

**Evidence Review to Support the National
Maternity Review 2015**

Report 1:

**Summary of the evidence on safety of place of birth;
and implications for policy and practice from the
overall evidence review**

Editors

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October 2015

Acknowledgements

We would like to acknowledge the support of colleagues at the National Perinatal Epidemiology Unit who provided comment on various aspects of the work conducted for this evidence review, in particular Professor Maria Quigley, Associate Professor Maggie Redshaw and Associate Professor Oliver Rivero-Arias; other individuals who provided help and advice in relation to the individual pieces of work are acknowledged within those individual reports.

Aspects of the work reported here would not have been possible to conduct in the timescale of this evidence review without the on-going working being conducted as part of the programme of work of the Policy Research Unit in Maternal Health and Care funded by the Department of Health Policy Research Programme (PRU 108/1001). The Birthplace data which we used to undertake further analyses were collected as part of the Birthplace in England Study which combined the Evaluation of Maternity Units in England study, funded by the National Institute for Health Research Service Delivery and Organisation (NIHR SDO) programme, and the Birth at Home in England study funded by the Department of Health Policy Research Programme (DH PRP).

Professor Marian Knight is funded by a National Institute for Health Research (NIHR) Research Professorship.

The views expressed in these reports are those of the authors and not necessarily those of the NHS, NHS England, the NIHR or the Department of Health.

Funding

This evidence review was commissioned by the Healthcare Quality Improvement Partnership on behalf of NHS England.

This report should be cited as:

Jennifer J Kurinczuk, Marian Knight, Jennifer Hollowell (Eds.). Evidence Review to Support the National Maternity Review 2015; Report 1: Summary of the evidence on safety of place of birth; and implications for policy and practice from the overall evidence review. Oxford: National Perinatal Epidemiology Unit, University of Oxford. 2015.

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Executive Summary

To support the National Maternity Review an evidence review was commissioned focusing specifically on the evidence relating to: safety of place of birth including an extension of the Birthplace in England cohort study analysis; the impact of consultant resident cover on labour ward; the effect of 'risk tiering' of care provision as used in selected European countries; and women's birth place preferences and experiences of choosing their intended place of birth.

Key findings

Overview of Birthplace study findings

In addition to the Birthplace study findings summarised in the 2014 update of the NICE intrapartum care guideline, further analyses of the Birthplace data found that:

- Planning birth in a midwifery-led setting was associated with fewer interventions irrespective of the woman's ethnicity or level of deprivation of the area where she lived.
- Amongst women having a first baby, the chance of transfer and the chances of receiving an intervention during labour or birth increased with age.
- Other factors, including gestational age, whether or not the woman had complicating conditions, such as prolonged rupture of membranes at the start of care in labour, and the use of immersion in water for pain relief also appeared to influence a woman's chances of transfer.
- Obese or very obese women having a second or subsequent baby who did not have other risk factors, such as diabetes or a previous caesarean section, had a lower chance of interventions and adverse outcomes than low risk women of normal weight having a first baby.
- Time of day variations in augmentation, epidural anaesthesia and instrumental delivery in planned low risk obstetric unit births suggested possible time of day variations in clinical thresholds for intervention
- Intervention rates in low risk women varied between units for reasons that were not well explained by differences in the characteristics of the women giving birth there or by known differences in the characteristics of the units.
- Exploratory analyses suggested that:
 - Intervention rates in planned obstetric unit births appeared to be slightly higher in trusts where more women planned birth in midwifery units or at home;
 - Larger FMUs that were nearer an OU appeared to have lower transfer rates and better maternal outcomes, but it was unclear whether size, proximity or some other characteristic of these units was important.
- 'Higher risk' women who planned birth in a midwifery-led setting, rather than in an obstetric unit as recommended by national clinical guidelines, appeared to have a lower risk of maternal interventions and adverse outcomes requiring obstetric care than 'higher risk' women who planned birth in an obstetric unit, but there was uncertainty about the outcomes for the baby.

Comparison of perinatal and maternal outcomes in births planned in freestanding midwifery unit (FMU) versus births planned in alongside midwifery units (AMU) in low risk women

- There were no differences in outcomes for the baby, as measured by the Birthplace primary outcome, in planned AMU and FMU births for either nulliparous or multiparous women.
- Low risk women who planned birth in an FMU had an increased chance of a straightforward vaginal birth and a lower chance of having an instrumental delivery compared with women who planned birth in an AMU.
- The chances of intrapartum caesarean section did not differ statistically significantly between births planned in an FMU and births planned in an AMU.
- Overall, the findings support the conclusion that women who planned birth in an FMU had a lower risk of intervention than women who planned birth in an AMU. However, women who planned birth the two settings were self-selected and the generalisability of the findings to other groups of women is uncertain.

Models of consultant resident cover and intrapartum outcomes

- The evidence relating to the effect of continuous resident consultant obstetric cover on outcomes of intrapartum care compared to other models of consultant cover is extremely limited, of poor quality and has a high risk of bias.
- There does not appear to be any reliable evidence from which robust conclusions can be drawn, based on intrapartum outcomes, to support a model of 24 hour resident consultant presence on the labour ward compared with other models of consultant cover.
- Case studies from hospitals in the UK which have introduced, or are planning to introduce, or have considered continuous resident consultant labour ward presence, have highlighted a number of key factors which need to be taken into consideration in relation to this model of intrapartum care.
- A model considered equitable by consultants and which includes prospective cover for holidays, thus truly providing continuous consultant labour ward presence, requires 26 consultants.
- Such a model can only be introduced within existing budgets in large urban hospitals with a high number of deliveries and a high load of 'high-risk' or higher tariff women.
- Consideration has to be made as to whether limited resources would best be used providing additional consultant or midwife cover at other times or in other areas in order to improve outcomes.
- There appears to be a tendency towards new consultants taking resident overnight shifts and established consultants being on call from home. This two tier system may lead effectively to a return to a system equivalent to the former senior registrar role and may lead to dissatisfaction and perceived inequity between recently appointed and established consultants.
- There is already some evidence that the number and grade of junior obstetric staff is reduced when consultants are resident overnight, which effectively may turn the consultant into a junior overnight, performing routine tasks rather than providing a more senior supervisory role.
- With resident consultant presence the step-up from a trainee to a consultant will become effectively much greater. This may further lead to a junior and senior consultant system

without serious consideration given to providing adequate training to obstetric trainees with resident consultants.

International models of 'risk tiering' of the provision of care

- Case studies of risk tiering in maternity care in France and Sweden indicate they use a system in networks of care very similar to the neonatal network system developed in England in the mid-2000s.
- It is not possible to discern a clear relationship between risk tiering of maternity and neonatal care and outcomes on the basis of the outcome data available.

Women's birth place preferences and experiences of choosing their intended place of birth

- Service attributes that are almost universally preferred by women include: local services, seeing a known midwife during antenatal care, being attended by a known midwife throughout labour and, for most but not all women, having a degree of control and involvement in decision-making.
- Women's views and preferences differ markedly for other attributes including: the degree of availability of medical staff and specialist services, the availability of epidural analgesia versus other pain management options, and a 'homely' versus a clinical appearance of the delivery room.
- Women's preferences are shaped by many factors, including the of services available to them.
- Most of the evidence on women's experiences of deciding on their intended birth place is old but suggests that:
 - women appear to be given insufficient relevant information and guidance about their options to be able to make an informed choice;
 - the beliefs and attitudes of the midwife and the way in which the midwife presents information and options at the booking visit, or subsequently, can strongly influence the extent to which women can exercise choice of birth place;
 - existing levels and patterns of provision or midwifery-led options and the beliefs and behaviours of health care staff appear to restrict women's choices and to make obstetric unit birth the 'default' option for many low risk women whose preferences might be better met in a midwifery-led setting.

Implications for policy and practice

Review of the available evidence supports a policy of offering low risk women a choice of birth setting.

The risk and benefits of the four different birth settings are different for low risk women having their first baby and those having their second or subsequent baby; for women having their first baby, the risks and benefits also vary with the woman's age. Women having a second or subsequent baby need to be aware that planning birth at home or in a midwifery unit confers benefits in terms of fewer interventions, does not increase risks for the baby and that their chances of transfer are low. For women having their first baby, planning birth at home or in a midwifery unit confers similar

benefits in terms of fewer interventions, but their chance of transfer is higher and increases with increasing age. Importantly, women having their first birth and contemplating a home birth need to be aware that there is an increased chance of an adverse outcome for their baby. The benefits, in terms of fewer interventions, of planned birth in a midwifery-led setting do not appear to differ according to the woman's ethnicity or the level of deprivation in the area where the woman lives.

The information women require to make an informed choice when planning their birth needs to present risks and benefits, personalised according to their individual circumstances, including tailored parity and age-related information about the chances of transfer and the risk of obstetric interventions and adverse maternal and neonatal outcomes associated with each setting. There is little evidence in the literature, which is now rather old, to suggest that tailored information of this nature is being provided.

Factors which influence choice of place of birth include having relevant services available in the neighbourhood; whether women know they have the right to exercise choice; the way in which information about choice is provided; the support which is provided when women make choices; and the beliefs of staff providing information about the value, risks and benefits of different birth settings.

Clarity of information is needed to help women distinguish between different birth settings particularly with regard to differences in: the chances of receiving interventions; the availability of epidural analgesia and other forms of pain management; whether obstetric and neonatal services are available onsite if needed; and the frequency and likely duration of transfer.

Service attributes which are almost universally valued by women include having local services, being seen by the same midwife or group of midwives antenatally, and having some degree of continuity of carer during labour and birth, either by being cared for by a known midwife or by the same midwife throughout labour and birth. Most, but not all, women have a preference for some degree of control and involvement in decision making. Women's preferences for other service attributes vary more, with women differing in whether or not they prefer to have obstetric staff on site, access to epidural analgesia or other forms of pain relief, and to give birth in a 'homely' or a more clinical environment. Evidence about women's preferences indicates that many women value the type of care provided in midwifery units, but for some safety means giving birth in a setting where trained doctors are readily available if needed, suggesting that an alongside midwifery unit may be the preferred option for some. For other women, needs and preferences may be better met by care in a freestanding midwifery unit or at home. Consideration needs to be given as to how to best deliver services which meet universally valued service attributes whilst offering choice to meet preferences which are not universally expressed.

Findings from an extended analysis of Birthplace in England data comparing outcomes in alongside and freestanding midwifery units show that outcomes for babies are similar in both settings, but spontaneous vaginal birth is a more likely outcome for low risk women planning birth in a freestanding midwifery unit and serious perineal trauma is also less likely for women having a second or subsequent baby.

NICE recommend that all areas should provide access to all four birth settings which could potentially involve a substantial expansion of freestanding units and may not be achieved easily in all

areas. There is evidence of considerable turnover in freestanding units, a number of which have opened and closed over the past decade. It may be more prudent therefore to consider targeting areas where there is evidence of sufficient demand to make freestanding units viable. Where an expansion of support for home births is being considered it is worth reflecting that the Birthplace evidence that trusts which supported more home births achieved better maternal outcomes compared with trusts which supported fewer home births but that there is no recent information about the number of women who might consider a home birth.

To achieve the expansion of midwifery-led options recommended by national guidance and to move away from the apparent default option of obstetric care for many low risk women, a cultural shift will be required to influence the beliefs of those involved in the commissioning and delivery of maternity care. Such a shift may be in tension with the RCOG recommendation of 24/7 consultant presence on labour ward for large units. Within fixed budgets the expansion of both the consultant establishment and midwifery-led care requiring more midwives may be difficult to achieve simultaneously. Case studies suggest that to achieve a 24/7 consultant presence on labour ward with prospective cover will require 26 consultants which may only be achieved in large urban hospitals with a high proportion of 'high-risk' or high tariff women. This review identified that there is insufficient research evidence comparing outcomes between a model of care in which consultant obstetricians are resident 24/7 on labour ward and other models of consultant cover to reach robust conclusions.

Whilst the Birthplace findings indicated that the expansion of the provision of midwifery-led care for low risk women could potentially reduce interventions and would be a cost-effective use of resources, it is important to note that these findings were based on the configuration and delivery of services in 2008-2010. Changes in configuration and delivery of care would need to be evaluated and monitored since it cannot be automatically assumed that the same outcomes will pertain as in 2008-2010. Furthermore, judgements over the configuration and nature of maternity services will be dependent upon the population served by individual trusts including the characteristics of the maternity population and the geographical spread of the catchment population.

The needs of higher risk women who may wish to avoid an obstetric unit birth, despite national guidance advice that a planned obstetric unit birth is advised, also merit consideration. In their effort to avoid an obstetric unit delivery some higher risk women opt for birth at home. Whilst the Birthplace evidence showed their intervention rates were lower at home, it was not possible to rule out important differences in adverse perinatal outcomes. For some women in this situation an 'out-with guideline' pathway to assess their suitability for a planned alongside midwifery unit birth may be one strategy to enable them to exercise choice and achieve the best outcomes.

Glossary of terms

| Term | Description |
|--|--|
| Alongside midwifery unit (AMU) | These are co-located units which are in the same building or on the same site as a consultant-led obstetric unit. Midwives are the lead professionals. Care is aimed at low risk women. Transfers to an obstetric unit are usually by wheelchair or trolley/bed. |
| Complicating conditions | Include conditions such as: prolonged rupture of membranes and meconium stained liquor. |
| Freestanding midwifery unit (FMU) | These are sometimes called birth centres. These units are geographically separate from hospital consultant-led obstetric units. Midwives are the lead professionals, sometimes with input from local general practitioners. Care is aimed at low risk women. Transfers to an obstetric unit are usually by car or ambulance. |
| Home birth | Labour care provided at home by community midwives. |
| Low risk women | As defined by the NICE 2007 guideline for intrapartum care (NICE 2007). Low risk women are defined by exclusion. Women are defined as low risk if, before the onset of labour, they are not known to have any of the medical or obstetric risk factors listed in the NICE 2007 intrapartum care guideline. These factors are considered to increase risk for the women and/or baby, and care in an obstetric unit would be expected to reduce this risk. |
| Midwifery unit | These are units (alongside and/or freestanding) in which midwives are the lead professionals. Care is aimed at low risk women. |
| Normal birth | As defined by the NCT, RCM and RCOG maternity Care Working Party (2007): birth without induction of labour, epidural or spinal analgesia, general anaesthetic, forceps or ventouse, caesarean section or episiotomy. |
| Obstetric unit (OU) | Hospital-based care provided by a team with obstetricians taking responsibility for high-risk women and midwives taking responsibility for low-risk women (but caring for all women admitted). A full range of medical services are available 24/7. |
| Parity | The number of babies delivered after 24 weeks' gestation. |
| Perinatal mortality | In the UK perinatal mortality is conventionally defined as stillbirths plus deaths in the first seven days after birth. Perinatal mortality is expressed as a rate per 1,000 total births (stillbirths plus live births). |
| Straightforward birth/ Straightforward vaginal birth | An outcome measure used in some secondary analyses of the Birthplace cohorts study data. Defined as birth without forceps or ventouse, intrapartum caesarean section, third- or fourth-degree perinatal trauma or blood transfusion. |

Abbreviations

| Abbreviation | Description |
|---------------------|---|
| AMU | Alongside midwifery unit |
| BMI | Body mass index |
| FMU | Freestanding midwifery unit |
| NHSE | NHS England |
| NICE | National Institute for Health and Care Excellence |
| NPEU | National Perinatal Epidemiology Unit |
| OU | Obstetric unit |
| RCM | Royal College of Midwives |
| RCOG | Royal College of Obstetricians and Gynaecologists |

1. Background

As outlined in the NHS Five Year Forward View (NHS England 2014), in March 2015 Simon Stevens, Chief Executive of NHS England (NHSE), announced details of a major review of the commissioning of NHS maternity services in England. The announcement was made on the same day the report of the Morecambe Bay Investigation (Kirkup 2015) was released and highlighted the need to “take stock, and consider how we can best deliver maternity care safely in every part of the country, while better meeting the high expectations women and their families rightly have” (Stevens 2015)

The terms of reference for the National Maternity Review in brief are to:

- First, review the UK and international evidence and make recommendations on safe and efficient models of maternity services, including midwife-led units;
- Second, ensure that the NHS supports and enables women to make safe and appropriate choices of maternity care for them and their babies; and
- Third, support NHS staff including midwives to provide responsive care.

Five high level work streams were identified to guide the review:

| Work stream | Scope |
|--|---|
| 1. Communications & Engagement | Develop and oversee communication and engagement strategy for the overall review. A strategy will also guide any specific communication and engagement activity linked to the other four work streams. |
| 2. Choice | Describe, the different choices that should be available to women and how to support and empower them, enabling them to balance their personal preferences with their individual risks. |
| 3. Models of Care | Set out a range of sustainable service models, (drawing on national and international evidence) - covering the antenatal, intrapartum and postnatal periods- which are both safe and deliver the choices women want to make. |
| 4. Professional Culture & Accountability | Create a change in culture where professionals are trustworthy and support the provision of a personalised, family focussed, kind, safe and accountable service. |
| 5. Levers & Incentives | Determine how best to use a range of existing and new levers and incentives across the system to drive new models of care, choice and professionalism. |

1.1 Evidence review

As part of the National Maternity Review the National Perinatal Epidemiology Unit (NPEU) was commissioned to carry out an evidence review relating to specific aspects of maternity care; the findings are reported here and in the accompanying three reports.

The evidence review, as agreed with the National Maternity Review Secretariat was commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England (NHSE), to take place between June and September 2015. The goal was to provide a review of relevant specific evidence in relation to work streams 2 and 3, and focusing on maternal choice and service models designed to deliver safe intrapartum care.

In outline the aims of the evidence review were to:

1. Summarise and synthesise the evidence on safety of place of birth focusing in particular on the findings of the Birthplace in England national prospective cohort study of planned place of birth.
2. Add to the evidence on safety of place of birth by extending the analysis of the Birthplace prospective cohort study data to use individual patient data and conduct a statistically more robust analysis to replicate the analysis that NICE carried out relating to comparisons of perinatal and maternal outcomes in planned FMU and AMU births. The goal of this extended analysis being to provide additional evidence on safety of place of birth to support decisions about the delivery of maternity care in remote and rural settings.
3. Conduct a systematic review of the evidence of the effectiveness of 168 hour per week consultant labour ward cover as a model of the delivery of intrapartum care in large units.
4. Conduct a systematic review of the evidence about factors which influence women's choices in relation to planned place of birth.
5. Provide an international context with information on the delivery and outcomes of maternity care in two European countries; one with similar maternal and perinatal outcome metrics and one with metrics which are amongst the best in Europe.

1.2 Presentation of the evidence review findings

In this report (Report 1) we present the summary and synthesis of the evidence on safety of place of birth (aim 1). The further analysis of the Birthplace study data (aim 2) is presented in Report 2. The systematic review of models of consultant cover on labour ward (aim 3), case studies of different models of consultant cover (aim 3) and the international findings (aim 5) are given in Report 3. Finally, the systematic review of factors influencing choice of place of birth (aim 4) is presented in Report 4. The implications of the findings from all the individual pieces of work carried out to address all five aims are presented as the final section of this report (Report 1).

2. Safety of place of birth in different birth settings

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2.1 Background

Choice of setting for birth has been central to government maternity care policy since the early 1990s (Campbell & Macfarlane 1994; Hall 2003; Department of Health 2004). This policy was consolidated in the 2000s (Department of Health/ Partnerships for Children Families and Maternity 2007; HM Government 2007) and the principle of choice was again reiterated and re-confirmed in the Health and Social Care Act 2012 (HSC Act 2012).

Providing information to help women in England make safe and appropriate choices about where to plan their birth was, until the publication of the Birthplace Programme findings in 2011 (Brocklehurst, Hardy et al. 2011), hampered by a lack of high quality evidence. Existing evidence until that point was limited to nine small randomised controlled trials comparing outcomes in alongside midwifery units with obstetric units. In total all nine trials included only 10,684 women and were therefore too few in number to detect rare but important adverse outcomes (Hodnett et al 2010). There were no trials of freestanding midwifery units and only one trial of home births which included only 11 women (Olsen & Jewell 1998).

Observational study evidence was available from a number of larger studies but again these were generally still too small to be able to detect severe adverse outcomes and were in some cases limited by lack of information about planned place of birth having to rely on actual place of birth and by a variety of different outcome measures having been used in the different studies (Olsen 1997; de Jonge, van der Goes et al. 2009; Janssen, Henderson et al. 2009; Lindgren, Radestad et al. 2008; Mori, Dougherty et al. 2008). The results tended to be inconsistent and due to the methodological differences were difficult to combine to produce reliable pooled results. A number of these studies were also from other countries which makes it difficult to apply the findings to the UK setting due to fundamental differences in health care systems.

On the basis of the totality of the evidence available in 2007 the National Institute of Health Care Excellence (NICE) concluded that although there was evidence of a higher chance of vaginal birth with less intervention for healthy women who plan to give birth at home or in a midwifery unit compared with an obstetric unit, there was a lack of good quality evidence comparing the risks of rare but serious adverse outcomes by birth setting (NICE 2007).

The 'Birthplace in England Research Programme' was designed to fill the gaps in evidence identified by NICE and others (Hollowell et al 2011). A series of six component studies utilising a range of methodological approaches, was designed to address a series of objectives relating to the organisation of intrapartum care, the differences in maternal and baby outcomes between birth settings, the comparative cost-effectiveness of planned birth setting and the features of maternity care systems that affect the quality and safety of care. A brief overview of the component studies of the Birthplace programme can be found in the Birthplace programme overview report (Hollowell 2011).

Birthplace findings relating to safety are summarised and synthesised in this report, focusing in particular on findings of the Birthplace in England national prospective cohort study of planned place of birth. In addition to the primary analysis a series of subsequent analyses of the cohort study data have been carried out as separately funded studies and published in a series of papers and reports. The results from these additional analyses have made a further major contribution to our understanding of the risks and benefits associated with different birth settings for different women in England. An annotated Bibliography of all journal publications based on the Birthplace in England prospective cohort study is given in Appendix A. A full list of reports from the Birthplace in England Research Programme is given in Appendix B. For contextual purposes the section of the NICE intrapartum care guideline dealing with place of birth (NICE 2014) is given as a summary in Appendix C. The Birthplace in England programme also included a series of qualitative organisational case studies which shed light on the organisation and delivery of care in a series of trusts. The key findings are summarised in Appendix D.

2.2 Defining low risk and higher risk women

The primary focus of the Birthplace in England Programme was on outcomes for mothers and babies by planned place of birth at the start of care in labour for 'low risk' women. Women were defined as 'low risk' if, before the onset of labour, they were not known to have any of the medical or obstetric risk factors listed in the NICE 2007 intrapartum care guideline (NICE 2007). These are considered to increase risk for the women and/or baby, and care in an obstetric unit would be expected to reduce this risk.

Most 'higher risk' women would plan to give birth in an obstetric unit (OU) but in the Birthplace prospective cohort study about 7% of women who planned birth at home, 4% who planned birth in an alongside midwifery unit (AMU) and 3% in a freestanding midwifery unit (FMU) had known risk factors. This enabled subsequent analyses to be conducted on outcomes for these 'higher risk' women; the findings of these are also summarised here.

2.3 Defining outcome measures

The Birthplace analyses used a number of different outcome measures.

Baby outcomes

- The **Birthplace primary outcome** was a composite measure of perinatal mortality and specific neonatal morbidities encompassing: 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 composite measure was designed to capture outcomes that may be related to the quality of intrapartum care, including morbidities associated with intrapartum asphyxia and birth trauma.
- Other adverse baby outcomes included: individual components of the primary outcome, neonatal unit admission, Apgar score less than 7 at 5 minutes.
- For some analyses of outcomes in 'higher risk' women a modified composite measure of adverse perinatal outcome was used encompassing: admission to a neonatal unit within 48 hours of birth for at least two days or the occurrence of any event included in the Birthplace primary outcome (stillbirth after the start of care in labour, early neonatal death, neonatal

encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, or fractured clavicle).

Maternal interventions and adverse outcomes

- Instrumental delivery (ventouse or forceps)
- Ventouse delivery
- Forceps delivery
- Intrapartum caesarean section
- Third or fourth degree perineal trauma
- Blood transfusion
- Admission to an intensive care unit, high dependency unit or specialist unit
- Maternal death (within 42 days of giving birth)
- Other maternal outcomes included: spontaneous vertex delivery, vaginal breech birth, breastfeeding initiation.

Composite maternal outcome measures

- **'Normal birth'**¹ defined as a birth with none of the following: induction of labour, epidural or spinal analgesia, general anaesthetic, forceps or ventouse, caesarean section; episiotomy
 - **'Straightforward birth'**, defined as birth without: caesarean section, forceps or ventouse, third/fourth degree perineal trauma, or blood transfusion.
- 'Maternal interventions and adverse outcomes requiring obstetric care'**
encompassing: augmentation, instrumental delivery, intrapartum caesarean section, general anaesthesia, blood transfusion, 3rd/4th degree tear, maternal admission. The purpose of this composite was to capture interventions and outcomes that would require transfer to an obstetric unit.

2.4 Risks, benefits and resource implications of planned place of birth for low risk women

It is important to note that the evidence from the Birthplace prospective cohort study evaluating the safety of place of birth implicitly takes account of any risks associated with transfer or with giving birth in a setting without immediate access to obstetric or neonatal services. This is because the study design and analysis took an 'intention-to-treat' approach by comparing the outcomes for women and babies by the care setting at the start of care in labour regardless of the setting where the birth actually took place. This fundamentally important element in the design of the Birthplace prospective cohort study was not part of the design of most previous studies and is therefore a major limitation in the interpretation of their findings.

The following tables summarise, **as a plain English summary**, the totality of the evidence arising from the Birthplace prospective cohort study in terms of safety of place of birth in the period 2008-10 when the data were collected. **The relevant scientific reports are recommended for a full presentation and discussion of findings**; also Appendix A for the Birthplace annotated bibliography.

¹ Based on the NCT, RCM and RCOG Maternity Care Working party definition

Box 1: Risks and benefits of planned place of birth for low risk women (Brocklehurst, Hardy et al. 2011, Hollowell, Puddicombe et al. 2011)

- For low risk women, adverse outcomes for the baby¹ were uncommon across all birth settings in England and affected fewer than 1 in 250 births to low risk women.
- There were no differences in adverse outcome for the baby in low risk women who planned birth in a **midwifery unit** compared with low risk women who planned birth in an obstetric unit. Low risk women who planned a **first or subsequent baby** in a midwifery unit had fewer interventions² than women who planned birth in an obstetric unit and around half the rate of caesarean section.
- For low risk women having their **first baby**, a planned **home birth** increased the risk of an adverse outcome for the baby from around 1 in 190 to just under 1 in 110 and there was a fairly high probability of transfer to an obstetric unit during labour or immediately after birth.
- For low risk women having their **second or subsequent baby**, a planned **home birth** did not increase the risks for the baby, it reduced the interventions² for the mother and the chance of transfer to an obstetric unit was low.
- **Parity** and **maternal age** had important effects on maternal interventions and adverse outcomes by planned place of birth and should be taken into account when assessing women and providing information regarding planned place of birth.

Notes

1. For the baby the primary outcome considered was a composite of perinatal mortality and specific neonatal morbidities: stillbirth after the start of care in labour, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, and fractured clavicle
2. The interventions considered included: ventouse delivery, forceps delivery, intrapartum caesarean section, syntocinon augmentation epidural or spinal analgesia, general anaesthesia, active management of the third stage, episiotomy. Adverse outcomes considered included: third/fourth degree perineal trauma, blood transfusion, admission to higher level of care.

Box 2: Effects of maternal characteristics (ethnicity, socio-economic circumstances, age, body mass index and parity) on intervention rates¹ and maternal outcomes² for low risk women (Hollowell, Pillas et al. 2014, Li, Townend et al. 2014, Hollowell, Rowe et al. 2015)

Maternal ethnicity

- Low risk women with a planned birth at home or in a midwifery unit had a lower chance of caesarean section and other interventions during labour than low risk women with a planned birth in an obstetric unit regardless of their ethnicity.
- Across all four birth settings low risk non-White women had an increased chance of having a caesarean section during labour compared with low risk White women.

Socio-economic circumstances

- Having accounted for other maternal characteristics, intervention rates and other maternal outcomes across all birth settings for low risk women were not different for women living in more deprived areas compared with those living in less deprived areas.
- Low risk women planning birth in a midwifery unit or at home had in a lower chance of intervention and a greater chance of a straightforward or normal birth² regardless of whether they lived in a more or less deprived area.

Maternal age

- For low risk women having their **first baby** the chance of intervention increased with maternal age and the chance of having a straightforward or normal birth decreased with increasing maternal age.
- For most low risk women having their **second or subsequent baby** there was no clear trend in interventions and outcomes associated with maternal age.
- For older low risk women having their **second or subsequent baby**, those who had a planned birth at home or in a midwifery unit had a greater chance of a straightforward or normal birth than older women planning birth in an obstetric unit.

Body mass index

- Otherwise healthy women who were obese (BMI 30-35 kg/m²) or very obese (BMI >35 kg/m²) and having their second or subsequent baby had a lower chance of both interventions and adverse maternal outcomes than low risk, normal weight women who were having their first baby. Adverse outcomes for the baby were uncommon but appeared to follow the same pattern.
- Obese and very obese women having their second or subsequent baby who are otherwise healthy and do not have additional risk factors such as diabetes or previous caesarean section may have lower obstetric risks than previously thought.

Notes

1. For findings relating to **ethnicity and area deprivation** see Hollowell, Rowe et al (2015), chapter 4. The interventions and outcomes considered were: instrumental delivery, caesarean section during labour, 'straightforward birth' and 'normal birth'.
2. For findings relating to interventions and maternal outcomes by **maternal age** see Hollowell, Rowe et al (2015), chapter 4 and Li, Townend et al (2014). The interventions and maternal outcomes considered included: instrumental delivery, caesarean section during labour, 'straightforward birth' and 'normal birth'. Additional outcomes reported in Li, Townend et al (2014) include: 'interventions and adverse outcomes requiring obstetric care', augmentation with syntocinon, general anaesthesia, blood transfusion, third/fourth degree perineal trauma and maternal admission for higher level care. The associations between maternal age and transfers are summarised in Box 3 below.
3. For findings relating to **maternal BMI**, see Hollowell, Pillas et al (2014). The following standard cut-offs were used to define BMI groups: underweight (BMI < 18.5 kg/m²), normal (BMI 18.5-24.9 kg/m²), overweight (BMI 25-29.9 kg/m²), obese (BMI 30-35 kg/m²), very obese (BMI > 35 kg/m²). The interventions and maternal outcomes considered included: 'interventions and adverse maternal outcomes requiring obstetric care', and the individual outcomes that formed part of this composite: augmentation with syntocinon, instrumental delivery, intrapartum caesarean section, general anaesthesia, maternal blood transfusion, third/fourth degree perineal tear, and maternal admission for higher level care. For the baby, adverse perinatal outcomes were evaluated using a composite measure encompassing: admission to a neonatal unit within 48 hours of birth, stillbirth after the start of care in labour or early neonatal death.

Box 3: Transfer of care during labour and after birth for low risk women (Schroeder, Petrou et al. 2011, Rowe, Fitzpatrick et al. 2012, Schroeder, Petrou et al. 2012, Rowe, Townend et al. 2013, Hollowell, Rowe et al. 2015)

Frequency of transfer

- It is inevitable that a proportion of women planning birth at home or in a midwifery unit will require transfer to an obstetric unit during labour or soon after birth; **not all these transfers will be urgent** and the chances of a transfer occurring will vary, particularly by parity and maternal age.
- About 1 in 4 low risk women planning birth in an alongside unit transferred to an obstetric unit.
- Transfers from home and free standing midwifery units have potentially more serious clinical and resource implications than transfers from an alongside midwifery unit and are therefore considered further here.
- About 1 in 5 low risk women planning to give birth at home or in a freestanding midwifery unit transferred to an obstetric unit; over two thirds and three quarters did so respectively during labour.
- Failure to progress was the most common reason for transfer from both settings and an indication of fetal distress was the second most common reason for transfer.
- Low risk women having their **first baby** had a 2 in 5 chance of transferring from home and a 1 in 3 chance of transferring from a freestanding midwifery unit. This was compared with about 1 in 10 low risk women having their **second or subsequent baby** transferring from any setting.

Variation in transfer rates by unit and Trust

- There was a greater variation in transfer rates than would be expected by chance in births planned in all three settings and this variation was not explained by maternal characteristics.

Duration of transfer

- For low risk women planning birth at home the median duration of transfer from decision to first assessment in an obstetric unit was 49 minutes. Where the transfer was before birth and for potentially urgent reasons the duration was 42 minutes.
- For low risk women planning birth in a freestanding midwifery unit the median duration of transfer from decision to first assessment in an obstetric unit was 60 minutes. Where the transfer was before birth and for potentially urgent reasons the duration was 50 minutes.
- The median duration of transfer for a potentially urgent reason from a freestanding midwifery unit within 20km of the nearest obstetric unit was 47 minutes. This increased to 55 minutes if the unit was 20-40km away from the obstetric unit and 61 minutes for more remote freestanding units.
- For women giving birth within 60 minutes of transfer, adverse neonatal outcomes occurred in 1-2 % of babies.

Factors affecting transfer

Maternal age

- Maternal age had an important effect on the chance of transfer for low risk women having their **first baby** but not for women having their second or subsequent baby.
- For low risk women having their **first baby** the chance of transfer from a freestanding midwifery unit increased with age.

Gestational age

- Low risk women who gave birth at 38-39 weeks' gestational age generally had a lower chance of transfer from home, a freestanding midwifery unit and an alongside midwifery unit compared with women who gave birth at 40 weeks' gestational age; women who gave birth at 41-42 weeks' generally had a high chance of transfer compared with women who gave birth at 40 weeks'.

Presence of 'complicating conditions'

- The presence of 'complicating conditions' identified at the start of care in labour in low risk women substantially increased the chance of transfer, with the chances doubling or tripling depending on parity and planned birth setting.

Ethnicity

There was no variation in the chances of transfer from any of the three birth settings for low risk women according to the ethnicity of the women or her understanding of English.

Immersion in water for pain relief

- For low risk women having a first baby, use of immersion in water for pain relief reduced the chances of transfer before birth.

Service configuration and distance

- Trusts with more planned home births tended to have lower transfer rates for low risk women planning a first or subsequent birth at home.
- For low risk women having their first baby, larger freestanding midwifery units tended to have lower transfer rates than smaller freestanding units.
- For low risk women having their first baby, freestanding midwifery units situated further from an obstetric unit tended to have a higher transfer rates than freestanding units nearer an obstetric unit.
- Lower transfer rates from freestanding midwifery units were found in larger units situated closer to an obstetric unit. However, the size of freestanding midwifery units and distance from an obstetric unit were correlated; smaller freestanding units tended to be more distant. As a consequence it is not possible to determine whether freestanding unit size and distance from the obstetric unit have independent effects.

Time of day

- Transfers did not occur uniformly throughout the 24 hours period, however, no meaningful patterns of peaks or troughs were evident in transfers from any of the three birth settings.

Resource implications of transfer

- Even taking into account the resource implications of transfer, planned low risk births at home and in midwifery units were still less costly and more cost-effective than planned low risk births in obstetric units.

Notes

1. Findings relating to reasons for **transfer, frequency and factors affecting transfer** are reported in: Hollowell, Puddicombe et al (2011), Birthplace in England Collaborative Group (2011), Rowe, Fitzpatrick et al (2012) and Hollowell, Rowe et al (2015) (chapter 5).
2. Findings relating to **urgency of transfer and transfer duration** are reported in Rowe, Townend et al (2013) and in Hollowell, Rowe et al (2015) (chapter 5)
3. Findings relating to the association between **unit characteristics and service configuration and transfer rates** are reported in: Rowe, Townend et al (2014) and Hollowell, Rowe et al (2015) (chapter 5).
4. Findings relating to use of **immersion in water for pain relief** are reported in Lukasse, Rowe et al (2014).
5. Findings relating to **costs and cost-effectiveness** are reported in Schroeder, Petrou et al (2011) and Schroeder, Petrou et al (2012).
6. Findings relating to **time of day variations** in transfer rates are reported in Hollowell, Rowe et al (2015) (chapter 5).

Box 4: Impact of service configuration and unit characteristics on intervention rates for low risk women with a planned birth in an obstetric unit (Rowe, Townend et al. 2014, Hollowell, Rowe et al. 2015)

- Intervention rates in low risk women varied substantially between obstetric units.
- Not all of the variation in intervention rates between obstetric units could be explained by differences in the characteristics of women giving birth in the units. Nor did the differences appear to be explained by known differences in the characteristics of obstetric units such as size and staffing levels.
- Exploratory analysis suggested that, the provision of a midwifery unit(s) and home births within trusts, the size of the obstetric unit and midwifery staffing levels might account for some, but not all, of the variation in intervention rates between obstetric units.
- Trusts with a greater provision of midwifery units and home births appeared to have higher intervention rates in their low risk planned obstetric unit births. It is unclear why this might have been the case but the size of this effect appeared to be small.
- However, at trust level the higher intervention rates in the low risk obstetric unit births will be more than offset by the lower levels of intervention in low risk births planned in midwifery units and at home.

Notes

1. Findings relating to unit characteristics, service configuration and variations in intervention rates for low risk women planning birth in an obstetric unit are reported in Rowe, Townend et al (2014) and Hollowell, Rowe et al (2015) (chapter 3)
2. The analysis explored variation in the following interventions and maternal outcomes: intrapartum caesarean section, instrumental delivery (forceps or ventouse), 'straightforward vaginal birth' and 'normal birth'. The unit characteristics considered included: size (number of births, number of delivery beds), midwifery 'understaffing', whether the unit had an attached AMU, and the proportion of births in the Trust that took place outside the OU or 'out-of-hospital (home or FMU).

Box 5: Impact of service configuration and unit characteristics on intervention rates for low risk women with a planned birth in an alongside midwifery unit, a freestanding midwifery unit or at home (Hollowell, Rowe et al. 2015)

Alongside midwifery units

- Intervention rates in low risk women varied substantially between alongside midwifery units. The degree of variation appeared to be greatest for women having a first baby.
- This variation was not explained by known differences in the characteristics of women planning birth in the units. In exploratory analysis, the variation was not explained by the known characteristics of the units.

Freestanding midwifery units

- Intervention rates in low risk women varied substantially between freestanding midwifery units in low risk women.
- This variation was not explained by known differences in the characteristics of women planning birth in the units.
- Exploratory analysis suggested that larger freestanding units and units that were nearer an obstetric unit tended to have lower intervention rates in low risk women having a first baby. Conversely smaller, more distant units tended to have higher intervention rates. However, size and proximity tended to be correlated so it is unclear which of these characteristics was most important.

Home births

- In low risk women having a second or subsequent baby and planning a home birth, intervention rates tended to be lower in trusts with a higher proportion of home births.

Notes

1. Findings relating to unit characteristics, service configuration and variations in intervention rates for low risk women planning birth in an alongside midwifery unit, freestanding midwifery unit or at home are reported in Hollowell, Rowe et al (2015) (chapter 3)
2. The analysis explored variation in the following interventions and maternal outcomes: intrapartum caesarean section, instrumental delivery (forceps or ventouse), 'straightforward vaginal birth' and 'normal birth'.

Box 6: Time of day and day of the week variations in interventions and outcomes (Hollowell, Rowe et al. 2015)

- Exploratory findings suggest that for low risk women who plan birth in an obstetric unit instrumental delivery, augmentation and epidural analgesia were more likely in births that occurred during weekday office hours (09.00 – 16.59hrs) than at night or weekends, and that intrapartum caesarean section was more common at night.
- In planned low risk obstetric unit births, there was an afternoon/early evening 'peak' in births in which the women had received augmentation with syntocinon or epidural analgesia.
- Time of day and day of the week was less strongly associated with *interventions and maternal outcomes* in births planned in midwifery units and at home.
- Several explanations for these findings are possible. Diurnal variations in augmentation, epidural analgesia and instrumental delivery may reflect normal circadian rhythms of labour and birth, but the marked variation seen in planned obstetric unit births may suggest possible diurnal variations in clinical thresholds for intervention or other non-clinical factors.

Notes

1. Findings relating to time of day are reported in Hollowell, Rowe et al (2015) (Chapter 6).
2. The interventions and maternal outcomes considered were: intrapartum caesarean section, instrumental delivery (forceps or ventouse), normal birth (as defined on page **Error! Bookmark not defined.**), straightforward birth (as defined page on page 15), birth after epidural analgesia, birth after augmentation of labour with oxytocin

2.5 Risks and benefits of planned place of birth for higher risk women

Whilst the Birthplace programme was primarily concerned with outcomes by planned place of birth for low risk women, data about women at higher risk of complications were also collected. The available data has enabled analyses to be carried out for women potentially at higher risk of adverse outcomes by virtue of their age, ethnicity, body mass index (BMI), past medical history, past obstetric history and post-term pregnancy.

Box 7: Risks and benefits of planned place of birth for higher risk women (Hollowell, Rowe et al. 2015, Li, Townsend et al. 2015)

Box 7

Characteristics of women

- Planned induction of labour was a risk factor in around half of the 'higher risk' women who planned birth in an obstetric unit. The findings summarised below relate to women with other risk factors.
- 'Higher risk' women who planned birth at home or in a freestanding midwifery unit were more likely to be older, white, having their second or subsequent baby, to be married or living with their partner, and living in less socio-economically deprived areas compared with 'higher risk' women planning birth in an obstetric unit.
- 'Higher risk' women who planned birth in an alongside midwifery unit were more similar to the 'higher risk' women who planned birth in an obstetric unit.

Risk factors

- Compared with 'higher risk' women planning birth in an obstetric unit, those planning birth at home or in a midwifery unit were less likely to have multiple risk factors and to have a different distribution of risk factors.
- Being severely obese (BMI >35 kg/m²) was common in all birth settings.
- Previous caesarean section was the most common risk factor in 'higher risk' women having their second or subsequent baby and planning birth in an obstetric unit; and was also a common risk factor in 'higher risk' women planning a home birth (see Box 8).
- Pre-eclampsia or pregnancy induced hypertension was less common in 'higher risk' women planning birth at home or in a midwifery unit than those planning birth in an obstetric unit.
- Post-term pregnancy (amongst women who did not receive planned induction of labour) was more common in 'higher risk' women planning birth at home or in a midwifery unit.
- Fewer 'higher risk' women planning birth at home or in a midwifery unit had 'complicating conditions' at the start of care in labour compared with 'higher risk' women planning birth in an obstetric unit.

Transfers

- The proportion of 'higher risk' women who transferred to an obstetric unit during labour or soon after birth was broadly similar for planned births at home, in an alongside midwifery unit and in a freestanding unit.

Box 7

- The proportion of transfers was higher for 'higher risk' women having their first baby (45-56%) than for 'higher risk' women having their second or subsequent baby (18-23%).
- For women planning birth in a midwifery unit 'higher risk' women were more likely to be transferred than low risk women.
- For women planning birth at home and in midwifery units decisions to transfer were made sooner for 'higher risk' women who had 'complicating conditions' noted at the start of care in labour compared with those who did not.
- Low risk women who were found to have 'complicating conditions' consistently had higher transfer rates than 'higher risk' women without complicating conditions and were transferred sooner after the start of care in labour than both low risk and 'higher risk' women without complicating conditions.

Perinatal and maternal outcomes

- Compared with low risk women planning birth at home, 'higher risk' women planning home birth had a significantly greater chance of an *adverse perinatal outcome* (see notes below for definition).
- The babies of 'higher risk' women who planned birth in an obstetric unit appeared to be more likely to be admitted to a neonatal unit than the babies of higher risk women who planned birth at home but it is unclear if this reflected a real difference in the health of babies in the two groups.
 - Rates of intrapartum related mortality and morbidity were not statistically significantly different between the two groups, but it was not possible to rule out important differences in '*intrapartum related mortality and morbidity*'
- 'Higher risk' women planning birth at home had a lower chance of 'maternal interventions or adverse outcomes requiring obstetric care' and an increased chance of having a 'straightforward birth' compared with 'higher risk' women planning birth in an obstetric unit.

Notes

1. Findings relating to all 'higher risk' women, including women with planned induction of labour, are reported in Hollowell, Puddicombe et al (2011).
2. Additional findings relating to 'higher risk' women but excluding women with planned induction of labour are reported in Hollowell et al 2015 (Chapter 7). Findings relating to outcome in 'higher risk' women planning birth at home compared with 'higher risk' women planning birth in an obstetric unit and compared to low risk women planning birth at home are reported in Li, Townend et al (2015)
3. In this analysis an '*adverse perinatal outcome*' was defined as admission to a neonatal unit within 48 hours of birth for at least two days or the occurrence of any event included in the Birthplace primary outcome (stillbirth after the start of care in labour, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, or fractured clavicle).
4. '*Intrapartum related mortality or morbidity*' refers to events included in the Birthplace primary outcome (stillbirth after the start of care in labour, early neonatal death, neonatal

encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, or fractured clavicle).

Box 8: Risks and benefits of planned vaginal birth at home following previous caesarean section (Rowe, Li et al. 2015)

- The proportion of women who are offered or attempt a vaginal birth after a previous caesarean section (VBAC) is not known.
- Compared with women planning VBAC in an obstetric unit, few women planning VBAC at home had additional pre-existing risk factors and they were less likely to have 'complicating conditions' at the start of care in labour.
- Over 1 in 2 women with one previous birth who attempted VBAC at home transferred during or soon after birth.
- Around 1 in 4 women with two or more previous births attempting VBAC at home transferred during or soon after birth.
- As with all transfers, failure to progress was the most common reason overall for transfer; repair or perinatal trauma was the most common reason for transfer after birth.
- Compared with women planning a VBAC in an obstetric unit, women planning a VBAC at home were significantly more likely to have a vaginal birth. The number of adverse outcomes in both settings was small, but the risk of an adverse outcome for the woman or the baby was 2-3%, and transfer rates were high.
- No change in current guidance (that women who have had a caesarean section in the past should plan birth in an obstetric unit) is recommended on the basis of these findings.

3. Implications for policy and practice

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This section draws together the implications for policy and practice of the evidence from the whole review included in all four of the reports. Implications for policy and practice following from the individual studies conducted for this evidence review are discussed in further detail within the individual reports 2 to 4.

Choice of place of birth for low risk women has been government policy in England since the early 1990s. It is clear that the available evidence, primarily from the Birthplace in England study, supports a policy of offering low risk women a choice of birth setting. Importantly however, the risks and benefits of the four different birth settings are different for women having their first baby and those having their second or subsequent baby and, for women having a first baby, the risks and benefits also vary with the woman's age. As a consequence the information women require to make an informed choice about their planned place of birth needs to be personalised according to their individual circumstances. There is little evidence available in the literature to suggest that tailored information is being provided, although it should be acknowledged that the evidence base relating to this is now rather old.

As recommended by NICE, the information provided to women about their birth place options should include information about the chances of transfer, and the risk of obstetric interventions and adverse maternal and neonatal outcomes associated with each birth setting, tailored according to whether this is their first or subsequent baby. Further evidence from Birthplace indicates that for women having their first baby information should also be tailored according to their age. In particular women having their first birth and contemplating birth at home need to be made aware that, compared with giving birth in an obstetric unit, they have an increased chance of adverse outcomes and a high probability of needing to transfer to an obstetric unit in labour or soon afterwards. Older women (40yrs+) having their first baby and women more than one week past their due date also need to be made aware that they will have a high chance of needing transfer from home or from a midwifery unit.

For choice to be perceived by women as a realistic option, it is self-evident that the relevant services need to be provided within the woman's neighbourhood. In addition, however, the evidence suggests that women's ability to exercise choice is influenced by the way in which information and options are presented, typically at the booking visit. Women need to be aware that they have the right to exercise choice and that when they make a choice they will be appropriately supported in the decision making process by informed health care professionals. Available evidence indicates that some women may wish to change their mind about their place of birth preference as their pregnancy progresses, but may feel that this is not possible or feel unsupported in this decision making. It is also important therefore, that women have the opportunity to review and alter their plans during pregnancy if they wish.

Guidance from NICE recommends that information about choice of place of birth is given locally by professionals speaking to women using non-judgemental words and behaviour. Women may also access other sources of information, however, particularly from the internet. Care should be taken to ensure that official sources of information online are consistent with or supportive of informed decision making for women. For example, the NHS Choices website² does not currently list all midwifery units and the statistics on interventions rates for hospitals do not distinguish between births planned in alongside midwifery units and obstetric units within the same trust, nor does the site provide local statistics about transfer rates or intervention rates in births planned in freestanding midwifery units or at home

The evidence shows that women's expectations regarding choice are influenced by the options on offer and that women's ability to exercise choice can be influenced by the way in which these options are presented. It is also clear that different women value different service attributes. Attributes of services which are almost universally valued by women include having local services, being seen by the same midwife or group of midwives during antenatal care, and some degree of continuity of carer during labour and birth, that is being cared for by a known midwife or by the same midwife throughout labour and birth. Most, but not all, women have a preference for a degree of control and involvement in decision making. More marked differences are seen between women in their degree of expressed preference for having obstetric staff on site, the availability of epidural versus other forms of pain relief and a 'homely' versus clinical environment. Evidence from a number of studies indicates that for some women, while they value the type of care provided by a midwifery-led unit, safety for them means giving birth in a setting where trained doctors are readily available should the need arise. For other women, their expressed needs and preferences are best met by care in a freestanding midwifery unit or at home. It is also important to note that women's preferences can be influenced by local initiatives. For example, midwifery-led choices can be made more accessible to women by training and supporting midwives in providing information and guidance to women. This suggests that consideration should be given as to how to provide services and aspects of services which most women value whilst offering a choice of options to enable women to access a service that best fits their needs and preferences, especially where these are not universal preferences.

Differences in women's preferences can only be met by providing a range of services. This should include, as a minimum, an obstetric unit, an alongside midwifery unit and provision to support home births, but consideration should also be given to the needs of women whose preferred option is a freestanding midwifery unit. This latter option may be particularly important in rural areas relatively remote from the nearest obstetric unit or where for other reasons there is strong support or demand for a local unit. The additional analyses conducted for this review using the Birthplace prospective cohort study data were carried out to compare outcomes in births planned in alongside midwifery units and freestanding units. The findings demonstrate that outcomes for babies are similar in the two settings, but that women who plan birth in an freestanding midwifery unit are more likely to experience a spontaneous vaginal birth and less likely to experience serious perineal trauma compared with women who plan birth in an alongside midwifery unit. Note should be taken however, of the fact that some differences may be due to unmeasured confounding factors and

² <http://www.nhs.uk/conditions/pregnancy-and-baby/pages/where-can-i-give-birth.aspx>

specifically to the possibility that women who opt for a birth in a freestanding unit are a self-selecting group who may be more open to approaches to labour and delivery that minimise interventions. Nevertheless, these findings should be interpreted as broadly supportive of providing the option of freestanding midwifery unit care for women who have a preference for it.

Guidance from NICE recommends that all areas should provide access to all four birth settings. This could potentially involve a substantial increase in FMU provision which may not be achievable in all areas. It may therefore be prudent to consider a cautious expansion in the provision of freestanding units, perhaps by targeting areas where there is a clear demand for services supporting birth with minimal intervention and where there is evidence there is sufficient demand to make a freestanding unit viable. A study of freestanding units by the Royal College of Midwives in 2013 showed that in 2001 there were 53 freestanding units and 59 in 2013, but in the period 2001 to 2013 30 new freestanding units had opened and 21 had permanently closed suggesting there may be considerable 'churn' in terms of requirements and viability of these units in some places (BirthChoiceUK 2013). There was also evidence of considerable variation between regions in the number of births in freestanding units over the 10 year period 2001 to 2011 with the southwest having the highest number of births in freestanding units and the east midlands the lowest, with the difference between the two being between four and six times as many. Although not discussed in the report one might speculate that the geographical distribution of the populations and relative spread and size of urban areas versus remote and rural in these two regions may have, in part, led to this difference in service provision.

In all but a few areas, planned home births account for only a very small proportion of births and there is no recent data on the proportion of women who might consider a home birth. Anecdotal evidence suggests that home birth services are being developed and expanded in some areas. Service commissioners and providers contemplating new provision or the expansion of home birth services may wish to consider the evidence from exploratory analyses of the Birthplace data, which suggests that trusts which supported more home births appeared to achieve better maternal outcomes in planned home births compared with those which supported fewer home births.

Whichever options for care are available it is essential that the information provided for women enables them to clearly distinguish between the different settings and the type of care available in each so that they can make an informed choice. The evidence suggests that women may not always be clear about the distinction between care in an obstetric unit and in a midwifery unit, or about the differences between the two different types of midwifery unit. These distinctions may be particularly important in hospitals where, for example, the alongside midwifery unit is the 'default' option for low risk women, or where the freestanding midwifery unit is located on a hospital site which does not provide obstetric care. In the former case it may not be clear, for instance, that epidural pain relief would only be available after transfer to the obstetric unit. In the latter it may not be immediately evident, unless made explicit, that transfer to an obstetric unit would involve a journey in an ambulance or other form of transport and that obstetric or neonatal care will not be provided on site if complications developed.

National guidance is supportive of an increase in the provision and geographical spread of midwifery-led options for care. In order to achieve this, measures are needed to influence the

beliefs of all health care professionals involved in the commissioning and delivery of maternity care. The evidence suggests that currently an obstetric unit birth is the 'default option' for many low risk women whose preferences may be better met in a midwifery-led setting. The cultural shifts required to achieve such a change and to deliver the current national guidance of midwifery-led care for low risk women are likely to be considerable in some places and there may also be tensions with aspirations to meet the Royal College of Obstetricians and Gynaecologists recommendation for 24/7 consultant presence on labour ward for units delivering over 6,000 births a year.

The Birthplace findings indicated that the expansion of provision of midwifery-led settings for birth could potentially reduce intervention rates in 'low risk' women and would potentially be a cost effective use of resources. It is important to note however, that these findings were based on the configuration of services and practices (admission and transfer criteria) in operation in 2008-10. In 2010 in England there were 180 obstetric units, 51 alongside midwifery units and 56 freestanding units. This is compared to 2015 figures of 160 obstetric units, 97 alongside units and 62 freestanding units. Thus the impact of major changes, for example centralisation of services in larger units (obstetric and/or alongside midwifery units), changes to unit admission criteria or a further expansion of midwifery units, will need to be monitored and evaluated. Similarly a change in configuration of services, for example, to increase the consultant presence on labour ward to 24/7 resident cover will have implications for a trust's capacity, within a fixed budget, to increase midwifery unit provision and vice versa since both options would be likely to require an expansion of staffing. The effects of all these types of changes in the 'intervention' i.e. the configuration and nature of the care and support for labour and delivery, will need to be monitored and evaluated and cannot automatically be assumed to result in the same outcomes as found in 2008-2010.

The case studies presented in this report indicate that expansion of the consultant complement to 26 would be required to achieve full 24/7 resident consultant cover on labour ward with prospective cover for holidays. Such a model is only likely to be a realistic option, within existing budgets, in large urban hospitals with a high case load of 'high-risk' or higher tariff women. Again, as illustrated by the case studies, consideration would need to be given as to whether available resources would be best used providing additional consultant or midwife cover at other times or in other areas in order to improve outcomes. For example, for the former more daytime consultant cover on labour ward would be one option, or for the latter additional midwives to staff a midwifery unit or expand staffing within an existing midwifery unit.

'One-size' clearly will not fit all and the judgement over the configuration and the nature of maternity services provided will be dependent upon the population each trust serves, not only in terms of the clinical risk status of the women they provide care for, but also in terms of other factors which are likely to be relevant, including ethnicity, socio-economic deprivation and the geographical distribution of their catchment population. The systematic review identified that there is insufficient research evidence comparing outcomes between a model of care in which consultant obstetricians are resident 24/7 on labour ward and other models of consultant cover to reach robust conclusions.

Whilst this evidence review relating to safety has concentrated for the most part on low risk women, consideration also needs to be given to the care of some higher risk women. The NICE guidelines are clear that planned obstetric unit birth is advised for higher risk women nevertheless, some higher

risk women may wish to avoid a planned obstetric unit birth and may wish to choose an alternative option. By definition, being at higher risk, they are unlikely to meet the admission criteria for midwifery-led care, although some units will accept some higher risk women and some trusts have dedicated 'out-with guideline' clinics. Anecdotal evidence suggests that in the absence of alternative options, a proportion of these women may instead choose to plan their birth at home rather than in an obstetric unit. In the Birthplace cohort study the planned home birth group had the highest proportion of higher risk women compared with the other midwifery-led settings. The evidence from Birthplace showed that intervention rates were lower for 'higher risk' women planning birth at home compared with in an obstetric unit, but it was not possible to rule out important differences in serious adverse perinatal outcomes between the two groups so a change in the current guidance for these women could not be recommended. Consideration needs to be given as to the strategy most likely to achieve the best outcomes for this group of women who may wish to avoid an obstetric unit birth 'at all costs' or who may simply want to experience some of the benefits afforded by midwifery-led options. One possibility is a pathway which enables higher risk women to review and discuss their options with experienced obstetric and midwifery staff. For some women in this context it may be considered appropriate, for example, to plan birth in an alongside midwifery unit.

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Appendix A: Annotated bibliography of Birthplace in England cohort study publications

Brocklehurst, P., P. Hardy, J. Hollowell, L. Linsell, A. Macfarlane, C. McCourt, N. Marlow, A. Miller, M. Newburn, S. Petrou, D. Puddicombe, M. Redshaw, R. Rowe, J. Sandall, L. Silverton and M. Stewart (2011). "Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study." *BMJ* 343: d7400. doi: <http://dx.doi.org/10.1136/bmj.d7400>

OBJECTIVE: To compare perinatal outcomes, maternal outcomes, and interventions in labour by planned place of birth at the start of care in labour for women with low risk pregnancies. DESIGN: Prospective cohort study.

SETTING: England: all NHS trusts providing intrapartum care at home, all freestanding midwifery units, all alongside midwifery units (midwife led units on a hospital site with an obstetric unit), and a stratified random sample of obstetric units.

PARTICIPANTS: 64,538 eligible women with a singleton, term (≥ 37 weeks gestation), and "booked" pregnancy who gave birth between April 2008 and April 2010. Planned caesarean sections and caesarean sections before the onset of labour and unplanned home births were excluded.

MAIN OUTCOME MEASURE: A composite primary outcome of perinatal mortality and intrapartum related neonatal morbidities (stillbirth after start of care in labour, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus, or fractured clavicle) was used to compare outcomes by planned place of birth at the start of care in labour (at home, freestanding midwifery units, alongside midwifery units, and obstetric units).

RESULTS: There were 250 primary outcome events and an overall weighted incidence of 4.3 per 1000 births (95% CI 3.3 to 5.5). Overall, there were no significant differences in the adjusted odds of the primary outcome for any of the non-obstetric unit settings compared with obstetric units. For nulliparous women, the odds of the primary outcome were higher for planned home births (adjusted odds ratio 1.75, 95% CI 1.07 to 2.86) but not for either midwifery unit setting. For multiparous women, there were no significant differences in the incidence of the primary outcome by planned place of birth. Interventions during labour were substantially lower in all non-obstetric unit settings. Transfers from non-obstetric unit settings were more frequent for nulliparous women (36% to 45%) than for multiparous women (9% to 13%).

CONCLUSIONS: The results support a policy of offering healthy women with low risk pregnancies a choice of birth setting. Women planning birth in a midwifery unit and multiparous women planning birth at home experience fewer interventions than those planning birth in an obstetric unit with no impact on perinatal outcomes. For nulliparous women, planned home births also have fewer interventions but have poorer perinatal outcomes.

Hollowell, J., R. Rowe, J. Townend, M. Knight, Y. Li, L. Linsell, M. Redshaw, P. Brocklehurst, A. Macfarlane, N. Marlow, C. McCourt, M. Newburn, J. Sandall and L. Silverton (2015). "The Birthplace in England national prospective cohort study: further analyses to enhance policy and service delivery decision-making for planned place of birth. *Health Services and Delivery Research.*" 3(6). <http://www.ncbi.nlm.nih.gov/books/NBK311289/>

BACKGROUND: Evidence from the Birthplace in England Research Programme supported a policy of offering 'low risk' women a choice of birth setting, but a number of unanswered questions remained.

AIMS: This project aimed to provide further evidence to support the development and delivery of maternity services and inform women's choice of birth setting: specifically, to explore maternal and organisational factors associated with intervention, transfer and other outcomes in each birth setting in 'low risk' and 'higher risk' women.

DESIGN: Five component studies using secondary analysis of the Birthplace prospective cohort study (studies 2-5) and ecological analysis of unit/NHS trust-level data (studies 1 and 5).

SETTING: Obstetric units (OUs), alongside midwifery units (AMUs), freestanding midwifery units (FMUs) and planned home births in England. Studies 1-4 focused on 'low risk' women with 'term' pregnancies planning vaginal birth in 43 AMUs (n = 16,573), in 53 FMUs (n = 11,210), at home in 147 NHS trusts (n = 16,632) and in a stratified, random sample of 36 OUs (n = 19,379) in 2008-10. Study 5 focused on women with pre-existing medical and obstetric risk factors ('higher risk' women).

MAIN OUTCOME MEASURES: Interventions (instrumental delivery, intrapartum caesarean section), a measure of low intervention ('normal birth'), a measure of spontaneous vaginal birth without complications ('straightforward birth'), transfer during labour and a composite measure of adverse perinatal outcome ('intrapartum-related mortality and morbidity' or neonatal admission within 48 hours for > 48 hours). In studies 1 and 3, rates of intervention/maternal outcome and transfer were adjusted for maternal characteristics.

ANALYSIS: We used (a) funnel plots to explore variation in rates of intervention/maternal outcome and transfer between units/trusts, (b) simple, weighted linear regression to evaluate associations between unit/trust characteristics and rates of intervention/maternal outcome and transfer, (c) multivariable Poisson regression to evaluate associations between planned place of birth, maternal characteristics and study outcomes, and (d) logistic regression to investigate associations between time of day/day of the week and study outcomes.

RESULTS: Study 1 - unit-/trust-level variations in rates of interventions, transfer and maternal outcomes were not explained by differences in maternal characteristics. The magnitude of identified associations between unit/trust characteristics and intervention, transfer and outcome rates was generally small, but some aspects of configuration were associated with rates of transfer and intervention. Study 2 - 'low risk' women planning non-OU birth had a reduced risk of intervention irrespective of ethnicity or area deprivation score. In nulliparous women planning non-OU birth the risk of intervention increased with increasing age, but women of all ages planning non-OU birth experienced a reduced risk of intervention. Study 3 - parity, maternal age, gestational age and 'complicating conditions' identified at the start of care in labour were independently associated with variation in the risk of transfer in 'low risk' women planning non-OU birth. Transfers did not vary by time of day/day of the week in any meaningful way. The duration of transfer from planned FMU and home births was around 50-60 minutes; transfers for 'potentially urgent' reasons were quicker than transfers for 'non-urgent' reasons. Study 4 - the occurrence of some interventions varied by time of the day/day of the week in 'low risk' women planning OU birth. Study 5 - 'higher risk' women planning birth in a non-OU setting had fewer risk factors than 'higher risk' women planning OU birth and these risk factors were different. Compared with 'low risk' women planning home birth, 'higher risk' women planning home birth had a significantly increased risk of our composite adverse perinatal outcome measure. However, in 'higher risk' women, the risk of this outcome was lower in planned home births than in planned OU births, even after adjustment for clinical risk factors.

CONCLUSIONS: Expansion in the capacity of non-OU intrapartum care could reduce intervention rates in 'low risk' women, and the benefits of midwifery-led intrapartum care apply to all 'low risk' women irrespective of age, ethnicity or area deprivation score. Intervention rates differ considerably between units, however, for reasons that are not understood. The impact of major changes in the configuration of maternity care on outcomes should be monitored and evaluated. The impact of non-clinical factors, including labour ward practices, staffing and skill mix and women's preferences and expectations, on intervention requires further investigation. All women planning non-OU birth should be informed of their chances of transfer and, in particular, older nulliparous women and those more than 1 week past their due date should be advised of their increased chances of transfer. No change in the guidance on planning place of birth for 'higher risk' women is recommended, but research is required to evaluate the safety of planned AMU birth for women with selected relatively common risk factors.

Hollowell, J., D. Pillas, R. Rowe, L. Linsell, M. Knight and P. Brocklehurst (2014). "The impact of maternal obesity on intrapartum outcomes in otherwise low risk women: secondary analysis of the Birthplace national prospective cohort study." *BJOG: An International Journal of Obstetrics & Gynaecology* 121(3): 343-355. <http://dx.doi.org/10.1111/1471-0528.12437>

OBJECTIVES: To evaluate the impact of maternal BMI on intrapartum interventions and adverse outcomes that may influence choice of planned birth setting in healthy women without additional risk factors.

DESIGN: Prospective cohort study.

SETTING: Stratified random sample of English obstetric units.

SAMPLE: 17230 women without medical or obstetric risk factors other than obesity.

METHODS: Multivariable log Poisson regression was used to evaluate the effect of BMI on risk of intrapartum interventions and adverse maternal and perinatal outcomes adjusted for maternal characteristics.

MAIN OUTCOME MEASURES: Maternal intervention or adverse outcomes requiring obstetric care (composite of: augmentation, instrumental delivery, intrapartum caesarean section, general anaesthesia, blood transfusion, 3rd/4th degree perineal tear); neonatal unit admission or perinatal death.

RESULTS: In otherwise healthy women, obesity was associated with an increased risk of augmentation, intrapartum caesarean section and some adverse maternal outcomes but when interventions and outcomes requiring obstetric care were considered together, the magnitude of the increased risk was modest (adjusted RR 1.12, 95% CI 1.02–1.23, for BMI > 35 kg/m² relative to low risk women of normal weight). Nulliparous low risk women of normal weight had higher absolute risks and were more likely to require obstetric intervention or care than otherwise healthy multiparous women with BMI > 35 kg/m² (maternal composite outcome: 53% versus 21%). The perinatal composite outcome exhibited a similar pattern.

CONCLUSIONS: Otherwise healthy multiparous obese women may have lower intrapartum risks than previously appreciated. BMI should be considered in conjunction with parity when assessing the potential risks associated with birth in non-obstetric unit settings.

Li, Y., J. Townend, R. Rowe, P. Brocklehurst, M. Knight, L. Linsell, A. Macfarlane, C. McCourt, M. Newburn, N. Marlow, D. Pasupathy, M. Redshaw, J. Sandall, L. Silverton and J. Hollowell (2015). "Perinatal and maternal outcomes in planned home and obstetric unit births in women at 'higher risk' of complications: secondary analysis of the Birthplace national prospective cohort study." *BJOG: An International Journal of Obstetrics & Gynaecology* 122(5): 741-753. <http://dx.doi.org/10.1111/1471-0528.13283>

OBJECTIVE: To explore and compare perinatal and maternal outcomes in women at 'higher risk' of complications planning home versus obstetric unit (OU) birth.

DESIGN: Prospective cohort study. Setting OUs and planned home births in England.

POPULATION: 8180 'higher risk' women in the Birthplace cohort.

METHODS: We used Poisson regression to calculate relative risks adjusted for maternal characteristics. Sensitivity analyses explored possible effects of differences in risk between groups and alternative outcome measures.

MAIN OUTCOME MEASURES: Composite perinatal outcome measure encompassing 'intrapartum related mortality and morbidity' (intrapartum stillbirth, early neonatal death, neonatal encephalopathy, meconium aspiration syndrome, brachial plexus injury, fractured humerus or clavicle) and neonatal admission within 48 hours for more than 48 hours. Two composite maternal outcome measures capturing intrapartum interventions/adverse maternal outcomes and straightforward birth.

RESULTS: The risk of 'intrapartum related mortality and morbidity' or neonatal admission for more than 48 hours was lower in planned home births than planned OU births [adjusted relative risks (RR) 0.50, 95% CI 0.31–0.81]. Adjustment for clinical risk factors did not materially affect this finding. The direction of effect was reversed for the more restricted outcome measure 'intrapartum related mortality and morbidity' (RR adjusted for parity 1.92, 95% CI 0.97–3.80). Maternal interventions were lower in planned home births.

CONCLUSIONS: The babies of 'higher risk' women who plan birth in an OU appear more likely to be admitted to neonatal care than those whose mothers plan birth at home, but it is unclear if this reflects a real difference in morbidity. Rates of intrapartum related morbidity and mortality did not differ statistically significantly between settings at the 5% level but a larger study would be required to rule out a clinically important difference between the groups.

Li, Y., J. Townend, R. Rowe, M. Knight, P. Brocklehurst and J. Hollowell (2014). "The effect of maternal age and planned place of birth on intrapartum outcomes in healthy women with straightforward pregnancies: Secondary analysis of the Birthplace national prospective cohort study." *BMJ Open* 4(1). <http://dx.doi.org/10.1136/bmjopen-2013-004026>

OBJECTIVES: To describe the relationship between maternal age and intrapartum outcomes in 'low-risk' women; and to evaluate whether the relationship between maternal age and intrapartum interventions and adverse outcomes differs by planned place of birth.

DESIGN: Prospective cohort study.

SETTING: Obstetric units (OUs), midwifery units and planned home births in England.

PARTICIPANTS: 63 371 women aged over 16 without known medical or obstetric risk factors, with singleton pregnancies, planning vaginal birth.

METHODS: Log Poisson regression was used to evaluate the association between maternal age, modelled as a continuous and categorical variable, and risk of intrapartum interventions and adverse maternal and perinatal outcomes.

MAIN OUTCOME MEASURES: Intrapartum caesarean section, instrumental delivery, syntocinon augmentation and a composite measure of maternal interventions/ adverse outcomes requiring obstetric care encompassing augmentation, instrumental delivery, intrapartum caesarean section, general anaesthesia, blood transfusion, third-degree/fourth-degree tear, maternal admission; adverse perinatal outcome (encompassing neonatal unit admission or perinatal death).

RESULTS: Interventions and adverse maternal outcomes requiring obstetric care generally increased with age, particularly in nulliparous women. For nulliparous women aged 16-40, the risk of experiencing an intervention or adverse outcome requiring obstetric care increased more steeply with age in planned non-OU births than in planned OU births (adjusted RR 1.21 per 5-year increase in age, 95% CI 1.18 to 1.25 vs adjusted RR 1.12, 95% CI 1.10 to 1.15) but absolute risks were lower in planned non-OU births at all ages. The risk of neonatal unit admission or perinatal death was significantly raised in nulliparous women aged 40+ relative to women aged 25-29 (adjusted RR 2.29, 95% CI 1.28 to 4.09).

CONCLUSIONS: At all ages, 'low-risk' women who plan birth in a non-OU setting tend to experience lower intervention rates than comparable women who plan birth in an OU. Younger nulliparous women appear to benefit more from this reduction than older nulliparous women.

Lukasse, M., R. Rowe, J. Townend, M. Knight and J. Hollowell (2014). "Immersion in water for pain relief and the risk of intrapartum transfer among low risk nulliparous women: secondary analysis of the Birthplace national prospective cohort study." *BMC Pregnancy & Childbirth* 14(1): 60. <http://dx.doi.org/10.1186/1471-2393-14-60>

BACKGROUND: Immersion in water during labour is an important non-pharmacological method to manage labour pain, particularly in midwifery-led care settings where pharmacological methods are

limited. This study investigates the association between immersion for pain relief and transfer before birth and other maternal outcomes.

METHODS: A prospective cohort study of 16,577 low risk nulliparous women planning birth at home, in a freestanding midwifery unit (FMU) or in an alongside midwifery unit (AMU) in England between April 2008 and April 2010.

RESULTS: Immersion in water for pain relief was common; 50% in planned home births, 54% in FMUs and 38% in AMUs. Immersion in water was associated with a lower risk of transfer before birth for births planned at home (adjusted RR 0.88; 95% CI 0.79-0.99), in FMUs (adjusted RR 0.59; 95% CI 0.50-0.70) and in AMUs (adjusted RR 0.78; 95% CI 0.69-0.88). For births planned in FMUs, immersion in water was associated with a lower risk of intrapartum caesarean section (RR 0.61; 95% CI 0.44-0.84) and a higher chance of a straightforward vaginal birth (RR 1.09; 95% CI 1.04-1.15). These beneficial effects were not seen in births planned at home or AMUs.

CONCLUSIONS: Immersion of water for pain relief was associated with a significant reduction in risk of transfer before birth for nulliparous women. Overall, immersion in water was associated with fewer interventions during labour. The effect varied across birth settings with least effect in planned home births and a larger effect observed for planned FMU births.

Rowe, R., Y. Li, M. Knight, P. Brocklehurst and J. Hollowell (2015). "Maternal and perinatal outcomes in women planning vaginal birth after caesarean (VBAC) at home in England: secondary analysis of the Birthplace national prospective cohort study." *BJOG: An International Journal of Obstetrics & Gynaecology* <http://dx.doi.org/10.1111/1471-0528.13565>.

OBJECTIVE: To compare vaginal birth rates in women planning vaginal birth after caesarean (VBAC) at home versus in an obstetric unit (OU) and explore transfer rates in women planning home VBAC.

DESIGN: Prospective cohort study.

SETTING: OUs and planned home births in England.

POPULATION: 1436 women planning VBAC in the Birthplace cohort, including 209 planning home VBAC.

METHODS: We used Poisson regression to calculate relative risks adjusted for maternal characteristics. Main outcome measures Main outcomes: (i) vaginal birth and (ii) transfer from planned home birth to OU during labour or immediately after birth. Secondary outcomes: (i) composite of maternal blood transfusion or admission to higher level care, (ii) stillbirth or Apgar score <7 at 5 minutes, (iii) neonatal unit admission.

RESULTS: Planned VBAC at home was associated with a statistically significant increase in the chances of having a vaginal birth compared with planned VBAC in an OU (adjusted relative risk 1.15, 95% confidence interval 1.06–1.24). The risk of an adverse maternal outcome was around 2–3% in both settings, with a similar risk of an adverse neonatal outcome. Transfer rates were high (37%) and varied markedly by parity (para 1, 56.7% versus para 2+, 24.6%).

CONCLUSION: Women in the cohort who planned VBAC at home had an increased chance of a vaginal birth compared with those planning VBAC in an OU, but transfer rates were high, particularly for women with only one previous birth, and the risk of an adverse maternal or perinatal outcome was around 2–3%. No change in guidance can be recommended. Tweetable abstract Higher vaginal birth rates in planned VBAC at home versus in OU but 2–3% adverse outcomes and high transfer rate.

Rowe, R. E., R. Fitzpatrick, J. Hollowell and J. J. Kurinczuk (2012). "Transfers of women planning birth in midwifery units: data from the Birthplace prospective cohort study." BJOG: An International Journal of Obstetrics & Gynaecology 119(9): 1081-1090. <http://dx.doi.org/10.1111/j.1471-0528.2012.03414.x>

OBJECTIVE: To examine the percentage of women transferred, reasons for transfer and factors associated with the transfer of women planning birth in midwifery units (MUs).

DESIGN: Prospective cohort study.

SETTING: All freestanding midwifery units (FMUs) and alongside midwifery units (AMUs) in England.

PARTICIPANTS: Twenty-nine thousand, two hundred and forty-eight eligible women with a singleton, term and 'booked' pregnancy, planning birth in an MU between April 2008 and April 2010.

METHODS: Multivariable logistic regression was used to explore the sociodemographic and clinical characteristics associated with transfer.

MAIN OUTCOME MEASURES: Transfer during labour or within 24 hours of birth.

RESULTS: Over one in four women were transferred from AMUs and over one in five from FMUs. In both types of MU, compared with multiparous women aged 25–29 years, nulliparous women aged <20 years had higher odds of transfer (FMU-adjusted odds ratio [OR], 4.5; 95% confidence interval [CI], 3.10–6.57; AMU-adjusted OR, 2.6; 95% CI, 2.18–2.06), and the odds of transfer increased with increasing age. Nulliparous women aged ≥35 years in FMUs had 7.4 times the odds of transfer (95% CI, 5.43–10.10) and, in AMUs, 6.0 times the odds of transfer (95% CI, 4.81–7.41). Starting labour care after 40 weeks of gestation and the presence of complicating conditions at the start of labour care were also independently associated with a higher risk of transfer.

CONCLUSIONS: Transfer from MUs is common, especially for first-time mothers. This study provides evidence on the maternal characteristics associated with an increased risk of transfer, which can be used to inform women's choices about place of birth.

Rowe, R. E., J. Townend, P. Brocklehurst, M. Knight, A. Macfarlane, C. McCourt, M. Newburn, M. Redshaw, J. Sandall, L. Silverton and J. Hollowell (2013). "Duration and urgency of transfer in births planned at home and in freestanding midwifery units in England: Secondary analysis of the birthplace national prospective cohort study." BMC Pregnancy and Childbirth 13(224). <http://dx.doi.org/10.1186/1471-2393-13-224>

BACKGROUND: In England, there is a policy of offering healthy women with straightforward pregnancies a choice of birth setting. Options may include home or a freestanding midwifery unit (FMU). Transfer rates from these settings are around 20%, and higher for nulliparous women. The duration of transfer is of interest because of the potential for delay in access to specialist care and is also of concern to women. We aimed to estimate the duration of transfer in births planned at home and in FMUs and explore the effects of distance and urgency on duration.

METHODS: This was a secondary analysis of data collected in a national prospective cohort study including 27,842 'low risk' women with singleton, term, 'booked' pregnancies, planning birth in FMUs or at home in England from April 2008 to April 2010. We described transfer duration using the median and interquartile range, for all transfers and those for reasons defined as potentially urgent or non-urgent, and used cumulative distribution curves to compare transfer duration by urgency. We explored the effect of distance for transfers from FMUs and described outcomes in women giving birth within 60 minutes of transfer.

RESULTS: The median overall transfer time, from decision to transfer to first OU assessment, was shorter in transfers from home compared with transfers from FMUs (49 vs 60 minutes; $p < 0.001$). The median duration of transfers before birth for potentially urgent reasons (home 42 minutes, FMU 50 minutes) was 8-10 minutes shorter compared with transfers for non-urgent reasons. In transfers for potentially urgent reasons, the median overall transfer time from FMUs within 20 km of an OU was 47 minutes, increasing to 55 minutes from FMUs 20-40 km away and 61 minutes in more

remote FMUs. In women who gave birth within 60 minutes after transfer, adverse neonatal outcomes occurred in 1-2% of transfers.

CONCLUSIONS: Transfers from home or FMU commonly take up to 60 minutes from decision to transfer, to first assessment in an OU, even for transfers for potentially urgent reasons. Most transfers are not urgent and emergencies and adverse outcomes are uncommon, but urgent transfer is more likely for nulliparous women.

Rowe, R. E., J. Townend, P. Brocklehurst, M. Knight, A. Macfarlane, C. McCourt, M. Newburn, M. Redshaw, J. Sandall, L. Silverton and J. Hollowell (2014). "Service configuration, unit characteristics and variation in intervention rates in a national sample of obstetric units in England: an exploratory analysis." *BMJ Open* 4(5). <http://dx.doi.org/10.1136/bmjopen-2014-005551>

OBJECTIVES: To explore whether service configuration and obstetric unit (OU) characteristics explain variation in OU intervention rates in 'low-risk' women.

DESIGN: Ecological study using funnel plots to explore unit-level variations in adjusted intervention rates and simple linear regression, stratified by parity, to investigate possible associations between unit characteristics/configuration and adjusted intervention rates in planned OU births.

Characteristics considered: OU size, presence of an alongside midwifery unit (AMU), proportion of births in the National Health Service (NHS) trust planned in midwifery units or at home and midwifery 'under' staffing.

SETTING: 36 OUs in England.

PARTICIPANTS: 'Low-risk' women with a 'term' pregnancy planning vaginal birth in a stratified, random sample of 36 OUs.

MAIN OUTCOME MEASURES: Adjusted rates of intrapartum caesarean section, instrumental delivery and two composite measures capturing birth without intervention ('straightforward' and 'normal' birth).

RESULTS: Funnel plots showed unexplained variation in adjusted intervention rates. In NHS trusts where proportionately more non-OU births were planned, adjusted intrapartum caesarean section rates in the planned OU births were significantly higher (nulliparous: $R^2=31.8\%$, coefficient=0.31, $p=0.02$; multiparous: $R^2=43.2\%$, coefficient=0.23, $p=0.01$), and for multiparous women, rates of 'straightforward' ($R^2=26.3\%$, coefficient=-0.22, $p=0.01$) and 'normal' birth ($R^2=17.5\%$, coefficient=0.24, $p=0.01$) were lower. The size of the OU (number of births), midwifery 'under' staffing levels (the proportion of shifts where there were more women than midwives) and the presence of an AMU were associated with significant variation in some interventions.

CONCLUSIONS: Trusts with greater provision of non-OU intrapartum care may have higher intervention rates in planned 'low-risk' OU births, but at a trust level this is likely to be more than offset by lower intervention rates in planned non-OU births. Further research using high quality data on unit characteristics and outcomes in a larger sample of OUs and trusts is required.

Schroeder, E., S. Petrou, N. Patel, J. Hollowell, D. Puddicombe, M. Redshaw and P. Brocklehurst (2012). "Cost effectiveness of alternative planned places of birth in woman at low risk of complications: evidence from the Birthplace in England national prospective cohort study." *BMJ* 344. <http://dx.doi.org/10.1136/bmj.e2292>

OBJECTIVES: To estimate the cost effectiveness of alternative planned places of birth.

DESIGN: Economic evaluation with individual level data from the Birthplace national prospective cohort study.

SETTING: 142 of 147 trusts providing home birth services, 53 of 56 freestanding midwifery units, 43 of 51 alongside midwifery units, and a random sample of 36 of 180 obstetric units, stratified by unit

size and geographical region, in England, over varying periods of time within the study period 1 April 2008 to 30 April 2010.

PARTICIPANTS: 64 538 women at low risk of complications before the onset of labour. Interventions Planned birth in four alternative settings: at home, in freestanding midwifery units, in alongside midwifery units, and in obstetric units.

MAIN OUTCOME MEASURES: Incremental cost per adverse perinatal outcome avoided, adverse maternal morbidity avoided, and additional normal birth. The non-parametric bootstrap method was used to generate net monetary benefits and construct cost effectiveness acceptability curves at alternative thresholds for cost effectiveness.

RESULTS: The total unadjusted mean costs were £1066, £1435, £1461, and £1631 for births planned at home, in freestanding midwifery units, in alongside midwifery units, and in obstetric units, respectively (equivalent to about €1274, \$1701; €1715, \$2290; €1747, \$2332; and €1950, \$2603). 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 thresholds of cost effectiveness when perinatal outcomes were considered. There was, however, an increased incidence of adverse perinatal outcome 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 cost effectiveness threshold of £20 000 declining to 0.63. With regards to maternal outcomes in nulliparous and multiparous women, planned birth at home generated the greatest mean net benefit with a 100% probability of being the optimal setting across all thresholds of cost effectiveness.

CONCLUSIONS: For multiparous women at low risk of complications, planned birth at home was the most cost effective option. For nulliparous low risk women, planned birth at home is still likely to be the most cost effective option but is associated with an increase in adverse perinatal outcomes.

Appendix B: Bibliography of Birthplace reports

NIHR Birthplace in England Research Programme reports

Report 1: Programme overview

Hollowell, J. on behalf of Birthplace in England Collaborative Group (2011). Birthplace programme overview: background, component studies and summary of findings. Birthplace in England research programme. Final report part 1. Birthplace in England research programme, NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0003/84945/FR1-08-1604-140.pdf

Report 2: Terms and definitions

Rowe, R. on behalf of Birthplace in England Collaborative Group (2011). Birthplace terms and definitions: consensus process. Birthplace in England research programme. Final report part 2. Birthplace in England Research Programme, NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0004/84946/FR2-08-1604-140.pdf

Report 3: the configuration of maternity care

Redshaw, M., R. Rowe, L. Schroeder, D. Puddicombe, A. Macfarlane, M. Newburn, C. McCourt, J. Sandall, L. Silverton, N. Marlow on behalf of Birthplace in England Collaborative Group (2011). Mapping maternity care: the configuration of maternity care in England. Birthplace in England research programme. Final Report 3. Birthplace in England research programme, NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0005/84947/FR3-08-1604-140.pdf

Report 4: the national prospective cohort study

Hollowell, J., D. Puddicombe, R. Rowe, L. Linsell, P. Hardy, M. Stewart, M. Redshaw, M. Newburn, C. McCourt, J. Sandall, A. Macfarlane, L. Silverton, P. Brocklehurst on behalf of Birthplace in England Collaborative Group (2011). The Birthplace national prospective cohort study: perinatal and maternal outcomes by planned place of birth. Birthplace in England research programme. Final report part 4. Birthplace in England research programme, NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0006/84948/SDO_FR4_-08-1604-140_V04.pdf

Report 5: cost-effectiveness analysis

Schroeder, L., S. Petrou, N. Patel, J. Hollowell, D. Puddicombe, M. Redshaw, P. Brocklehurst on behalf of Birthplace in England Collaborative Group (2011). Birthplace cost effectiveness analysis of planned place of birth: individual level analysis. Birthplace in England research programme. Final Report part 5. Birthplace in England research programme, NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0007/84949/FR5-08-1604-140.pdf

Report 6: Qualitative organisational case studies

McCourt, C., S. Rance, J. Rayment and J. Sandall (2011). Birthplace qualitative organisational case studies: how maternity care systems may affect the provision of care in different birth settings Birthplace in England research programme. Final report part 6. Oxford, Queen's Printer and Controller of HMSO. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0008/84950/FR6-08-1604-140.pdf

Report 7: Birthplace cost-effectiveness analysis of planned place of birth: decision analytic modelling

Schroeder, E., S. Petrou, J. Hollowell, M. Redshaw and P. Brocklehurst (2014). Birthplace cost-effectiveness analysis of planned place of birth: decision analytic model. Birthplace in England research programme. Final report part 7. London, NIHR Service Delivery and Organisation Programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0016/116026/FR7-08-1604-140.pdf

Addendum: Evaluation of the availability and quality of data required to model intrapartum mortality by planned place of birth

Hollowell, J. and A. Macfarlane (2014). Evaluation of the availability and quality of data required to model intrapartum mortality by planned place of birth. Addendum to the Birthplace in England Research programme final report. NIHR Service Delivery and Organisation programme. http://www.nets.nihr.ac.uk/_data/assets/pdf_file/0017/116036/SDO_Add_08-1604-140.pdf

NIHR Birthplace in England cohort study follow-on analysis

Hollowell, J., R. Rowe, J. Townend, M. Knight, Y. Li, L. Linsell, M. Redshaw, P. Brocklehurst, A. Macfarlane, N. Marlow, C. McCourt, M. Newburn, J. Sandall and L. Silverton (2015). The Birthplace in England national prospective cohort study: further analyses to enhance policy and service delivery decision-making for planned place of birth. Health Services and Delivery Research. Southampton (UK), NIHR Journals Library. Health Services and Delivery Research, Vol 3 (36) <http://www.ncbi.nlm.nih.gov/books/NBK311289/>.

Appendix C: Summary of the NICE intrapartum guideline (CG190) in relation to place of birth

The first intrapartum care guideline for the care of healthy women and their babies during childbirth was issued in 2007 (CG55) (NICE 2007). This was updated and reissued in December 2014 (CG190) (NICE 2014). The following summarises the key priorities recommended for implementation in relation to place of birth.

Summary of the NICE recommendations relating to place of birth for healthy women (NICE 2014)

- Commissioners and providers¹ should ensure that **all four birth settings** are available to all women (in the local area or in a neighbouring area).
- Explain to both multiparous and nulliparous women that they may choose any birth setting, and support them in their choice of setting:
 - Advise **low-risk multiparous women** that planning to give birth at **home or in a midwifery-led unit** (freestanding or alongside) is “particularly suitable for them because the rate of interventions is lower and the outcome for the baby is no different compared with an obstetric unit.”
 - Advise **low-risk nulliparous women** than planning to give birth in a **midwifery-led unit** (freestanding or alongside) is “particularly suitable for them because the rate of interventions is lower and the outcome for the baby is no different compared with an obstetric unit.”
 - Advise **low-risk nulliparous women** that if they plan **birth at home** “there is a small increase in the risk of an adverse outcome for the baby.”
- Providers, senior staff and all healthcare professionals should ensure that in all birth settings there is a **culture of respect** for each woman as an individual, so that she is in control, is listened too and cared for with compassion, and that appropriate informed consent it sought. This should be demonstrated through appropriate non-judgemental words and behaviour.
- Maternity services should:
 - Provide a model of care that supports one-to-one care in labour for all women; and
 - Benchmark services and identify overstaffing or understaffing by using workforce planning models and/or women-to-midwife ratios.
- Commissioners and providers¹ should ensure that there are:
 - Robust protocols in place for transfer of care between settings;
 - Clear local pathways for the continued care of women who are transferred from one setting to another including:
 - when crossing provider boundaries
 - if the nearest obstetric or neonatal unit is closed to admissions or the local midwifery-led unit is full.

1. This can also include networks of providers

Appendix D: Key findings from the Birthplace qualitative organisational case studies (McCourt, Rance et al. 2011)

- Access to good quality information often differed across social groups. Variations existed in how services and professionals provided such information in order to deliver equity of access and choice.
- Concerns around transfer distance meant that many women did not feel they had any realistic choice of place of birth. Travel distance to OUs was a concern for women living in more rural areas.
- Out-of hospital birthplaces functioned best when they were embedded into the system of maternity services, supported by all staff, and not just seen as a midwifery concern.
- Variations existed at Trust level in support given to out-of-hospital births, including training for safety and teamwork across the maternity workforce. The deployment and resourcing of community midwifery was especially variable across Trusts, and those providing such support took a systematic approach to staff deployment to underpin women's choice of birth setting.
- Strong midwifery and obstetric leadership and a culture of mutually supportive professional teamwork appeared to be central features of Trusts where midwifery led and obstetric services functioned well.
- Audit and review were sources of organisational learning and improvement. These were promoted by leadership and staff involvement, and a 'learning and accountability' rather than a 'blame' culture, with attention to system processes and structures as well as individual professional practices.
- In some Trusts, community and birth centre midwives who had a low volume of births, and only attended 'low risk' births appeared to benefit from periodic rotation into settings in which they could gain experience of higher risk births. In well-integrated services, midwives working on obstetric units were also periodically rotated into low risk settings.
- The presence of an AMU sometimes highlighted contrasts in birth philosophies across units. There were also some cases of strong leadership for promotion of normal birth across the maternity system.
- The presence of an AMU appeared to intensify the workload in the adjoining obstetric unit where service providers struggled to support normal birth.
- Women's concerns about their safety and that of their baby (or babies) were expressed but not always listened to by staff. Being heard and receiving timely support was aided by continuity of carer and/or presence of a birth partner or relative.
- Early labour assessment at home appeared to provide an opportunity for accurate clinical assessment and women's informed decision-making about the safest place to give birth.

