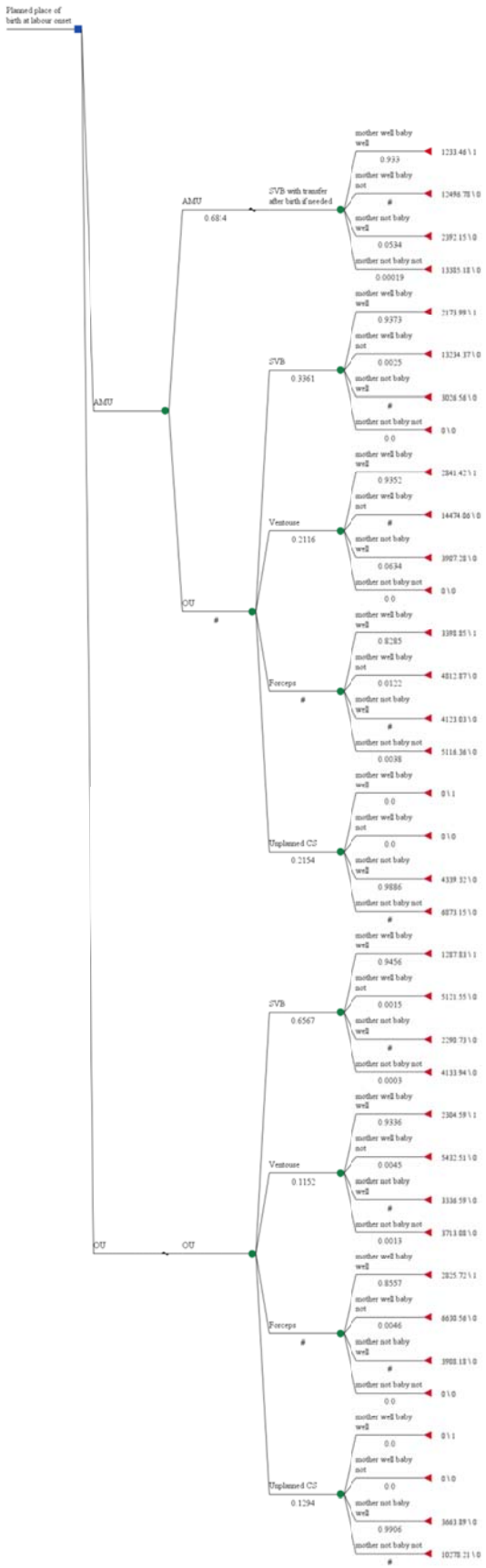


as produced by Schroeder the Secretary of State for Health.

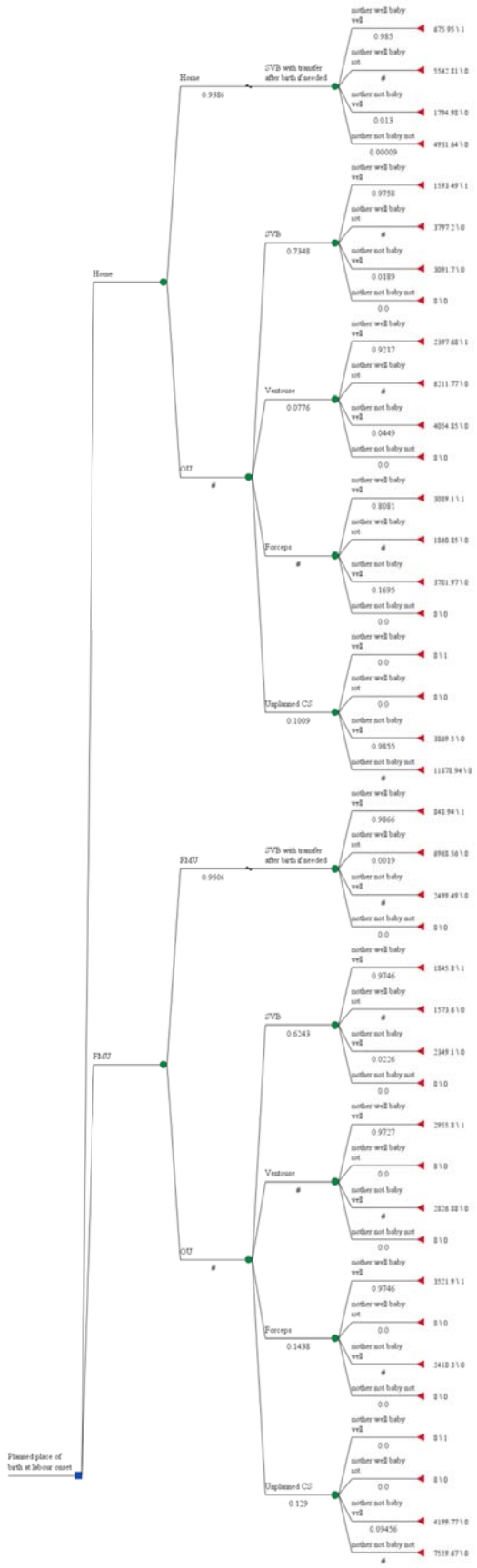
Appendix 7: Decision analytic model for 'low risk' nulliparous women without complicating conditions at the start of care in labour



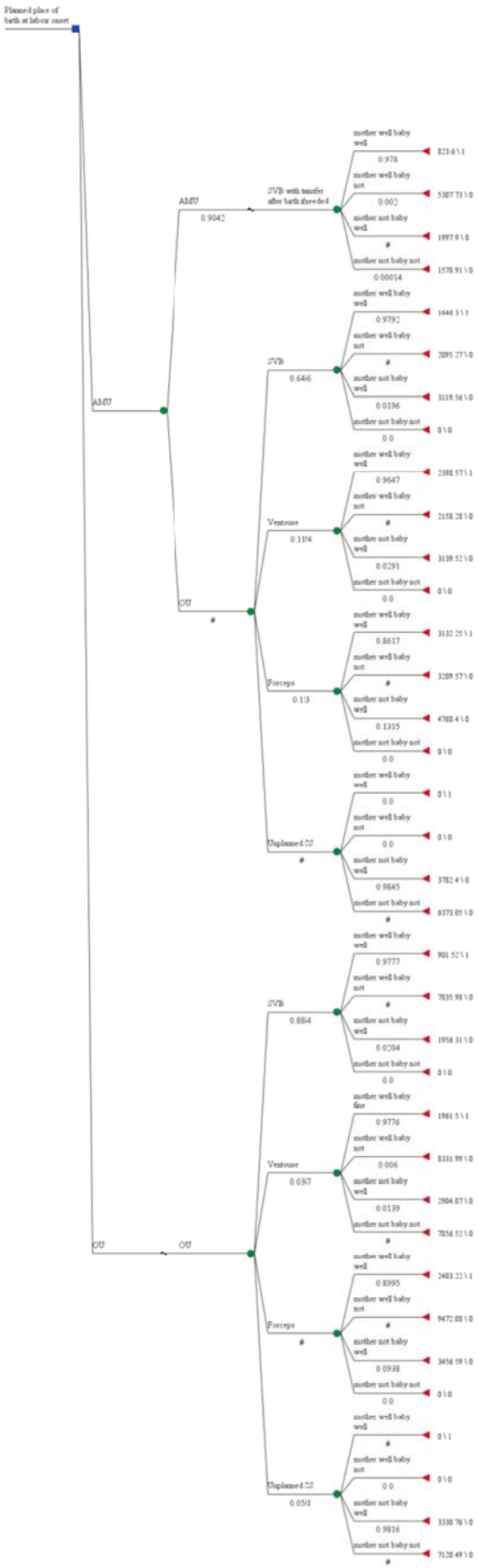
Appendix 7: Decision analytic model for 'low risk' nulliparous women without complicating conditions at the start of care in labour continued



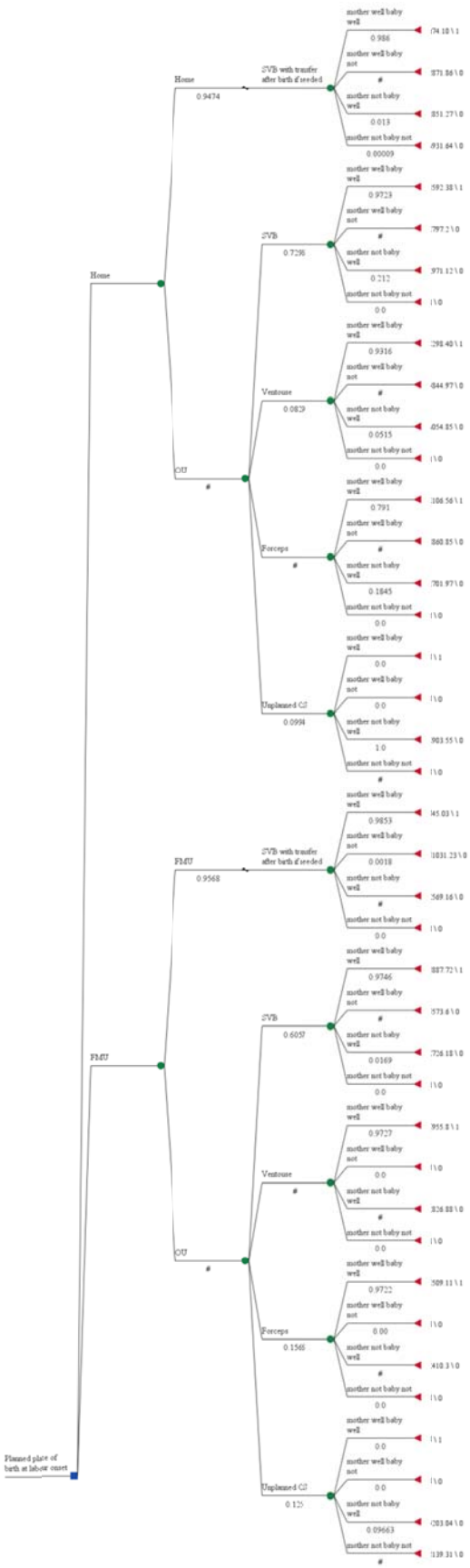
Appendix 7: Decision analytic model for 'low risk' multiparous women



Appendix 7: Decision analytic model for 'low risk' multiparous women continued



Appendix 7: Decision analytic model for 'low risk' multiparous women without complicating conditions at the start of care in labour



Appendix 7: Decision analytic model for 'low risk' multiparous women without complicating conditions at the start of care in labour