

# National Maternity and Perinatal Audit

## Clinical Report 2019

Based on births in NHS maternity services between 1 April 2016 and 31 March 2017



The National Maternity and Perinatal Audit (NMPA) is led by the Royal College of Obstetricians and Gynaecologists (RCOG) in partnership with the Royal College of Midwives (RCM), the Royal College of Paediatrics and Child Health (RCPCH) and the London School of Hygiene and Tropical Medicine (LSHTM).

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We are indebted to our colleagues from national data organisations: to NHS Digital, the Information Services Division (ISD) of the NHS National Services Scotland, and the National Welsh Informatics Service for their provision of data and internal linkage of hospital and maternity datasets, and to the ISD for their additional linkage of neonatal and maternity data. Our colleagues at the Neonatal Data Analysis Unit (NDAU) at Imperial College London have provided invaluable support and assistance with using and interpreting the National Neonatal Research Database (NNRD).

We are also very grateful to the members of the NMPA Women and Families Involvement Group, Clinical Reference Group and Sprint Audit Advisory Groups for their advice and input into the development of measures, the report and web pages.

Finally, we are grateful to all the women and their families that agreed to the inclusion of their and their babies' data in the datasets used by the NMPA.

**The NMPA Project Team and Board**

# Foreword

With the publication of this second clinical report of the National Maternity and Perinatal Audit, we celebrate three successful and productive years auditing maternal and perinatal care across Great Britain. The award of a two-year extension will allow the NMPA to continue until 2021. We are proud and privileged to work on this collaborative, three-nations project, working together in a multiprofessional team.

In this report, we celebrate the increasing commitment of our colleagues in providing data on maternal and perinatal care and outcomes to the NMPA, either directly via their maternity information systems (England) or indirectly via central national databases (Scotland and Wales). This has led to an improvement in the completeness of the data within the NMPA with 97% of births now being included. However, this current clinical report will be the last to be based, for England, on data received directly from individual English NHS trusts. Future reports will use a central national database also for England (NHS Digital's Maternity Services Data Set).

This NMPA clinical report presents results for measures that cover births that took place between 1 April 2016 and 31 March 2017 in the NHS. For the first time, the NMPA is able to report on birth without intervention. There are also three new neonatal measures derived from linking NMPA data with the National Neonatal Research Database (NNRD) allowing future initiatives within maternity and perinatal care with the aim of improving outcomes for babies.

This report continues to highlight substantial variation in maternity care and outcomes among maternity care providers. While some variation in care is inevitable and may reflect meeting the individual needs of women and babies, all maternity services need to ensure that risks are minimised and that the care being delivered is of the highest standard. We are pleased that many trusts and boards have used the results to effect positive change to improve outcomes, as reflected by vignettes in this report.

Compared with the previous year, we are pleased to see that the percentage of babies small for gestational age born at or beyond 40 weeks has decreased, which may reflect the implementation of initiatives to reduce stillbirths in each of the three nations. The NMPA will continue to monitor this development.

All women want and need the best possible care during childbirth. Current initiatives to improve maternal and neonatal care across England, Scotland and Wales require high-quality data to support their recommendation and implementation. The information provided by the NMPA enables service providers, commissioners, policy makers and women and their families to reflect on variation in care and work together to drive improvement.

**Dr Tina Harris, Senior Clinical Lead for Midwifery**

**Dr Jane Hawdon, Senior Clinical Lead for Neonatology**

**Dr Dharmindra Pasupathy, Senior Clinical Lead for Obstetrics**

**National Maternity and Perinatal Audit**



‘It’s perfectly normal’. Something most women and their families will hear at some point in their maternity journey. But does this mean that it’s acceptable because it’s perceived by another individual to be ‘normal’?

For the second year running, I’m delighted to be a part of the NMPA’s Women and Families Involvement Group. As a woman who has given birth to two children during the last three years under NHS maternity care, I have seen at a local level the levels of variation in engaging with women and their families to identify and co-design improvement to practices and policies. The way the NMPA measures processes and outcomes of individual trusts and boards against their peers opens up local as well as national conversations between providers and service users. This means that open and honest conversations can take place to co-design services, co-produce care plans and co-create trusting and honest partnerships between healthcare professionals and service users.

While personally I would tentatively use the word ‘trending’ to describe this second NMPA report, I firmly believe the key messages should be used in collaboration with other national results to measure the successes, areas for improvement and above all the implementation of the Maternity Transformation Programme, Best Start and the Maternity Vision for Wales.

The Women and Families Involvement Group gives the NMPA rich engagement with real families from different backgrounds with varied maternity experiences, and in turn the opportunity to express what’s important to service users in the form of the sprint audits and co-designing the means of communicating information from the report to a wide audience. We have continued our partnership as an advisory and consultative panel in order to maximise the relevance of the audited measures to service users. After all, women are the centre of their health and care.

There are very few standards in maternity care, which the Women and Families Involvement Group understands because one can’t standardise care that is driven by us, the service users, to be personalised. Therefore, I really like that the key findings are presented by trust and board and so the significance can be seen on a national scale thanks to the funnel graphs. I think that by presenting the information like this it’s annually putting the emphasis on healthcare professionals, NHS managers, commissioners and policy makers to examine their current practices, processes and outcomes against their peers. With regard to service users, this local information is empowering as it drives the maternity services to always be looking at innovative ways to improve, and encourages and allows women and their families to make good informed consented choices.

So, looking at your local results from the audit, you may describe them as ‘perfectly normal’; but I urge you to use the NMPA as a measuring tool in order to gain momentum and confidently move into more personalised and assured care for all women and their families.

**Mrs Emma Crookes**  
**NMPA Women and Families Involvement Group**  
**RCOG Women’s Network**

# Abbreviations and glossary

<b>Alongside midwifery unit</b>	A maternity unit where midwives have primary responsibility for care during labour in women at low risk of complications and which is located on the same site as an obstetric unit so it has access to the same medical facilities if needed.
<b>Apgar score</b>	A five-component score that is used to summarise the health of a newborn baby, typically at 1, 5 and 10 minutes of age.
<b>ATAIN</b>	Avoiding Term Admissions Into Neonatal units, a national project.
<b>BiPAP</b>	Bi-level positive airway pressure.
<b>BMI</b>	Body mass index, defined as an individual's weight in kilograms divided by their height in metres squared.
<b>Case mix</b>	The demographic characteristics and state of health of the people using a particular health service.
<b>CPAP</b>	Continuous positive airway pressure.
<b>CQC</b>	Care Quality Commission, responsible for inspecting healthcare services.
<b>Elective caesarean section</b>	Planned caesarean birth before labour onset.
<b>Emergency caesarean section</b>	Unplanned caesarean birth (prior to, or during labour).
<b>Episiotomy</b>	A cut through the vaginal muscle and skin to facilitate birth of the baby.
<b>Freestanding midwifery unit</b>	A maternity unit where midwives have primary responsibility for care during labour in women at low risk of complications and which is not located on the same site as an obstetric unit.
<b>Forceps</b>	An instrument to assist vaginal birth.
<b>Great Britain (GB)</b>	The island consisting of England, Scotland and Wales.
<b>HES</b>	Hospital Episode Statistics, a dataset containing information about individuals admitted to NHS hospitals in England.
<b>HQIP</b>	Healthcare Quality Improvement Partnership.
<b>Index of multiple deprivation</b>	A within-country measure of socio-economic status.
<b>Instrumental birth</b>	Birth with the assistance of either a ventouse cup or forceps.
<b>Intrapartum</b>	During labour and birth.
<b>ISD</b>	Information Services Division, the central data provider for Scotland.
<b>Late preterm</b>	In this report, refers to babies born between 34 <sup>+0</sup> and 36 <sup>+6</sup> weeks of gestation.
<b>Local Maternity System</b>	The maternity element of Sustainability and Transformation Partnerships in England. They are collaborations between maternity service providers, commissioners and other stakeholders, tasked with planning and coordinating local services across organisational boundaries.
<b>MBRRACE-UK</b>	Mothers and babies: Reducing Risk through Audits and Confidential Enquiries across the UK; the collaboration appointed by the HQIP to run the national Maternal, Newborn and Infant Clinical Outcome Review Programme, conducting surveillance and investigating the causes of maternal deaths, stillbirths and infant deaths.
<b>Mechanical ventilation</b>	With respect to the neonatal measures, refers to a baby who is intubated with an endotracheal tube and attached to a ventilator. This is also known as 'invasive ventilation'. This does not include non-invasive ventilation (CPAP, BiPAP, high-flow oxygen via nasal cannulae).
<b>Mlds</b>	Maternity Indicators dataset, managed by NHS Wales Informatics Service. This captures a selected subset of data items from the maternity IT systems in Welsh health boards.

<b>MSDS</b>	Maternity Services Data Set, managed by NHS Digital. This gathers data about pregnancy and birth from maternity healthcare providers in England.
<b>NCCHD</b>	National Community Child Health Database (Wales).
<b>NDAU</b>	Neonatal Data Analysis Unit, at Imperial College London.
<b>Neonatal encephalopathy</b>	A heterogeneous, clinically defined syndrome characterised by disturbed brain function in the earliest days of life in a baby born at or beyond 35 weeks of gestation, manifested by a reduced level of consciousness or seizures, often accompanied by difficulty with initiating and maintaining breathing, and by depression of tone and reflexes.
<b>Neonatal network</b>	Linked group of neonatal care providers working in a coordinated way to ensure equitable provision of high-quality clinically effective services, unconstrained by existing professional and geographical boundaries.
<b>NHS board/local health board</b>	In Scotland and Wales, NHS services are provided by 14 NHS boards and seven local health boards respectively, which each include a number of hospitals and community services.
<b>NHS trust</b>	In England, NHS services are provided by NHS trusts (commissioned by clinical commissioning groups).
<b>NHSE</b>	NHS England (NHS England and NHS Improvement from April 2019).
<b>NMPA</b>	National Maternity and Perinatal Audit.
<b>NNAP</b>	National Neonatal Audit Programme.
<b>NNRD</b>	National Neonatal Research Database.
<b>NWIS</b>	NHS Wales Informatics Service.
<b>OASI</b>	Obstetric anal sphincter injury.
<b>Obstetric unit</b>	A maternity unit where care is provided by a team of midwives and doctors to women at low and at higher risk of complications. All women will be cared for by midwives during pregnancy, birth and after the birth. Midwives have primary responsibility for providing care during and after labour to women at low risk of complications, while obstetricians have primary responsibility for women who are at increased risk of, or who develop, complications. Diagnostic and medical treatment services – including obstetric, neonatal and anaesthetic care – are available on site.
<b>ONS</b>	Office for National Statistics.
<b>PEDW</b>	Patient Episode Database for Wales, a routinely collected dataset of hospital care in Wales.
<b>Perinatal</b>	Related to events around the time of birth; may be used in general or in relation to pregnant women and new mothers, as in perinatal mental health, or to unborn and newborn babies, as in perinatal mortality and in the NMPA.
<b>Placenta accreta</b>	When the placenta is attached to the muscle of the womb and does not come away properly after the birth.
<b>Postnatal</b>	After the birth.
<b>Pre-eclampsia</b>	A pregnancy complication which is characterised by high blood pressure, protein in the urine and oedema (fluid retention) and can lead to poor outcomes for both mothers and babies.
<b>Preterm birth</b>	Birth of a baby before 37 <sup>+0</sup> weeks of gestation.
<b>Primiparous</b>	A primiparous woman is a woman having a first birth.
<b>RCM</b>	Royal College of Midwives.
<b>RCOG</b>	Royal College of Obstetricians and Gynaecologists.
<b>RCPCH</b>	Royal College of Paediatrics and Child Health.
<b>Registrable birth</b>	In UK law, a birth is registrable, meaning it will be recorded in national statistics and issued with a certificate of birth or stillbirth, if the baby is born without signs of life after 24 completed weeks of gestation or with signs of life at any gestation.

<b>Robson groups</b>	A system that classifies women into ten groups based on their obstetric characteristics (parity, previous caesarean birth, gestational age, onset of labour, fetal presentation and the number of babies).
<b>SBR</b>	Scottish Birth Record, a dataset recording all births in Scotland, managed by the Information Services Division.
<b>Secundiparous</b>	A secundiparous woman is a woman having a second birth.
<b>SGA</b>	Small for gestational age.
<b>SMR-01</b>	Scottish Morbidity Record 1, a dataset containing information about general/acute inpatient and day case admissions in Scotland, managed by the Information Services Division in Scotland.
<b>SMR-02</b>	Scottish Morbidity Record 2, a dataset containing information about maternity inpatient and day case admissions in Scotland, managed by the Information Services Division in Scotland.
<b>Stillbirth</b>	The birth of a baby without signs of life at or after 24 weeks of gestation.
<b>Term gestation</b>	Defined in this report as gestation between 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks.
<b>Therapeutic hypothermia</b>	Lowering of body temperature in order to preserve brain function, sometimes known as 'cooling'.
<b>Third and fourth degree tear</b>	A tear from childbirth that extends into the anal sphincter (third degree tear) or mucosa (fourth degree tear).
<b>Transitional care</b>	Care of babies who need more support than can be provided by the mother and normal midwifery care alone, but with mother and baby remaining together and the mother remaining the primary carer, usually on a postnatal ward or dedicated transitional care ward.
<b>UKNC</b>	United Kingdom Neonatal Collaborative
<b>VBAC</b>	Vaginal birth after caesarean section for a previous birth.
<b>Ventouse</b>	An instrument to assist vaginal birth using a vacuum cup applied to the baby's head.

# Executive summary

## Introduction

In the wake of national maternity and neonatal reviews and other improvement initiatives, changes are being implemented in the delivery of care to mothers and their babies in England, Scotland and Wales. Use of electronic records for maternity care is constantly developing, and provides a rich source of data to understand and evaluate these changes. The National Maternity and Perinatal Audit (NMPA) uses these data to produce information that can usefully support the improvement of maternity and perinatal care.

This report presents measures of maternity and perinatal care based on births in English, Welsh and Scottish NHS services between 1 April 2016 and 31 March 2017. The report also provides contextual information describing the characteristics of women and babies cared for by NHS maternity services during this time period.

The majority of the measures presented in this report are the same as presented in our previous report on 2015/16 data. One measure has been removed: early elective delivery without documented clinical indication. Four measures have been added. The first is birth without intervention, a composite measure to describe births that start and proceed spontaneously. The other new measures relate to babies admitted to a neonatal unit following birth: the proportions of term and late preterm babies who are admitted to a neonatal unit; the proportion of term babies who receive mechanical ventilation in the first 72 hours of life; and the proportion of babies who develop an encephalopathy in the first 72 hours of life.

The results in this report are presented at trust/board level, rather than by site with an obstetric unit, as was the case for most measures in the previous report. This follows feedback from clinical services to the NMPA team,<sup>\*</sup> and enables a more balanced inclusion of births in freestanding midwifery units and at home, as these can be included in trust level results but not as individual sites owing to low numbers.<sup>†</sup> The majority of trusts have a single obstetric unit and for those trusts this reporting change makes little difference. Site level results continue to be reported on the [NMPA website](#).

## Methods

The analysis in this report is based on 728 620 births in NHS maternity services in England, Scotland and Wales between 1 April 2016 and 31 March 2017.<sup>‡</sup> The project is estimated to have captured 97% of eligible births in this time period. The NMPA makes use of data electronically collected through maternity information systems and national datasets. These datasets have been enhanced through linkage of maternity data from the NMPA to the National Neonatal Research Database (NNRD), which collects information on babies admitted to neonatal care.

In order to compare like with like, the majority of measures are restricted to singleton, term births. As a general principle, the denominator for each measure is restricted to women or babies to whom

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\* Feedback can be provided to the NMPA team via email at [nmpa@rcog.org.uk](mailto:nmpa@rcog.org.uk).

† These births could not be included when the smallest unit of consideration was hospital sites as the numbers of births are very low. In order for numbers to be large enough to be published and a valid statistical comparison to be made, many measures are restricted to sites with at least 500 births.

‡ The time lag between the period covered by this report and its publication is due to the timing of the receipt of one of the English national datasets.

the outcome or intervention of interest is applicable. For example, the measure of the 'proportion of women with a third or fourth degree tear' is restricted to women who gave birth vaginally. Rates of measures are also adjusted for risk factors that are beyond the control of the maternity service, such as age, ethnicity, level of socio-economic deprivation and clinical risk factors that may explain variation in results between organisations.

The trusts and boards included in the audit provide intrapartum maternity care on one or more sites, and this report presents aggregated results by trust or board for each measure. Results are reported at other organisational levels (site, region and country) on the [NMPA website](#).

## How to use this report and the NMPA website

Users of these results should use this set of measures to consider how maternity services compare locally and nationally. We recommend that this be a starting point for reflection on the reasons behind variation in practice and outcomes, and that this report be used to identify areas for potential quality improvement.

Users of this report should not consider the results of individual measures in isolation, but rather collectively and alongside other relevant programmes such as Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK)<sup>1</sup> and the National Neonatal Audit Programme (NNAP).<sup>2</sup>

Women and their families can use these results to start conversations with their care providers. A lay summary of the report is provided on the [NMPA website](#).

The [NMPA website](#) enables comparison of individual services and benchmarking against national averages. Guidance on using the data on the NMPA website can be found on the [Resources page](#) and in the [Frequently Asked Questions](#). We welcome feedback on how the audit outputs can be made more useful.

## Key findings

For reference, the key findings have been numbered to correspond with the recommendations of the same number at the end of this executive summary, e.g. recommendation 4 is based on key findings 4a, 4b and 4c, and recommendations 6a and 6b on key finding 6. (See p. xvi for a full list of key findings, recommendations, report evidence and related national guidance).

- KF1 When comparing findings on data quality, maternal characteristics and measures between the two reporting years, our findings have remained generally stable and many findings were similar to the previous report both at national and at trust/board level. Where changes are seen, it should be noted that these are changes only over two discrete periods in time, and therefore cannot be considered to be trends at this stage.
- KF2 The quality and completeness of data submitted to the NMPA has improved between the 2015/16 and 2016/17 reporting years; however, many trusts and boards are still excluded from one or more measures owing to poor data quality and completeness.
- KF3 There is variation between and within the three countries in the availability, quality and completeness of the data items used to generate the measures in this report.
- KF4a Only a minority of trusts and boards submitted data of sufficient completeness and quality to be included in the measure of birth without intervention.

- KF4b The quality of data collected about smoking in pregnancy and at the time of birth is poor. This is concerning given the importance of smoking cessation as part of initiatives to reduce stillbirth.
- KF4c The quality and completeness of the data items needed to determine place of birth, in particular where obstetric units and alongside midwifery units are co-located, remains variable.
- KF5 More than half (50.4%) of women with a recorded BMI at booking were overweight or obese (up from 47.3% in 2015/16).
- KF6 There is a small increase in induction rates (27.9% to 29.2%) and a small decrease in the proportion of small-for-gestational-age babies born at or after 40 weeks (55.3% to 52.3%) in England only compared with 2015/16 data. This coincides with the introduction of the Saving Babies' Lives care bundle and requires further monitoring.
- KF7 There remains substantial variation, beyond that which would be expected due to chance, in the rates of key measures of maternity care such as induction of labour and modes of birth. This suggests that there remains variation in clinical practice, decision making and outcomes across England, Scotland and Wales.
- KF8 Among the 163 508 women with singleton pregnancies who gave birth at term for whom available data were of sufficient quality, 36.9% did so without intervention (spontaneous onset, progress and birth, without epidural, spinal or general anaesthesia and without episiotomy). There was substantial variation in this rate (between 23% and 48%), which persisted after adjustment for case mix.
- KF9 There remains variation, beyond that which would be expected, in the proportion of women experiencing complications at birth in the form of a third or fourth degree tear, or a postpartum haemorrhage of 1500 ml or more.
- KF10 5.8% of babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation (term), and 41.9% of those born between 34<sup>+0</sup> and 36<sup>+6</sup> weeks (late preterm), are admitted to a neonatal unit. There is substantial variation in these rates, even after adjustment for maternal case mix factors, perhaps reflecting different organisational provision for babies requiring additional care after birth.
- KF11 5.8 in 1000 babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation receive mechanical ventilation in the first 3 days of life. There are a number of trusts and boards with levels of ventilation that are higher than expected, even after adjustment for maternal case mix factors.
- KF12 1.7 in 1000 babies born between 35<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation develop an encephalopathy, a component of neonatal brain injury, in the first 3 days of life. Following adjustment for case mix, there are a number of trusts and boards with higher levels of encephalopathy than expected.

## Conclusions

This second clinical report from the NMPA demonstrates overall stability in the availability of data. It is positive that the completeness of the data received by the NMPA has increased, both in terms of births captured and of individual data items. This suggests that electronic maternity records are being used more widely and effectively.

This report gives a national picture of services in 2016/17 and builds on the NMPA's previous report from 2015/16.<sup>3</sup> It is not possible to speak of trends based on just two years, but we highlight areas that require monitoring, in particular around induction of labour, timing of birth and timely delivery of babies that are small for gestational age.

## Recommendations

For reference, the recommendations have been numbered to correspond with the key findings of the same number earlier on this executive summary, e.g. recommendation 4 is based on key findings 4a, 4b and 4c, and recommendations 6a and 6b on key finding 6.

- R1 [Recommendations from the NMPA report on 2015/16 data](#) remain relevant, particularly those related to data quality and to the wide variation in rates of smoking cessation, breastfeeding and skin-to-skin contact. All users of this report should review and assess their performance locally against data in this report and consider improvement action required in response.  
*(All users of this report)*
- R2 Maternity service providers and national organisations responsible for collating and managing maternity datasets should use the NMPA data items described in the [NMPA Measures Technical Specification](#) as a guide to focus improvements to data quality.  
*(National organisations responsible for collating and managing maternity datasets, maternity service providers)*
- R3 National organisations from across England, Wales and Scotland that are responsible for collating and managing maternity datasets should work together to ensure alignment of data specifications used.  
*(National organisations responsible for collating and managing maternity datasets, with support and input from maternity service providers and from national governments and NHS bodies)*
- R4 Where local data provided have been insufficient to report results, or where results suggest there may be data quality issues for any or all of the following measures:
- birth without intervention
  - smoking in pregnancy
  - planned and actual place of birth,
- maternity service providers should work with maternity information system suppliers and those responsible for collating and managing maternity datasets to improve completeness and accuracy of the data items required for these measures to inform local quality improvement activities.  
*(Maternity service providers, national organisations responsible for collating and managing maternity datasets, maternity information system suppliers)*
- R5 Maternity services, primary care and public health services should work together, with involvement of local service users, to ensure that there is appropriate provision to support weight management prior to, during and after pregnancy.  
*(Maternity service providers, public health service providers, commissioners, primary care, women and their families and organisations representing service users)*
- R6a The NMPA, MBRRACE-UK and other national organisations responsible for collating and managing maternity datasets should continue to monitor for evidence of improvements in:
- the rate of detection of small-for-gestational-age babies
  - stillbirth rates.
- (NMPA, MBRRACE-UK and national organisations responsible for collating and managing maternity datasets)*



- R6b Following implementation of national initiatives such as the Saving Babies' Lives care bundle in England, the NMPA and NHS trusts and boards should monitor for possible increases in induction rates and the impact of this on women, their babies and service providers.  
*(NMPA, NHS trusts and boards)*
- R7 National bodies such as NHS England, the Scottish Government, the Welsh Government, the RCOG and the RCM should work together to review the need for guidance and standards to reduce variation in key aspects of maternity care, including induction of labour and modes of birth.  
*(National bodies including the RCOG, RCM, NICE and SIGN, all clinicians, women and their families and organisations representing service users)*
- R8 Maternity service providers and local service users should work together to understand the barriers to birth without intervention in their service by reviewing:
- rates of birth without intervention (where local data provided have been adequate to report against this measure)
  - rates of individual interventions
  - place of birth.
- (Trusts and boards, women and their families and organisations representing service users)*
- R9a National bodies should continue their work to develop and implement package interventions for prevention and management of third and fourth degree tears and postpartum haemorrhage.  
*(National bodies including the RCOG and RCM, and national governments and NHS bodies)*
- R9b All maternity services should review their clinical practices to ensure an accurate diagnosis and effective prevention and management of:
- postpartum haemorrhage
  - obstetric anal sphincter injury
- to minimise variations in care.  
*(Maternity service providers)*
- R10 Maternity and neonatal service providers should together review their rates of late preterm and term admissions to neonatal units and consider whether any of their admissions may be avoidable. The NMPA endorses the [recommendations made by the ATAIN programme](#) to address avoidable term admissions.  
*(Maternity and neonatal service providers)*
- R11 Maternity and neonatal service providers with higher than expected levels of mechanical ventilation between 37<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any changes to clinical practice identified.  
*(Maternity and neonatal service providers)*
- R12a Maternity and neonatal service providers with higher than expected rates of encephalopathy between 35<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any identified actions and changes to clinical practice.  
*(Maternity and neonatal service providers)*
- R12b National projects working in the area of neonatal brain injury (NNAP, NMPA, Each Baby Counts) should work together to develop an agreed, jointly used, measurable definition for neonatal encephalopathy as a component of neonatal brain injury to ensure consistent measurement.  
*(NMPA, NNAP, Each Baby Counts, Healthcare Safety Investigation Branch, other national projects)*

# Key findings, recommendations, report evidence and related national guidance

Key finding (KF) Recommendation (R) (Audience)	Report findings underlying the recommendation	Page	Related national guidance
<p><b>KF1</b> When comparing findings on data quality, maternal characteristics and measures between the two reporting years, our findings have remained generally stable and many findings were similar to the previous report both at national and at trust/board level. Where changes are seen, it should be noted that these are changes only over two discrete periods in time, and therefore cannot be considered to be trends at this stage.</p> <p><b>R1</b> <b>Recommendations from the NMPA report on 2015/16 data remain relevant, particularly those related to data quality and to the wide variation in rates of smoking cessation, breastfeeding and skin-to-skin contact. All users of this report should review and assess their performance locally against data in this report and consider improvement action required in response.</b> (All users of this report)</p>	Throughout report		
<p><b>KF2</b> The quality and completeness of data submitted to the NMPA has improved between the 2015/16 and 2016/17 reporting years; however, many trusts and boards are still excluded from one or more measures owing to poor data quality and completeness.</p> <p><b>R2</b> <b>Maternity service providers and national organisations responsible for collating and managing maternity datasets should use the NMPA data items described in the NMPA Measures Technical Specification as a guide to focus improvements to data quality.</b> (National organisations responsible for collating and managing maternity datasets, maternity service providers)</p>	Table 4 and throughout report	11	<p><b>NHSR Maternity Incentive Scheme – Year Two, 2018<sup>4</sup></b></p> <p><b>PRSB Maternity Record Standard, 2019<sup>5</sup></b></p>
<p><b>KF3</b> There is variation between and within the three countries in the availability, quality and completeness of the data items used to generate the measures in this report.</p> <p><b>R3</b> <b>National organisations from across England, Wales and Scotland that are responsible for collating and managing maternity datasets should work together to ensure alignment of data specifications used.</b> (National organisations responsible for collating and managing maternity datasets, with support and input from maternity service providers and from national governments and NHS bodies)</p>	Table 4 and trust/board level data quality findings on NMPA website	11	<b>PRSB Maternity Record Standard, 2019<sup>5</sup></b>

<b>Key finding (KF)</b>	<b>Report findings underlying the recommendation</b>	<b>Page</b>	<b>Related national guidance</b>
<b>Recommendation (R)</b> <i>(Audience)</i>			
<b>KF4a</b>	Only a minority of trusts and boards submitted data of sufficient completeness and quality to be included in the measure of birth without intervention.	11, 24	<b>NICE Smoking: Acute, Maternity and Mental Health Services</b> , 2013 <sup>6</sup>
<b>KF4b</b>	The quality of data collected about smoking in pregnancy and at the time of birth is poor. This is concerning given the importance of smoking cessation as part of initiatives to reduce stillbirth.	11, 30	<b>NHSE Saving Babies' Lives Version Two</b> , 2019 <sup>7</sup>
<b>KF4c</b>	The quality and completeness of the data items needed to determine place of birth, in particular where obstetric units and alongside midwifery units are co-located, remains variable.	14	<b>NICE Intrapartum Care for Healthy Women and Babies</b> , 2014 <sup>8</sup>
<b>R4</b>	<p><b>Where local data provided have been insufficient to report results, or where results suggest there may be data quality issues for any or all of the following measures:</b></p> <ul style="list-style-type: none"> <li>• birth without intervention</li> <li>• smoking in pregnancy</li> <li>• planned and actual place of birth,</li> </ul> <p>maternity service providers should work with maternity information system suppliers and those responsible for collating and managing maternity datasets to improve completeness and accuracy of the data items required for these measures to inform local quality improvement activities. (<i>Maternity service providers, national organisations responsible for collating and managing maternity datasets, maternity information system suppliers</i>)</p>		<b>NHSE Better Births</b> , 2016 <sup>9</sup> <b>Scottish Govt The Best Start</b> , 2017 <sup>10</sup> <b>NHSR Maternity Incentive Scheme – Year Two</b> , 2018 <sup>4</sup> <b>PRSB Maternity Record Standard</b> , 2019 <sup>5</sup>
<b>KF5</b>	More than half (50.4%) of women with a recorded BMI at booking were overweight or obese (up from 47.3% in 2015/16).	Table 5	<b>NICE Weight Management Before, During and After Pregnancy</b> , 2010 <sup>11</sup>
<b>R5</b>	<p><b>Maternity services, primary care and public health services should work together, with involvement of local service users, to ensure that there is appropriate provision to support weight management prior to, during and after pregnancy.</b> (<i>Maternity service providers, public health service providers, commissioners, primary care, women and their families and organisations representing service users</i>)</p>		

<b>Key finding (KF)</b>	<b>Report findings underlying the recommendation</b>	<b>Page</b>	<b>Related national guidance</b>
<b>Recommendation (R)</b> <i>(Audience)</i>			
<b>KF6</b>	There is a small increase in induction rates (27.9% to 29.2%) and a small decrease in the proportion of small-for-gestational-age babies born at or after 40 weeks (55.3% to 52.3%) in England only compared with 2015/16 data. This coincides with the introduction of the Saving Babies' Lives care bundle and requires further monitoring.	Tables 8 and 9, and Figures 3 and 4	<b>RCOG</b> <i>Investigation and Management of the Small-for-Gestational-Age Fetus, 2013</i> <sup>12</sup> <b>NHSE</b> <i>Saving Babies' Lives Version Two, 2019</i> <sup>7</sup> <b>MCQIC</b> Maternity Care programme, 2013 <sup>13</sup>
<b>R6a</b>	<b>The NMPA, MBRRACE-UK and other national organisations responsible for collating and managing maternity datasets should continue to monitor for evidence of improvements in:</b> <ul style="list-style-type: none"> <li>• the rate of detection of small-for-gestational-age babies</li> <li>• stillbirth rates.</li> </ul> <i>(NMPA, MBRRACE-UK and national organisations responsible for collating and managing maternity datasets)</i>		<b>NICE</b> <i>Inducing Labour, 2008</i> <sup>14</sup>
<b>R6b</b>	<b>Following implementation of national initiatives such as the Saving Babies' Lives care bundle in England, the NMPA and NHS trusts and boards should monitor for possible increases in induction rates and the impact of this on women, their babies and service providers.</b> <i>(NMPA, NHS trusts and boards)</i>		
<b>KF7</b>	There remains substantial variation, beyond that which would be expected due to chance, in the rates of key measures of maternity care such as induction of labour and modes of birth. This suggests that there remains variation in clinical practice, decision making and outcomes across England, Scotland and Wales.	Throughout report	This recommendation relates to guidance development where no clear guidance is available to reduce variation, but also to existing guidance on key measures such as <b>NICE</b> <i>Caesarean Section, 2013</i> <sup>15</sup> and <b>NICE</b> <i>Inducing Labour, 2008</i> <sup>14</sup>
<b>R7</b>	<b>National bodies such as NHS England, the Scottish Government, the Welsh Government, the RCOG and the RCM should work together to review the need for guidance and standards to reduce variation in key aspects of maternity care, including induction of labour and modes of birth.</b> <i>(National bodies including the RCOG, RCM, NICE and SIGN, all clinicians, women and their families and organisations representing service users)</i>		

<b>Key finding (KF)</b>	<b>Report findings underlying the recommendation</b>	<b>Page</b>	<b>Related national guidance</b>
<b>Key finding (KF)</b> <b>Recommendation (R)</b> <i>(Audience)</i>			
<b>KF8</b>	Among the 163 508 women with singleton pregnancies who gave birth at term for whom available data were of sufficient quality, 36.9% did so without intervention (spontaneous onset, progress and birth, without epidural, spinal or general anaesthesia and without episiotomy). There was substantial variation in this rate (between 23% and 48%), which persisted after adjustment for case mix.	Table 11, and Figures 8 and 9	24–25
<b>R8</b>	<b>Maternity service providers and local service users should work together to understand the barriers to birth without intervention in their service by reviewing:</b> <ul style="list-style-type: none"> <li>• <b>rates of birth without intervention (where local data provided have been adequate to report against this measure)</b></li> <li>• <b>rates of individual interventions</b></li> <li>• <b>place of birth.</b></li> </ul> <i>(Trusts and boards, women and their families and organisations representing service users)</i>		
<b>KF9</b>	There remains variation, beyond that which would be expected, in the proportion of women experiencing complications at birth in the form of a third or fourth degree tear, or a postpartum haemorrhage of 1500 ml or more.	Tables 15 and 16, and Figures 13 and 14	31–33
<b>R9a</b>	<b>National bodies should continue their work to develop and implement package interventions for prevention and management of third and fourth degree tears and postpartum haemorrhage.</b> <i>(National bodies including the RCOG and RCM, and national governments and NHS bodies)</i>		<b>MNHSC</b> Early recognition and management of deterioration of mother or baby, 2018 <sup>16</sup> <b>Maternity Network Wales OBS</b> Cymru, 2016 <sup>17</sup> <b>MCQIC</b> Maternity Care programme, 2013 <sup>18</sup>
<b>R9b</b>	<b>All maternity services should review their clinical practices to ensure an accurate diagnosis and effective prevention and management of:</b> <ul style="list-style-type: none"> <li>• <b>postpartum haemorrhage</b></li> <li>• <b>obstetric anal sphincter injury</b></li> </ul> <b>to minimise variations in care.</b> <i>(Maternity service providers)</i>		

<b>Key finding (KF)</b>	<b>Report findings underlying the recommendation</b>	<b>Page</b>	<b>Related national guidance</b>
<b>Recommendation (R)</b> <i>(Audience)</i>			
<b>KF10</b>	5.8% of babies born between 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation (term), and 41.9% of those born between 34 <sup>+0</sup> and 36 <sup>+6</sup> weeks (late preterm), are admitted to a neonatal unit. There is substantial variation in these rates, even after adjustment for maternal case mix factors, perhaps reflecting different organisational provision for babies requiring additional care after birth.	Table 21, and Figures 20 and 21	<b>NHSE Reducing Harm Leading to Avoidable Admission of Full-term Babies into Neonatal Units (ATAIN), 2017<sup>19</sup></b>
<b>R10</b>	<b>Maternity and neonatal service providers should together review their rates of late preterm and term admissions to neonatal units and consider whether any of their admissions may be avoidable. The NMPA endorses the recommendations made by the ATAIN programme to address avoidable term admissions.</b> <i>(Maternity and neonatal service providers)</i>	43–44	<b>BAPM A Framework for Neonatal Transitional Care, 2017<sup>20</sup></b> <b>Scottish Govt The Best Start, 2017<sup>10</sup></b> <b>NHSR Maternity Incentive Scheme – Year Two, 2018<sup>4</sup></b>
<b>KF11</b>	5.8 in 1000 babies born between 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation receive mechanical ventilation in the first 3 days of life. There are a number of trusts and boards with levels of ventilation that are higher than expected, even after adjustment for maternal case mix factors.	Table 22 and Figure 22	<b>RCOG Each Baby Counts, 2017<sup>21</sup></b>
<b>R11</b>	<b>Maternity and neonatal service providers with higher than expected levels of mechanical ventilation between 37<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any changes to clinical practice identified.</b> <i>(Maternity and neonatal service providers)</i>	45	<b>NHSR Maternity Incentive Scheme – Year Two, 2018<sup>4</sup></b>
<b>KF12</b>	1.7 in 1000 babies born between 35 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation develop an encephalopathy, a component of neonatal brain injury, in the first 3 days of life. Following adjustment for case mix, there are a number of trusts and boards with higher levels of encephalopathy than expected.	Table 23 and Figure 23	<b>NHSR Maternity Incentive Scheme – Year Two, 2018<sup>4</sup></b> <b>NHSE Long Term Plan, 2019<sup>22</sup></b>
<b>R12a</b>	<b>Maternity and neonatal service providers with higher than expected rates of encephalopathy between 35<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any identified actions and changes to clinical practice.</b> <i>(Maternity and neonatal service providers)</i>		
<b>R12b</b>	<b>National projects working in the area of neonatal brain injury (NNAP, NMPA, Each Baby Counts) should work together to develop an agreed, jointly used, measurable definition for neonatal encephalopathy as a component of neonatal brain injury to ensure consistent measurement.</b> <i>(NMPA, NNAP, Each Baby Counts, Healthcare Safety Investigation Branch, other national projects)</i>		
<b>BAPM</b>	British Association of Perinatal Medicine	PRSB	Primary Record Standard Board (England)
<b>MBRRACE-UK</b>	Mothers and babies: Reducing Risk through Audits and Confidential Enquiries across the UK	RCM	Royal College of Midwives
<b>MCOIC</b>	Maternity and Children Quality Improvement Collaborative	RCOG	Royal College of Obstetricians and Gynaecologists
<b>MNHSC</b>	Maternal and Neonatal Health Safety Collaborative	SIGN	Scottish Intercollegiate Guidelines Network

# Introduction

This is the second clinical report of the National Maternity and Perinatal Audit (NMPA) of NHS maternity services across England, Scotland and Wales.\* It is commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of the funding nations.

The NMPA aims to produce high-quality information that can be used by providers, commissioners and users of the maternity services to benchmark against national standards and recommendations where these exist, and to identify good practice and areas for improvement. The NMPA consists of:

- an organisational survey of maternity and neonatal care provision, and services available to women
- an annual clinical audit of a number of key measures to identify unexpected variation between maternity services
- a programme of periodic 'sprint' audits on specific topics.

The NMPA published its [first organisational survey report](#)<sup>23</sup> in August 2017 and its [first clinical report](#),<sup>3</sup> on births from 1 April 2015 to 31 March 2016, in November 2017. Two sprint audit reports, on admissions of babies to neonatal care and of mothers to intensive care, were published in January 2019. This second clinical report covers births from 1 April 2016 to 31 March 2017.<sup>†</sup>

National reviews in England<sup>9</sup> and Scotland<sup>10</sup> resulted in plans to transform services that are now underway, and an updated vision for maternity services in Wales has been launched recently.<sup>24</sup> The aims of these reviews include the improvement of safety, choice and personalisation of care for women and babies across all three countries. Use of electronic records for maternity care is constantly developing, and provides a rich source of data to understand and evaluate these changes. The NMPA uses these data to produce information that can usefully support the improvement of maternity and perinatal care.

## The philosophy of the NMPA

The NMPA makes use of data routinely collected in the course of clinical care in all three countries. The audit therefore incorporates information about all women giving birth and their babies, providing an overview of maternity services as well as data about individual units, without placing an undue burden on clinical staff.

The NMPA does not limit its set of audit measures to only those that have 'auditable standards'. Very few standards exist in maternity care that can be measured via a national audit and there are no clear standards to define 'acceptable ranges' for rates of common interventions such as caesarean section and induction of labour. For this reason, the NMPA presents a broad range of measures that enable maternity service providers, commissioners and other stakeholders to reflect on service provision, and to benchmark their results against national averages and other services. It is hoped that this will contribute to reducing unwarranted variation, further improving safety and ensuring that maternity services meet the needs of women and their families.

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\* It has not yet been possible to include Northern Ireland, but this may change in the future.

† The time lag between the period covered by this second clinical report and its publication is due to the timing of the receipt of one of the English national datasets.

## Objectives of the clinical audit

The main objectives are:

- to further develop a comprehensive set of clinically meaningful and technically robust audit measures that cover the maternity and perinatal pathway and can be used for performance assessment and quality improvement
- to describe variation between providers for key measures, highlighting good practice and areas for improvement
- to monitor changes over time.

## What does this report cover?

This report presents measures of maternity and neonatal care based on births in English, Welsh and Scottish NHS services between 1 April 2016 and 31 March 2017. Measures were selected for inclusion in the report on the basis of explicit evaluation criteria (Appendix 2). The report also provides contextual information describing the characteristics of women and babies cared for by NHS maternity services during this time period. Three of the measures are treated as 'outlier' indicators, representing an adverse outcome for women or babies with potential long-term effects. Trusts or boards that have results that are higher than would be expected by chance are notified and asked to investigate why this might be the case. These measures are:

- third and fourth degree tears
- postpartum haemorrhage of 1500 ml or more (England and Wales only)\*
- Apgar score of less than 7 at 5 minutes.†

The trusts and boards included in the audit provide intrapartum maternity care on one or more sites, and this report presents aggregated results by trust or board for each measure. Results are reported at other organisational levels (site, region and country) on the [NMPA website](#).

The [NMPA website](#) also provides an overview of results per maternity service, including spine charts of clinical measures per service and organisational information that may help users to identify possible organisational factors influencing variation between units.

## What has changed from the previous report?

The results in this report are presented at trust/board level, rather than by site with an obstetric unit, as was the case for most measures in the previous report. This follows feedback from clinical services to the NMPA team,‡ and enables a more balanced inclusion of births in freestanding midwifery units and at home, as these can be included in trust level results but not as individual sites owing to low numbers.§ The majority of trusts have a single obstetric unit and for those trusts this reporting change makes little difference. Site level results continue to be reported on our [website](#).

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\* In Scotland's central maternity data, postpartum haemorrhage is recorded as a binary variable for blood loss of 500 ml or above. This does not match with the NMPA's definition of severe obstetric haemorrhage and therefore this is not included in the report. However, rates of blood loss of 500 ml or more are available on the [NMPA website](#).

† The NMPA outlier policy, which provides further detail on outlier management, is available on the [NMPA website](#).

‡ Feedback can be provided to the NMPA team via email at [nmpa@rcog.org.uk](mailto:nmpa@rcog.org.uk).

§ These births could not be included when the smallest unit of consideration was hospital sites as the numbers of births are very low. In order for numbers to be large enough to be published and a valid statistical comparison to be made, many measures are restricted to sites with at least 500 births.



In this report, four measures have been added. The first is birth without intervention, a composite measure to describe births that start and proceed spontaneously. This was developed with a consensus group of clinicians, lay members and stakeholder groups in response to the desire to measure births without intervention within the constraints of available data.

The other new measures relate to babies admitted to a neonatal unit following birth:

- the proportions of term and late preterm babies who are admitted to a neonatal unit
- the proportion of term babies who receive mechanical ventilation in the first 72 hours of life
- the proportion of babies who develop an encephalopathy in the first 72 hours of life.

These measures have been developed through linkage of NMPA maternity data to the National Neonatal Research Database (NNRD) as part of the neonatal sprint audit project conducted in 2018.<sup>25</sup> This linkage enables adjustment for maternal factors, and offers the opportunity to explore the potential of using neonatal outcomes as measures of maternity care.

One measure has been removed following our previous report: the proportion of elective deliveries (by caesarean section or induction of labour) performed at 37<sup>+0</sup> to 38<sup>+6</sup> weeks of gestation without a documented clinical indication. The coding of indications for early elective delivery was not reliable, either within or between countries. In the context of changing recommendations around timing of birth, particularly for women experiencing reduced fetal movements (it was not possible to identify 'reduced fetal movements' accurately in the NMPA dataset for 2016/17), it was not felt that reporting of this measure on a national level was of use, although the NMPA continues to recommend its use locally.

## How to use this report and the NMPA website

This report provides national rates of key events, procedures and complications for mothers and babies across England, Scotland and Wales. A list of the measures included in this report is given in Table 1.

Users of these results should use this set of measures to consider how maternity services compare locally and nationally. We recommend that this be a starting point for reflection on the reasons behind variation in practice and outcomes, and that this report be used to identify areas for potential quality improvement. Examples of how the findings of the [previous NMPA clinical report](#) have been used by trusts and boards in order to improve service quality can be found in the green boxes throughout the report.

Users of this report should not consider the results of individual measures in isolation, but rather collectively and alongside other relevant programmes such as MBRRACE-UK and the National Neonatal Audit Programme (NNAP).

Women and their families can use these results to inform conversations with their care providers. A woman's individual chance of a given outcome will be determined by her individual characteristics as well as by the organisation providing her care; the impact of these factors should be considered as part of her personalised care.

The [NMPA website](#) enables comparison of individual services and benchmarking against national averages. Guidance on using the data on the NMPA website can be found on the [Resources page](#) and in the [Frequently Asked Questions](#). In addition, the [website](#) now provides information on the population of women cared for by each maternity service and a lay summary of the results, which we hope will be of use to women and their families, and to clinicians in communicating the results of the audit. We welcome feedback on how the audit outputs can be made more useful.

**Table 1** Measures of care before, during and after birth

	Can be measured by the NMPA in at least some trusts/boards in the country
	Cannot be measured in the country (owing to data collection, quality, format, supply or linkage)
	New measure in this report
	Outlier measure

	Measure	England	Scotland	Wales
<b>Timing of birth</b>	Proportion of women with induced labour (term, singleton)			
	Proportion of small-for-gestational-age babies who were not born before 40 <sup>+0</sup> weeks (term, singleton)			
<b>Giving birth</b>	Proportion of women who had a spontaneous vaginal birth (term, singleton)			
	Proportion of women who had an instrumental birth (term, singleton)			
	Proportion of women who had a caesarean birth (term, singleton)			
	Proportion of births that occurred without intervention (term, singleton): (a) Spontaneous onset, progress and birth, without episiotomy or epidural, spinal or general anaesthesia			
	(b) Spontaneous onset and birth, without episiotomy or epidural, spinal or general anaesthesia			
	Proportion of women who had their first baby by caesarean section who gave birth to their second baby vaginally (term, singleton)			
<b>Maternal measures</b>	Proportion of women who were smokers at booking who no longer smoked at the time of birth			
	Proportion of vaginal births with an episiotomy (term, singleton, cephalic position)			
	Proportion of vaginal births with a third or fourth degree tear (term, singleton, cephalic position)			
	Proportion of women with an obstetric haemorrhage of 1500 ml or more (term, singleton)			
	Proportion of women who had an unplanned, overnight readmission to hospital within 42 days of giving birth (term, singleton)			
<b>Neonatal measures</b>	Proportion of liveborn babies with skin-to-skin contact within 1 hour of birth (34 weeks and over)			
	Proportion of liveborn babies who were given breast milk (34 weeks and over): (a) at first feed (b) at discharge			
	Proportion of liveborn babies with a 5 minute Apgar score of less than 7 (term, singleton)			

	Measure	England	Scotland	Wales
Neonatal measures developed through linkage to NNRD	Proportion of liveborn babies who were admitted to a neonatal unit (singleton) at (a) 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation (term babies) (b) 34 <sup>+0</sup> and 36 <sup>+6</sup> weeks of gestation (late preterm babies)			
	Proportion of liveborn babies who received mechanical ventilation in the first 72 hours of life (term, singleton)			
	Proportion of liveborn babies who developed an encephalopathy in the first 72 hours of life (35 weeks and over, singleton)			

## Presentation of results on funnel plots

A funnel plot is a graphical method for comparing the performance of organisations.<sup>26</sup> The main advantage of this technique is that it takes the size of each organisation into account. This is important because the amount by which the result of an individual service may vary from the national mean is influenced by random fluctuations that are related to the number of births within the service.

In the sample funnel plot in Figure 1, results for England are shown as blue circles, for Scotland as teal triangles and for Wales as lilac squares. The dotted lines show the 95% control limits and the dashed (outer) lines the 99.8% control limits. 5% of trusts would be expected to lie outside the dotted lines and 0.2% outside the dashed lines due to chance. Here, many more trusts and boards lie outside these lines. This is an example of overdispersion (see below).

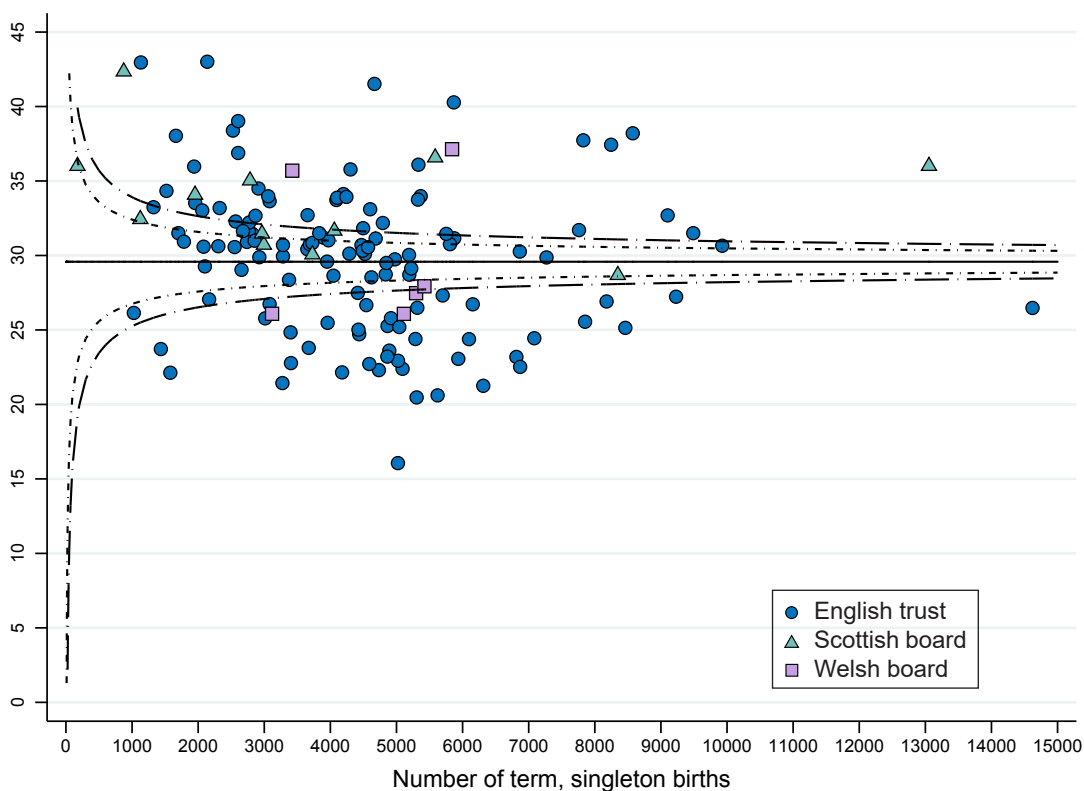


Figure 1 A sample funnel plot

The control limits within funnel plots show how much of the variation between services exceeds that expected to occur due to chance alone. For three outlier measures, this is taken as an indication of care quality. For other measures, we use funnel plots only to show where there are substantial systematic (non-random) differences between services.

Several of the funnel plots presented in this report show evidence of a phenomenon known as overdispersion. This occurs when a greater level of variability among services is demonstrated than can be explained by chance and the existence of a few outlying results. Important possible explanations for overdispersion include differences in data quality, the limitations of the risk adjustment methods and 'clinical uncertainty'. This means variation in practice as a result of the absence of clear evidence-based clinical standards and different clinician preferences. We have attempted to limit the impact of differences in case mix, and in data collection and coding practices between sites. It is likely that some of the systematic variation between services reflects clinical uncertainty.

Interactive funnel plots are available on the [NMPA website](#), as well as data tables and overviews of all results per trust/board and site.

## Presentation of results on scatter plots

For our measures on smoking cessation, feeding of babies and skin-to-skin contact at birth, data quality is sufficiently poor that the comparison of data on funnel plots is considered inappropriate. These results are therefore presented on scatter plots, which do not seek to compare performance between organisations.

# Methods

The NMPA uses data routinely collected in the course of clinical care through electronic maternity and hospital records. The data sources used in this report are described in Appendix 1.

## Analysis

### Construction of audit measures

The statistics in this report are presented as the proportion of events occurring within a group of women or babies. The reference group of women or babies (the denominator) varies between audit measures. As a general principle, the denominator for each measure is restricted to women or babies to whom the outcome or intervention of interest is applicable. For example, the measure for the 'proportion of women with a third or fourth degree tear' is restricted to women who gave birth vaginally.

For measures related to maternal care, results are presented per woman giving birth. For measures related to the care of the baby, results are presented per baby born. In order to compare like with like, the majority of measures are restricted to singleton, term births.

We do not restrict on the basis of fetal presentation at birth for measures that include births by caesarean section, as this information is not reliably completed in the datasets in any of the three countries.<sup>27</sup>

### Case mix adjustment

Clinical and demographic characteristics of women can affect both the demands placed on the maternity service and the outcomes of care. Some women and babies with more complex needs and at higher risk of complications are referred to specialist services. Accounting for risk factors that are outside the control of care providers is therefore essential for fair and meaningful comparisons across services.

In this report, we control for differences in the case mix between services by adjusting results for clinical and demographic characteristics using logistic regression models. These models adjust for factors such as maternal age, ethnicity, level of socio-economic deprivation, and clinical risk factors that may contribute to variation in results between organisations. Neonatal factors included in the case mix are birthweight and gestational age only. Further details, including which case mix factors were used in each model, are provided in the NMPA Measures Technical Specification on the [NMPA website](#).

### Suppression of small numbers

We do not present results where individual women or babies could theoretically be identified. Statistical power to detect true differences between services is also influenced by the number of births occurring at each. These issues affect the level at which some results can be reported, and particularly affect the reporting of site level results for freestanding midwifery units, the majority of which have fewer than 500 births annually. Births from freestanding midwifery units can, however, be included in analyses reported at trust level. For each measure, any trust or board reporting

fewer than 5 births that are eligible to be in the numerator or denominator are not reported at trust level, again to prevent the possibility of identification. This particularly affects reporting of neonatal encephalopathy and mechanical ventilation in this report.

## Data quality

### Key findings and recommendations

**KF2** The quality and completeness of data submitted to the NMPA has improved between the 2015/16 and 2016/17 reporting years; however, many trusts and boards are still excluded from one or more measures owing to poor data quality and completeness.

**R2** **Maternity service providers and national organisations responsible for collating and managing maternity datasets should use the NMPA data items described in the NMPA Measures Technical Specification as a guide to focus improvements to data quality.**

*(National organisations responsible for collating and managing maternity datasets, maternity service providers)*

**KF3** There is variation between and within the three countries in the availability, quality and completeness of the data items used to generate the measures in this report.

**R3** **National organisations from across England, Wales and Scotland that are responsible for collating and managing maternity datasets should work together to ensure alignment of data specifications used.**

*(National organisations responsible for collating and managing maternity datasets, with support and input from maternity service providers and from national governments and NHS bodies)*

**KF4a** Only a minority of trusts and boards submitted data of sufficient completeness and quality to be included in the measure of birth without intervention.

**KF4b** The quality of data collected about smoking in pregnancy and at the time of birth is poor. This is concerning given the importance of smoking cessation as part of initiatives to reduce stillbirth.

**KF4c** The quality and completeness of the data items needed to determine place of birth, in particular where obstetric units and alongside midwifery units are co-located, remains variable.

**R4** **Where local data provided have been insufficient to report results, or where results suggest there may be data quality issues for any or all of the following measures:**

- **birth without intervention**
- **smoking in pregnancy**
- **planned and actual place of birth,**

**maternity service providers should work with maternity information system suppliers and those responsible for collating and managing maternity datasets to improve completeness and accuracy of the data items required for these measures to inform local quality improvement activities.**

*(Maternity service providers, national organisations responsible for collating and managing maternity datasets, maternity information system suppliers)*

This report is based on births in NHS maternity services in England, Scotland and Wales between 1 April 2016 and 31 March 2017. Data from 149 of 151 trusts and boards that provide on-site intrapartum care have been included in the audit (Table 2).

**Table 2** Trusts/boards included in the audit, 2016/17

Type of site	England	Scotland	Wales	GB total
Trusts/boards with freestanding midwifery units only	2 <sup>a</sup>	1	1	4 <sup>a</sup>
Trusts/boards with at least one obstetric unit	128 <sup>a</sup>	13	6	147 <sup>a</sup>
<b>Total number of trusts/boards</b>	<b>130</b>	<b>14</b>	<b>7</b>	<b>151</b>
Total number of trusts/boards included in the audit	128	14	7	149

<sup>a</sup> In England, there are two trusts that contain freestanding midwifery units only, but one of these submitted their data together with a neighbouring trust with an obstetric unit. These trusts were handled together as the homebirths within this dataset could not be attributed to one trust or the other.

## Case ascertainment

For this report, the NMPA captured information about approximately 97% of all births in England, Scotland and Wales. This has improved from the [previous NMPA clinical report](#), where the proportion of births captured (the case ascertainment) was 92%. This is mainly due to greater ascertainment of births in England and Wales.

Data on Scottish births were provided by the Information Services Division of NHS National Services Scotland, which collects data centrally from all territorial NHS boards and evaluates case ascertainment centrally.

Evaluating case ascertainment in Wales and England is performed by the NMPA. This is more challenging because births are not recorded by place of birth but by parental place of residence by the Office for National Statistics (ONS), and there are a number of births that occur across the English–Welsh border. For England, we first compared the number of births reported by each trust against the number recorded for that trust in Hospital Episode Statistics 2016/17 financial year data. We then compared the national number of births with ONS figures. For Wales, we compared the number of births in the dataset with 2016 National Community Child Health Database (NCCHD) data for live births combined with ONS data for stillbirths.\*

**Table 3** Estimated proportion of births captured, by country

Country	Reported to the NMPA		Total registrable births (from official national statistics)	Estimated proportion of births captured (%)
	Women who gave birth in 2016/17	Babies born in 2016/17		
England	632 735	642 525	660 258 <sup>a</sup>	97.3%
Scotland	53 437	54 259	54 431	99.7%
Wales	31 357	31 836	33 524 <sup>a</sup>	95.0%
Overall	717 529	728 620	748 213	97.4%

<sup>a</sup> The total is calculated as the number of live births for 2016/17, together with the number of stillbirths for the calendar year 2016. This is a slight overestimate as the number of stillbirths fell in 2017. Tables for ONS data are available from the [ONS website](#).

\* The overall total is defined as the number of live births for 2016 from NCCHD data available at [gov.wales](#), including those to non-Welsh residents, together with the number of stillbirths for 2016. This is a slight overestimation as the number of both live births and stillbirths fell in 2017.

## How does the NMPA assess data quality?

As described in Appendix 1, the NMPA uses a different approach to obtaining data in each country, reflecting the status and maturity of centralised national maternity datasets. There are differences in data quality and completeness between the three countries that are detailed in the [first NMPA clinical report](#).

We assessed data quality at organisational (trust or board) level in three ways:

- Data completeness: for all key data items required by the NMPA, we excluded records if the proportion of records missing this information exceeded 30%.
- Plausible distribution: for many key data items we defined acceptable ranges for non-missing values. Rates of each measure were tabulated by trust/board and inspected by a clinical team. We excluded strongly outlying trusts and boards that had a rate that was either too low or too high to be plausible; that is, where no clinical reason for this level of variation could be envisaged. For example, trusts or boards with an obstetric unit failed the gestational age check if the proportion of babies born at term (37<sup>+0</sup> to 42<sup>+6</sup> weeks) was less than 70%.
- Internal consistency checks: for some data items, it was also possible to perform internal consistency checks within the database. For example, it would be implausible for a woman whose labour onset is recorded as 'prelabour caesarean section' to also be recorded as having given birth vaginally. We confirmed that these types of implausible records were rare within the dataset.

Details of the criteria used for this can be found in the [NMPA Measures Technical Specification](#). Individual trust/board level data quality results are available on the [NMPA website](#).

The analysis in this report is restricted to (a) trusts/boards that passed the NMPA trust/board level data quality checks and (b) birth records within those trusts or boards that contained the required data to construct the measure. The number of trusts and boards for which results were available therefore varied from measure to measure, depending on the specific data requirements (Table 4).

## Variation in data quality

There remain important differences in data quality between and within countries (Table 4). While key measures such as induction of labour and mode of birth can be reported almost universally, there are gaps in the availability of information for complications such as third and fourth degree tears. For the new composite measure on birth without intervention, only a minority of records can be included.

The [NMPA Measures Technical Specification](#) highlights key data items used in the production of this report. We recommend that, as systems change, trusts and boards focus on maintaining and improving data quality for these core data items expanding the range of data collected and ensuring correct mapping to central datasets.



**Table 4** Results of data quality assessment, by data item and country<sup>a</sup>

Measure <sup>b</sup>	% of all birth records that passed the data quality checks for this item				No. of relevant trusts and boards that passed the data quality checks for this item (n = 147 or *n = 149)
	England	Scotland	Wales <sup>c</sup>	GB total <sup>d</sup>	
<b>Timing of birth</b>					
Proportion of women with induced labour	97.0%	99.5%	100%	97.3%	142 (96.6%)
Proportion of small-for-gestational-age babies who were not born before 40 <sup>+0</sup> weeks	96.4%	100%	100%	96.8%	143 (97.3%)
<b>Modes of birth</b>					
Mode of birth (spontaneous vaginal, instrumental and caesarean)	99.3%	98.3%	100%	99.2%	147 (100.0%)
Birth without intervention (a) <sup>e</sup>	32.3%	0%	0%	28.5%	39 (26.5%)
Birth without intervention (b) <sup>e</sup>	65.6%	99.5%	22.7%	66.2%	98 (66.7%)
Proportion of women who had their first baby by caesarean section who gave birth to their second baby vaginally	99.3%	99.7%	100%	99.3%	142 (96.6%)
<b>Maternal measures</b>					
Proportion of women who were smokers at booking who smoked at the time of birth	79.9%	–	81.4%	78.5%	120 (80.5%)*
Proportion of vaginal births with an episiotomy	95.7%	100%	80.7%	95.4%	141 (95.9%)
Proportion of vaginal births with a third or fourth degree tear	99.3%	100%	79.2%	98.5%	145 (98.6%)
Proportion of women with an obstetric haemorrhage of 1500 ml or more	89.7%	–	100%	83.4%	121 (82.3%)
Proportion of women who had an unplanned, overnight readmission to hospital within 42 days of giving birth	97.8%	100%	100%	98.1%	146 (99.3%)
<b>Neonatal measures</b>					
Proportion of liveborn babies with skin-to-skin contact within 1 hour of birth	69.3%	0%	0%	61.1%	93 (62.4%)*
Proportion of liveborn babies who were given breast milk at first feed	75.9%	56.2%	0%	71.1%	111 (74.5%)*
Proportion of liveborn babies with a 5 minute Apgar score of less than 7	91.0%	100%	100%	92.1%	138 (93.9%)
<b>Neonatal measures that use NNRD linkage</b>					
Proportion of liveborn babies who were admitted to a neonatal unit (term and late preterm)	92.1%	71.4%	–	90.4%	128 (87.1%)
Proportion of liveborn babies who received mechanical ventilation	92.1%	71.4%	–	90.4%	128 (87.1%) <sup>f</sup>
Proportion of liveborn babies who developed an encephalopathy in the first 72 hours of life	91.1%	71.4%	–	90.4%	124 (84.4%) <sup>f</sup>

<sup>a</sup> For details of the data quality assessments undertaken, refer to the [NMPA Measures Technical Specification](#).

<sup>b</sup> Each indicator requires the individual evaluation of several different data items as detailed in the technical specification.

<sup>c</sup> Wales is not included in the measures that require linkage to the NNRD as, owing to data permissions, the NMPA was not able to obtain identifying information for Welsh births in order to link the NMPA's maternity data to the NNRD.

<sup>d</sup> This total is restricted to England and Scotland for those neonatal measures that use linkage to the NNRD.

<sup>e</sup> Birth without intervention in this report has two definitions. Definition (a) reports birth with spontaneous onset and progression and spontaneous birth, without epidural and without episiotomy; definition (b) omits the criterion for spontaneous progression.

<sup>f</sup> Despite passing the data quality checks, results for some of these trusts and boards cannot be reported because the small numbers of events could theoretically lead to identification of individuals (see methods section).

# Findings

## Characteristics of women giving birth

### Key findings and recommendations

**KF5** More than half (50.4%) of women with a recorded BMI at booking were overweight or obese (up from 47.3% in 2015/16).

**R5** **Maternity services, primary care and public health services should work together, with involvement of local service users, to ensure that there is appropriate provision to support weight management prior to, during and after pregnancy.**

*(Maternity service providers, public health service providers, commissioners, primary care, women and their families and organisations representing service users)*

KF4b, KF4c and R4 (p. xvii) also apply.

The NMPA provides a unique opportunity to describe the diversity of the women who gave birth during the audit period. This section outlines demographic and other general characteristics of these women and their babies. Where applicable, these characteristics were used in the case mix adjustment for the NMPA measures, which are also available at trust/board level, by country and overall on the [NMPA website](#).

The NMPA holds records for 717 529 women and 728 620 babies (of whom 705 883 were singletons) from the period 1 April 2016 to 31 March 2017 in England, Scotland and Wales (Tables 3 and 5).

The findings on maternal characteristics for 2016/17 do not differ significantly from those in our previous report, where they are described in more detail.<sup>3</sup> 22.0% of women who gave birth were over the age of 35, and 4.1% were over the age of 40, reflecting the trends in rising maternal age (Table 5).<sup>28</sup> However, for the first time, more than half (50.4%) of women with a recorded BMI at booking were overweight or obese, up from 47.3% in 2015/16.

**Table 5** Characteristics of women included in the audit

Characteristic	GB <sup>a</sup>		England		Scotland		Wales	
<b>Total number</b>	717 529		632 735		53 437		31 357	
<b>Age</b>								
<15	493	0.1%	419	0.1%	41	0.1%	33	0.1%
15–19	22 591	3.2%	19 344	3.1%	1 863	3.5%	1 384	4.4%
20–24	106 653	14.9%	92 718	14.7%	8 035	15.3%	5 900	18.8%
25–29	201 959	28.2%	177 826	28.2%	14 526	27.6%	9 607	30.6%
30–34	226 113	31.6%	200 419	31.7%	16 798	32.0%	8 896	28.4%
35–39	128 094	17.9%	114 335	18.1%	9 179	17.5%	4 580	14.6%
40–44	27 428	3.8%	24 593	3.9%	1 944	3.7%	891	2.8%
45+	2 071	0.3%	1 867	0.3%	140	0.3%	64	0.2%
<b>Ethnic origin</b>								
White	503 443	78.5%	439 002	76.8%	38 646	92.3%	25 795	91.1%
Black	39 645	6.2%	37 966	6.6%	912	2.2%	767	2.7%
Asian	72 513	11.3%	69 892	12.2%	1 519	3.6%	1 102	3.9%
Other	25 870	4.0%	24 427	4.3%	800	1.9%	643	2.3%
<b>Index of multiple deprivation<sup>b</sup></b>								
1 = least deprived	117 693	17.3%	102 175	17.1%	8 944	17.1%	6 574	21.9%
2	99 907	14.7%	84 695	14.1%	9 552	18.2%	5 660	18.8%
3	128 074	18.8%	112 438	18.8%	9 541	18.2%	6 095	20.3%
4	152 920	22.5%	136 074	22.7%	10 995	21.0%	5 851	19.5%
5	182 484	26.8%	163 200	27.3%	13 404	25.6%	5 880	19.6%
<b>BMI</b>								
<18.5	17 648	2.9%	15 528	2.9%	1 425	2.8%	695	2.4%
18.5–24.9	287 067	46.7%	251 389	47.0%	23 505	45.6%	12 173	42.4%
25.0–29.9	174 537	28.4%	151 952	28.4%	14 399	27.9%	8 186	28.5%
30.0–34.9	82 078	13.4%	70 473	13.2%	7 331	14.2%	4 274	14.9%
35.0–39.9	34 860	5.7%	29 623	5.5%	3 173	6.2%	2 064	7.2%
≥ 40.0	18 379	3.0%	15 341	2.9%	1 723	3.3%	1 315	4.6%
<b>Obstetric history</b>								
<i>Parity</i>								
Primiparous	299 387	42.0%	264 414	42.1%	22 462	42.8%	12 511	39.9%
Multiparous	413 187	58.0%	364 332	57.9%	30 009	57.2%	18 846	60.1%
<i>Previous caesarean section among multiparous women</i>								
Yes	85 465	21.7%	74 504	21.6%	7 002	23.3%	3 959	21.0%
<b>Multiplicity</b>								
Singleton	705 883	98.4%	622 359	98.4%	52 643	98.5%	30 881	98.5%
Twins	11 457	1.6%	10 200	1.6%	786	1.5%	471	1.5%
Triplets or more	188	0.03%	175	0.03%	8	0.01%	5	0.02%

<sup>a</sup> For each characteristic, the proportions of its categories are calculated only among records for which complete information about that characteristic is available.

<sup>b</sup> The index of multiple deprivation is derived from the recorded standardised socio-economic quintile of the individual's local area based on postcode (LSOA) in England, on postcode in Scotland and on GP cluster in Wales. As the areas used are of different granularity, with the smallest areas in Scotland and largest in Wales, these are not comparable between the three countries.

## Place of birth

The National Institute for Health and Care Excellence (NICE) recommends that women at low risk of complications are advised that planning birth in a midwifery unit (or at home if this is not their first baby) would be particularly suitable for them, and that women with certain health conditions or pregnancy complications plan birth in an obstetric unit. To enable this, NICE recommends that all women have access to all four choices of birth setting (obstetric unit, alongside midwifery unit, freestanding midwifery unit and home).<sup>8</sup> Unfortunately, the NMPA is currently unable to report on planned place of birth at any point in pregnancy owing to poor data quality.

Table 6 shows that half of all women in Scotland, three-quarters in England and all in Wales gave birth on a site where a midwifery unit was available, allowing women the opportunity to give birth in such a setting depending on individual circumstances.

**Table 6** Place of birth by site in Great Britain, 2016/17<sup>a</sup>

Type of site	England	Scotland <sup>b</sup>	Wales
Site with a freestanding midwifery unit only	9 869 (1.6%)	879 (1.7%)	975 (3.1%)
Site with an obstetric unit only	133 487 (21.1%)	26 867 (50.6%)	0
Site with an obstetric unit and an alongside midwifery unit	470 095 (74.3%)	25 310 (47.7%)	29 471 (94.0%)
Home (planned) <sup>b</sup>	11 655 (1.8%)	Unable to report	795 (2.5%)
Other	7 629 (1.2%)	# <sup>c</sup>	116 (0.4%)

<sup>a</sup> Based on the maternity unit type(s) associated with the site code of the place of birth recorded.

<sup>b</sup> Homebirth is not recorded in SMR-02, so is not included in the calculation of the percentages for place of birth by site in Scotland.

<sup>c</sup> Numbers less than 5 are suppressed.

In England, where this can be most accurately determined, the estimated proportions of women giving birth in different birth settings (Table 7) were similar to those of 2015/16 in our previous report. Examination of the inclusion of an additional data item to indicate type of midwifery unit suggests that the figures in Table 7 slightly underestimate the rate of births in alongside midwifery units (by around 0.5%), but this data item could only be used for just over half of trusts with an alongside midwifery unit. It remains important for service planning and for enabling choice for women that the quality of place of birth data improves.

**Table 7** Place of birth by unit/birth setting in England, <sup>a</sup> 2016/17<sup>b</sup>

Type of setting	Number of women (%)	% out of those where place of birth could be determined
Freestanding midwifery unit	9 869 (1.6%)	1.7%
Alongside midwifery unit	63 789 (10.1%)	10.7%
Obstetric unit	510 905 (80.7%)	85.5%
Planned homebirth	11 655 (1.8%)	2.0%
Other (e.g. in transit, elsewhere in hospital such as A&E, unplanned homebirth)	1 361 (0.2%)	0.2%
Unable to ascertain	35 156 (5.6%)	

<sup>a</sup> This analysis can only be done for England as the NMPA does not have access to maternity unit type information where obstetric units and alongside midwifery units are co-located in Scotland and Wales.

<sup>b</sup> In order to estimate the proportions of women giving birth in different unit types, we drew on a combination of the place of delivery field and the unit types known to be present on the site where the woman was recorded to have given birth, and the midwifery unit type field only for those sites where its data quality was sufficient.

## Measures of care before, during and after birth

This section is separated into five subsections: timing of birth, modes of birth, maternal measures, neonatal measures and additional neonatal measures for England and Scotland only, using linkage to the NNRD.<sup>25</sup>

Most NMPA measures are restricted to women giving birth to singleton babies at term. However, these restrictions do not apply to the measures on smoking cessation, breast milk and skin-to-skin contact. Alternative gestational ranges are applied to the measures for late preterm admissions to neonatal units and for neonatal encephalopathy. We received information about gestational age in weeks instead of days from many services and have therefore pragmatically defined term as between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation.

When considering the results presented in this chapter, it is important to bear in mind that the comparisons are centred around national averages, not established standards. For many of these measures, the 'ideal' rate is unknown. It is always possible to further improve services as we strive to deliver the best possible care to women and their babies.

For each of the measures that follow, we report the number of trusts or boards that could be included in the measure. The overall numbers of trusts and boards included in the audit are provided in Table 2.

### Timing of birth

#### Key findings and recommendations

**KF6** There is a small increase in induction rates (27.9% to 29.2%) and a small decrease in the proportion of small-for-gestational-age babies born at or after 40 weeks (55.3% to 52.3%) in England only compared with 2015/16 data. This coincides with the introduction of the Saving Babies' Lives care bundle and requires further monitoring.

**R6a** **The NMPA, MBRRACE-UK and other national organisations responsible for collating and managing maternity datasets should continue to monitor for evidence of improvements in:**

- **the rate of detection of small-for-gestational-age babies**
- **stillbirth rates.**

*(NMPA, MBRRACE-UK and national organisations responsible for collating and managing maternity datasets)*

**R6b** **Following implementation of national initiatives such as the Saving Babies' Lives care bundle in England, the NMPA and NHS trusts and boards should monitor for possible increases in induction rates and the impact of this on women, their babies and service providers.**

*(NMPA, NHS trusts and boards)*

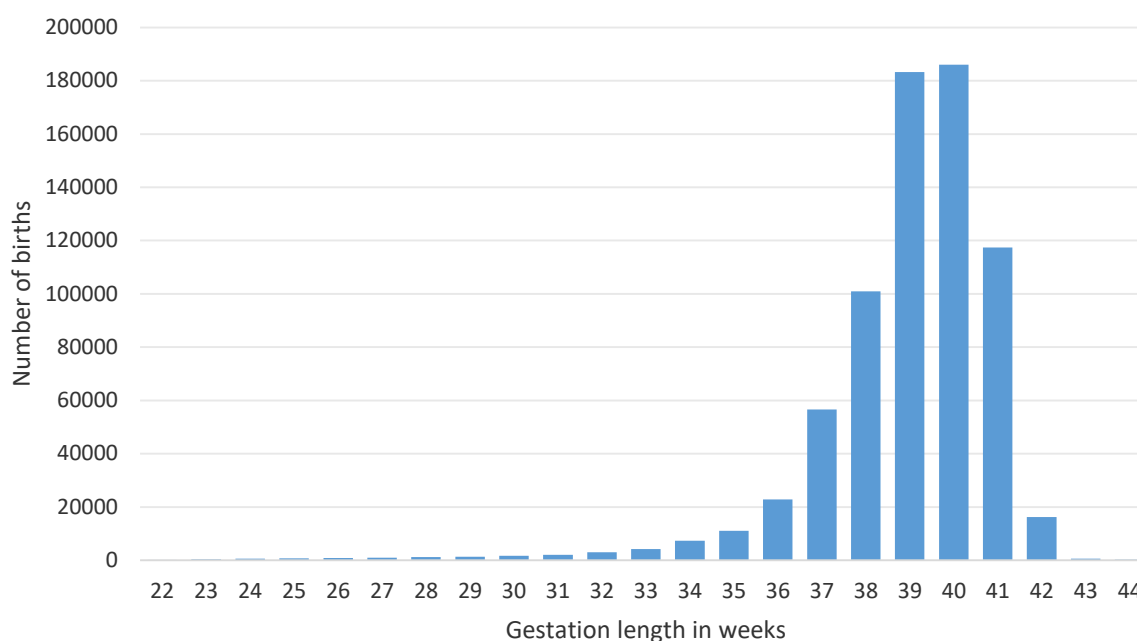
In this section, we show gestational age at birth and results of measures on induction of labour and the proportion of babies born small for gestational age who are born at or after 40 completed weeks of gestation.

The estimated average length of pregnancy is 40 weeks after the first day of the last menstrual period. The majority of women will spontaneously go into labour between 37 and 42 weeks of pregnancy, in the period known as 'term'. In the UK, national guidance recommends that women with otherwise uncomplicated singleton pregnancies are offered induction of labour to prevent prolonged pregnancy between 41<sup>+0</sup> and 42<sup>+0</sup> weeks of gestation.<sup>14</sup> However, there are many reasons why an earlier birth may be recommended. If an elective caesarean section is performed, this is recommended to take place at or after 39 weeks of pregnancy.<sup>15</sup>

The most common overarching reason for early induction of labour is to prevent stillbirth due to placental failure. Induction of labour prior to 40 weeks is recommended for women over the age of 40,<sup>29</sup> for some women with conditions such as diabetes or pre-eclampsia,<sup>30,31</sup> and for women with babies who are small for gestational age.

## Gestational age at birth

The pattern of gestational age at birth reflects the timing and prevalence of elective caesarean sections and of induction of labour for the prevention of prolonged pregnancy (Figure 2). 93.8% of singleton babies and 40.4% of twins and higher order multiple babies were born at term, i.e. at 37 weeks of gestation or later. The proportion of preterm births among singletons was similar in all three countries, at 6.4%. All these numbers are very similar to those for 2015/16.



**Figure 2** Gestational age at birth in completed weeks in England, Scotland and Wales in 2016/17

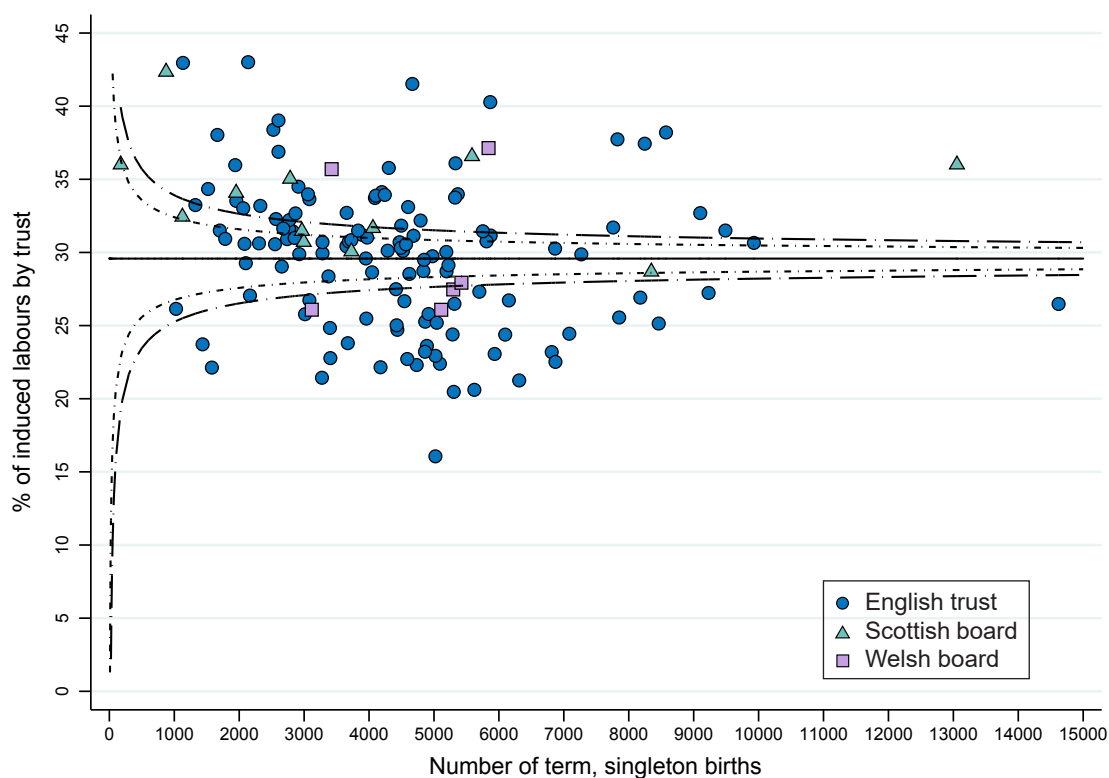
## Induction of labour

**What is measured:** The proportion of women with a singleton baby between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation who have an induction of labour.

**Table 8** Proportion of women with a singleton pregnancy at term who have an induction of labour

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis	124	12	6	142
Number of women included in analysis	555 074	47 649	28 215	630 938
Number of women who have induction of labour	162 336	15 602	8 701	186 639
Proportion of women who have induction of labour (adjusted) <sup>a</sup>	29.2%	33.2%	30.1%	29.6%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 3** Case mix adjusted trust/board level proportions of women with a singleton pregnancy at term who have induction of labour

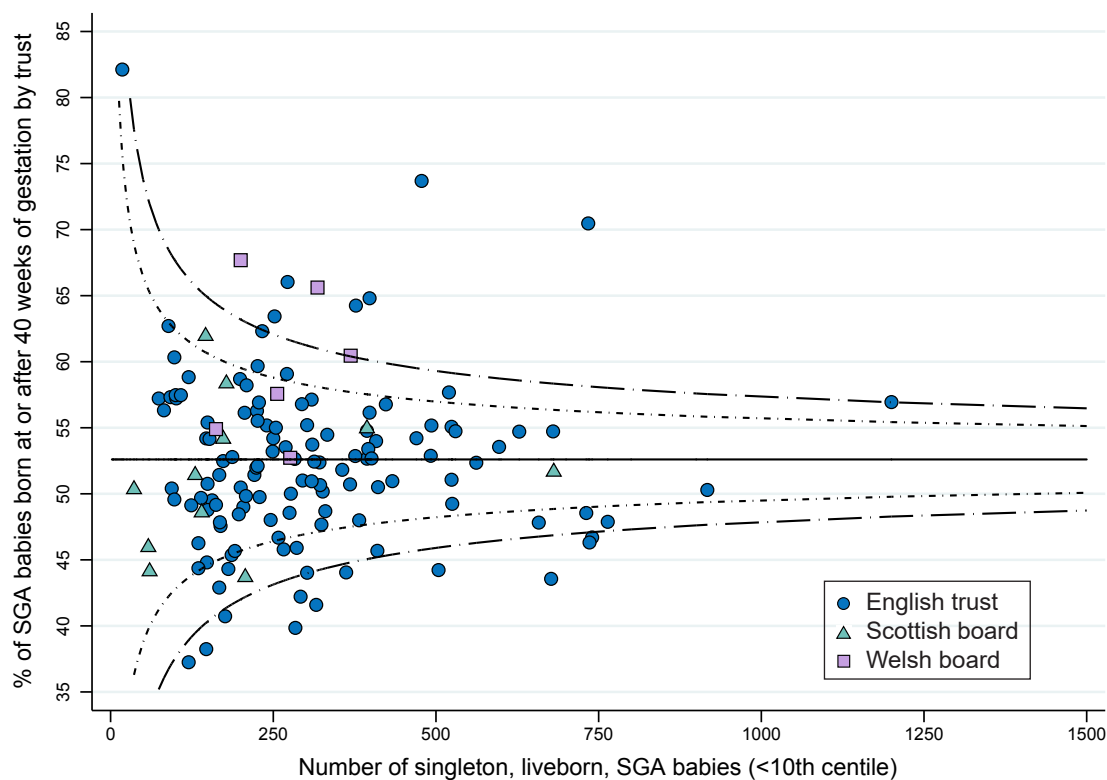
## Small-for-gestational-age babies born at or after 40 weeks

**What is measured:** Of term babies born small for gestational age (defined as below the 10th birthweight centile using UK 1990 charts),<sup>32</sup> the proportion who are born after their estimated due date.

**Table 9** Proportion of term babies born small for gestational age at or after 40<sup>+0</sup> weeks

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis	124	13	6	143
Number of babies included in analysis	38 913	2 207	1 581	42 701
Number of all babies at term with birthweight <10th centile, who are born at or after 40 <sup>+0</sup> weeks	20 357	1 171	934	22 462
Proportion of term babies who are born with weight <10th centile	7.2%	4.7%	6.0%	7.0%
Proportion of term babies born with weight <2nd centile	1.0%	0.7%	1.0%	1.0%
Proportion of all babies at term who are <10th centile, who are born at or after 40 <sup>+0</sup> weeks (adjusted) <sup>a</sup>	52.3%	52.3%	60.0%	52.6%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 4** Case mix adjusted trust/board level proportions of babies born at term with weight below the 10th centile, who are born at or after 40<sup>+0</sup> weeks



## Discussion

In this section, we have shown data relating to gestational age at birth, induction of labour rates and the birth of small-for-gestational-age babies at or after 40 weeks. Gestation and mode of labour onset are generally well recorded in electronic datasets.

These issues are interrelated: recent initiatives to reduce stillbirth recommend induction of labour if there is concern about the baby's wellbeing. However, the effectiveness of methods of measuring babies' wellbeing remain unclear. The high rate of small-for-gestational-age babies at term being born at or after 40 weeks that persists across all services, despite earlier birth being recommended by Royal College of Obstetricians and Gynaecologists (RCOG) guidance<sup>12</sup> and the introduction of new initiatives such as the Growth Assessment Protocol (GAP),<sup>33</sup> suggests that detection of small babies remains a clinical challenge.

The introduction of the Saving Babies' Lives care bundle<sup>34</sup> in England in March 2016 was preceded by similar initiatives in Scotland<sup>13</sup> and Wales.<sup>35</sup> Two elements of the care bundle, additional growth monitoring and increasing awareness of fetal movements, would be expected to increase induction rates and possibly improve detection of small-for-gestational-age babies.<sup>36</sup> We observed a small increase in induction rates (27.9% to 29.2%) and a small decrease in the proportion of small-for-gestational-age babies born at or after 40 weeks in England (55.3% to 52.3%) compared with 2015/16.<sup>3</sup> While it is too early to call this a trend, it requires further monitoring, as well as further evaluation of the impact of increased induction rates on women, their families and babies, and on service provision. The recent update of the Saving Babies' Lives care bundle partially addresses these concerns by emphasising the need to avoid early term birth for reduced fetal movements alone.<sup>7</sup>

## Giving birth

### Key findings and recommendations

**KF7** There remains substantial variation, beyond that which would be expected due to chance, in the rates of key measures of maternity care such as induction of labour and modes of birth. This suggests that there remains variation in clinical practice, decision making and outcomes across England, Scotland and Wales.

**R7** **National bodies such as NHS England, the Scottish Government, the Welsh Government, the RCOG and the RCM should work together to review the need for guidance and standards to reduce variation in key aspects of maternity care, including induction of labour and modes of birth.**

*(National bodies including the RCOG, RCM, NICE and SIGN, all clinicians, women and their families and organisations representing service users)*

**KF8** Among the 163 508 women with singleton pregnancies who gave birth at term for whom available data were of sufficient quality, 36.9% did so without intervention (spontaneous onset, progress and birth, without epidural, spinal or general anaesthesia and without episiotomy). There was substantial variation in this rate (between 23% and 48%), which persisted after adjustment for case mix.

**R8** **Maternity service providers and local service users should work together to understand the barriers to birth without intervention in their service by reviewing:**

- **rates of birth without intervention (where local data provided have been adequate to report against this measure)**
- **rates of individual interventions**
- **place of birth.**

*(Trusts and boards, women and their families and organisations representing service users)*

This section describes the ways in which women give birth, including modes of birth (spontaneous vaginal, instrumental and caesarean), birth without intervention and vaginal birth after caesarean section.

Modern maternity care is characterised by rising rates of intervention due to reduced overall parity, changes in demographics such as average age, prevalence of comorbidity and increased rate of obesity, and a desire to reduce preventable adverse outcomes.

There is substantial variation in decision making around mode of birth. Each clinical decision involves a judgement about whether the intervention is justified or not. For example, there is considerable debate about the value of electronic monitoring of the baby's wellbeing.<sup>37,38</sup> Therefore, decision making also reflects shifting perceptions of what constitutes an acceptable level of risk, caseload, cultures and policies in maternity units and individual preferences of clinicians and women.

It is not possible to define what constitutes an 'ideal' rate for each mode of birth. Instead, this section of the report aims to describe these rates and to show how they vary. It is useful to consider the rates of different modes of birth together in order to understand the overall experience for women nationally and in a given country or trust/board.

We also present the results of a new measure, birth without intervention. We convened a stakeholder group to agree a definition for this measure, which draws on previous debates on 'normal' birth<sup>39</sup>

and represents a birth that starts, proceeds and ends spontaneously, without episiotomy and without epidural, spinal or general anaesthesia. This measure has been proposed by many NMPA stakeholders and we hope it will be of use in evaluating clinical practice, for counselling, and to women and their families.

## Modes of birth

**What is measured:** Of women who give birth to a singleton baby between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion with each mode of birth:

(a) spontaneous vaginal birth: vaginal birth without the use of instruments

(b) instrumental birth: vaginal birth with the assistance of instruments

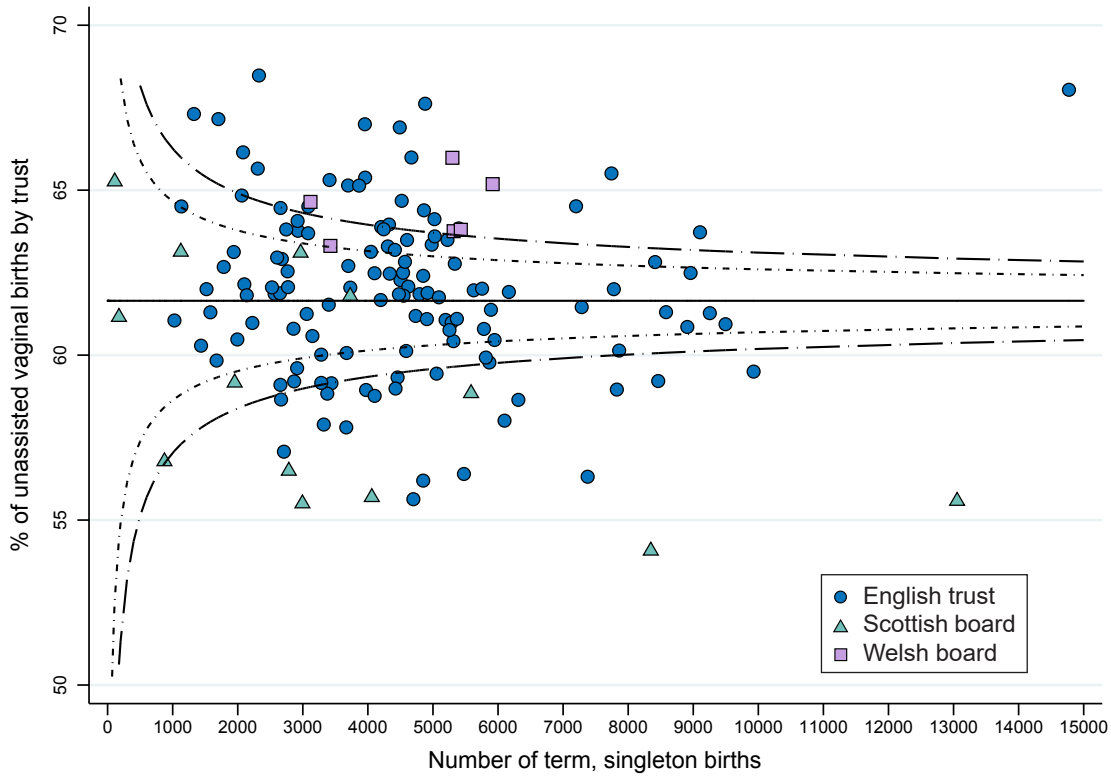
(c) caesarean birth (both elective\* and emergency)

**Table 10** Proportion of women giving birth to a singleton baby at term who have a (a) spontaneous vaginal birth, (b) instrumental birth or (c) caesarean birth

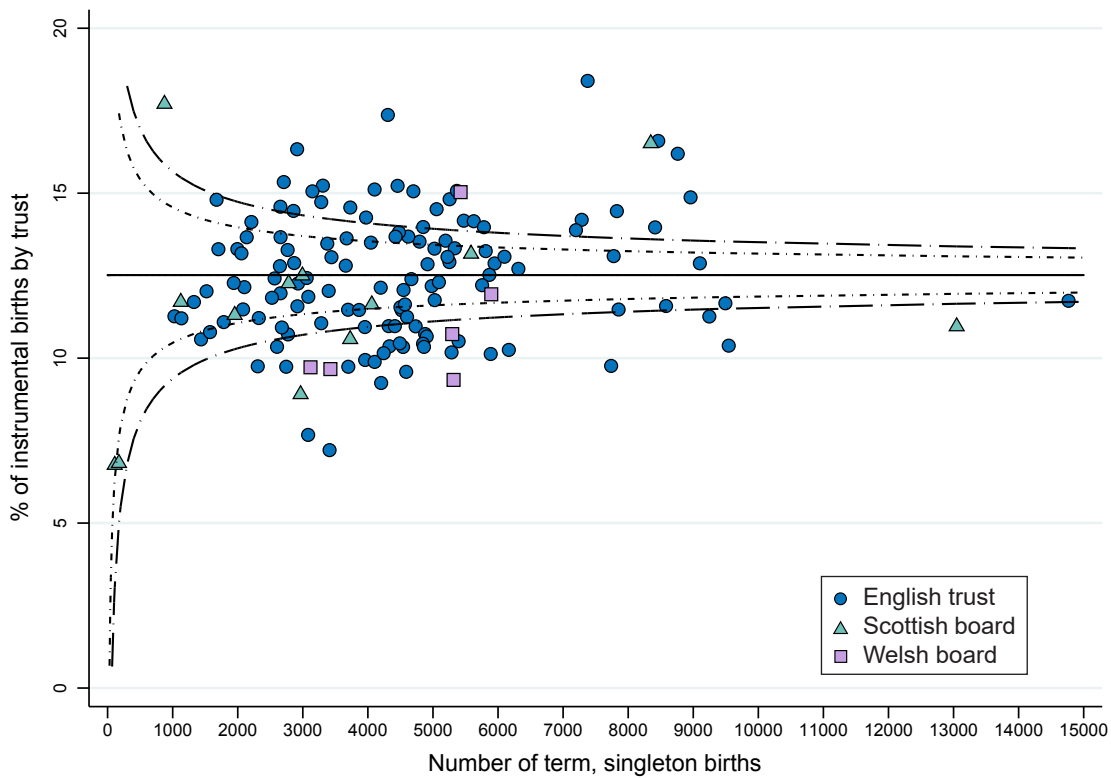
		England	Scotland	Wales	GB total
Number of trusts/boards included in analysis		128	13	6	147
Number of mothers included in analysis		574 986	47 759	28 505	651 250
Number of women who have a spontaneous vaginal birth		355 720	27 357	18 403	401 480
Number of women who have an instrumental birth		72 569	5 813	3 043	81 425
Number of women who have a caesarean birth		145 986	14 579	7 030	167 595
Overall rate (adjusted) <sup>a</sup>	Spontaneous vaginal birth	61.9%	57.1%	64.5%	61.6%
	Instrumental birth	12.6%	12.3%	11.4%	12.5%
	Forceps	7.1%	9.3%	8.1%	7.3%
	Ventouse	5.5%	3.0%	3.3%	5.2%
	Caesarean birth	25.5%	30.5%	24.1%	25.8%
	Elective	11.1%	13.3%	10.9%	11.3%
	Emergency	14.3%	16.8%	13.3%	14.5%
Rate in primiparous women (adjusted) <sup>a</sup>	Spontaneous vaginal birth	50.2%	46.1%	53.7%	50.0%
	Instrumental birth	23.4%	22.5%	21.2%	23.2%
	Elective caesarean birth	5.2%	6.1%	4.6%	5.2%
	Emergency caesarean birth	21.2%	25.4%	19.5%	21.4%
Rate in multiparous women (adjusted) <sup>a</sup>	Spontaneous vaginal birth	70.3%	65.2%	72.3%	70.0%
	Instrumental birth	4.8%	5.1%	4.3%	4.8%
	Elective caesarean birth	15.2%	20.4%	16.4%	15.7%
	Emergency caesarean birth	9.5%	9.5%	8.7%	9.4%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).

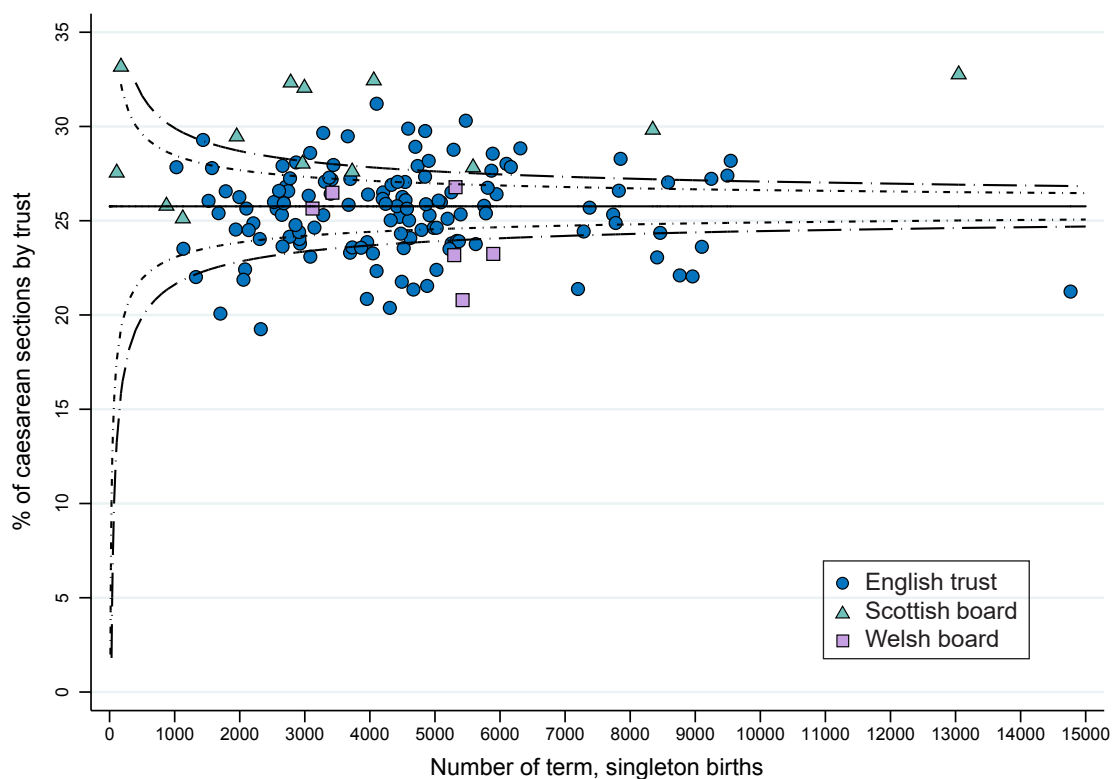
\* In this context, 'elective' means a planned operation. This can be for a broad variety of indications, including but not limited to placental problems such as placenta accreta, factors to do with the baby such as breech presentation, previous caesarean section or other operation on the womb, or maternal medical or psychological health conditions. A small proportion of 'elective' caesarean sections are performed at the request of the mother without another medical, surgical or psychological indication.



**Figure 5** Case mix adjusted trust/board level proportions of women giving birth to a singleton baby at term who have a spontaneous vaginal birth



**Figure 6** Case mix adjusted trust/board level proportions of women giving birth to a singleton baby at term who have an instrumental birth



**Figure 7** Case mix adjusted trust/board level proportions of women giving birth to a singleton baby at term who have a caesarean birth

### Using the NMPA results

“The NMPA results for 2015/16 births identified that we had increased rates in a number of areas:

- The proportion of small-for-gestational-age babies not born by their estimated due date: The Trust follows the RCOG guideline of offering Induction of labour after 37 completed weeks of gestation for SGA [small-for-gestational-age] and IUGR [intrauterine growth restriction] babies. To monitor and identify babies at risk of growth restriction, the trust has implemented GROW [customised growth charts as recommended by the GAP protocol<sup>33</sup>],\* with midwives being trained in scanning to increase capacity and a dedicated midwife for GROW in post. Dedicated consultant-led scanning sessions will be introduced in May 2019 to scan and monitor IUGR, SGA babies and mothers with medical comorbidities such as hypertension, etc.
- Third and fourth degree tears: The utilisation of Episissors\* has been introduced and a masterclass in instrumental delivery held to reduce rates of obstetric anal sphincter injury.
- Caesarean sections: To reduce the caesarean rate the trust has introduced caesarean section review meetings every 2 weeks, where all category 1 sections and caesareans at full dilatation are reviewed by an obstetric consultant and midwifery manager. This forum advises on guidelines and identifies individual and wider training needs. Learning is disseminated at local and joint forums including the Local Maternity System.”

*Luton and Dunstable University Hospital NHS Foundation Trust*

\* Any branded products mentioned are not nationally mandated tools and inclusion in this report does not constitute endorsement by the NMPA, its funders or commissioners. Alternative products may be available.

## Birth without intervention

For this measure, results are reported according to two possible definitions. The first represents the 'full' definition for the purpose of the NMPA, which incorporates spontaneous labour onset, spontaneous progress and spontaneous birth, without epidural, spinal or general anaesthesia and without episiotomy. However, the second definition omits the criterion for spontaneous progress in order to be able to include Scotland and Wales in the measure: augmentation with drugs is not recorded in the Scottish central maternity data, and in the Welsh central maternity data it is not recorded separately from augmentation by breaking the waters (artificial rupture of membranes).

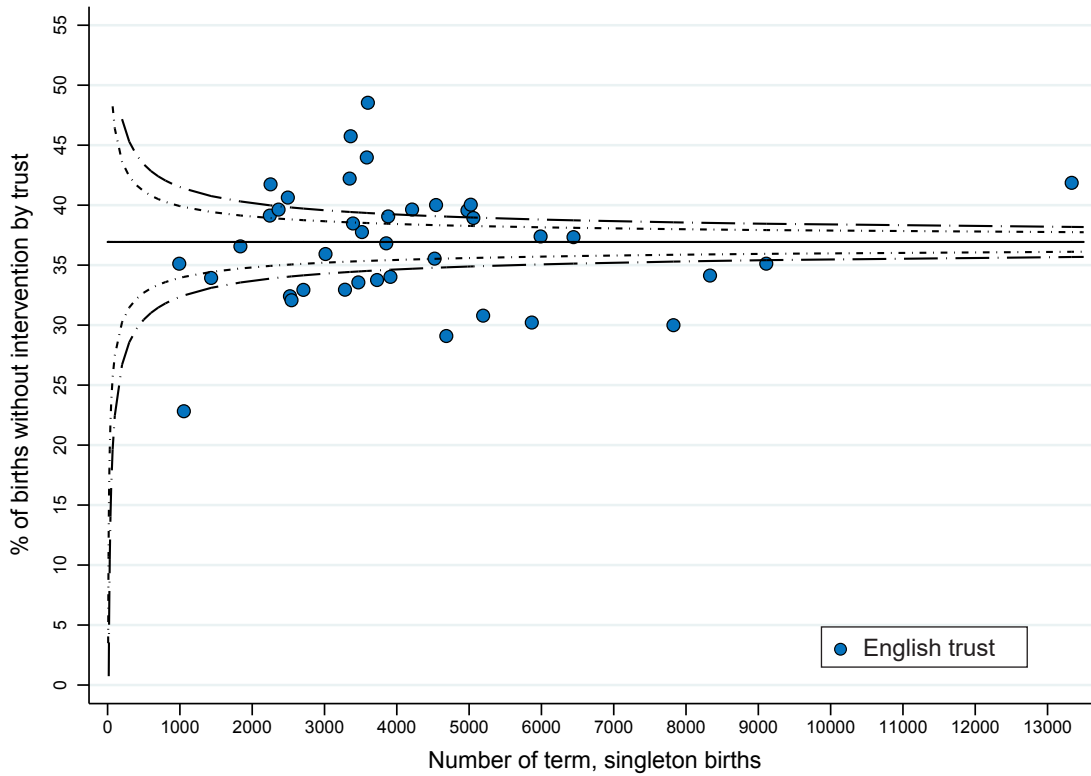
**What is measured:** Of women who give birth to a singleton baby between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who have a birth without intervention, defined as a birth that meets the following criteria:

- 1 spontaneous labour onset
- 2 spontaneous progress without drugs to augment labour (*criterion omitted in second definition*)
- 3 spontaneous vaginal birth
- 4 without epidural, spinal or general anaesthesia
- 5 without episiotomy.

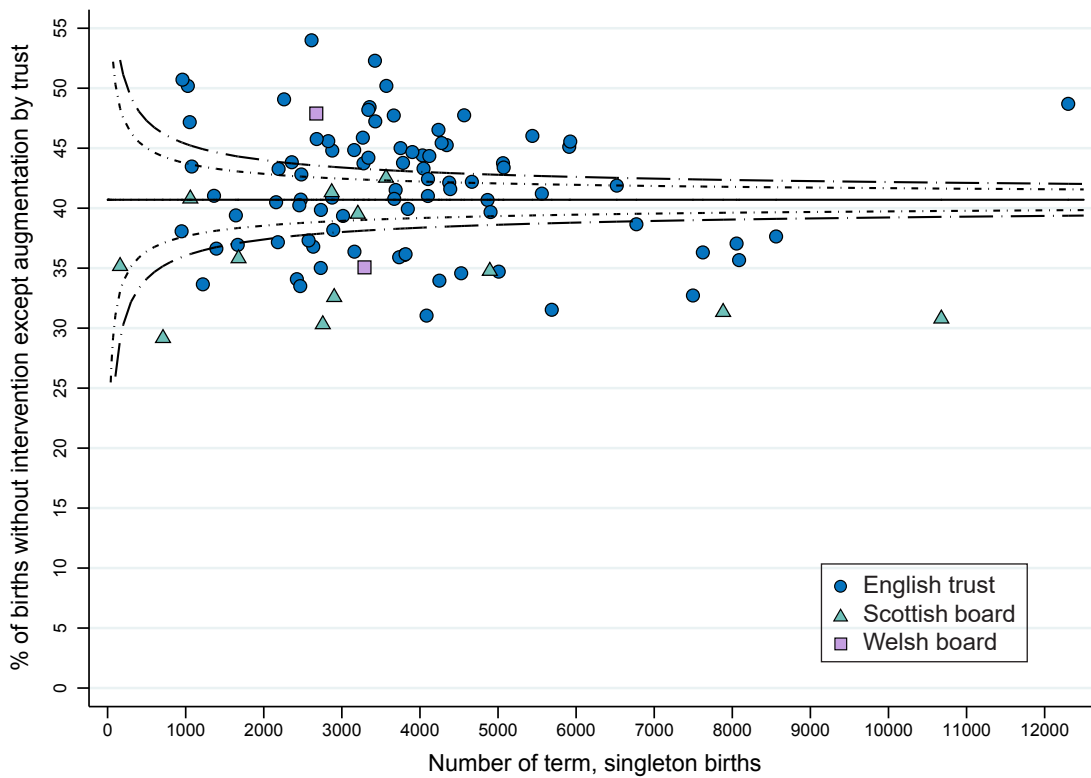
**Table 11** Proportion of women who give birth to a singleton baby at term without intervention

	England	Scotland	Wales	GB total
<b>Birth without intervention, including criteria 1–5 (a)</b>				
Number of trusts/boards included in analysis	39	–	–	39
Number of mothers included in analysis	163 508	–	–	163 508
Number of women who gave birth without intervention	60 389	–	–	60 389
Rate of birth without intervention (adjusted) <sup>a</sup>	36.9%	–	–	36.9%
<b>Birth without intervention, including criteria 1,3,4,5 (b)</b>				
Number of trusts/boards included in analysis	84	12	2	98
Number of mothers included in analysis	320 198	42 361	5 963	368 522
Number of women who gave birth without intervention	133 272	14 380	2 341	149 993
Rate of birth without intervention (adjusted) <sup>a</sup>	41.5%	34.2%	41.1%	40.7%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 8** Case mix adjusted trust/board level proportions of women who give birth to a singleton baby at term without intervention, including criteria 1–5 (a)



**Figure 9** Case mix adjusted trust/board level proportions of women who give birth to a singleton baby at term without intervention, including criteria 1,3,4,5 (b)

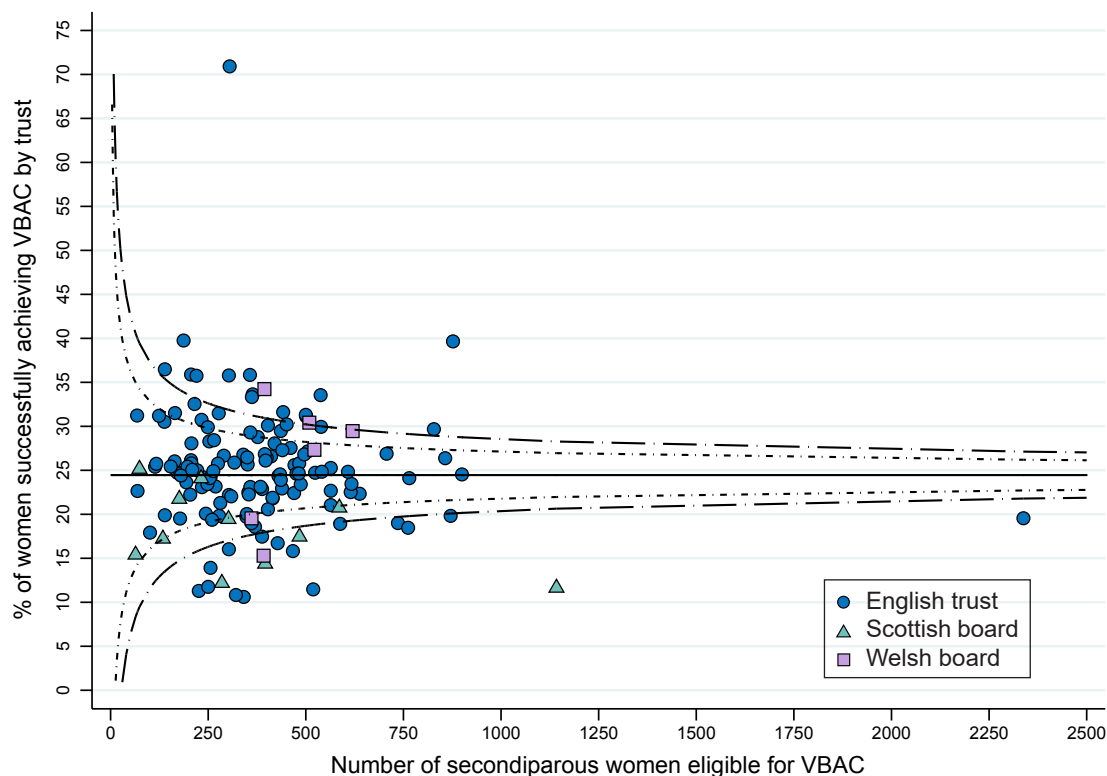
## Vaginal birth after caesarean section

**What is measured:** Of women having their second baby after having had a caesarean section for their first baby, \* the proportion who give birth to their second baby vaginally.

**Table 12** Proportion of women giving birth to their second baby at term, who had their first baby by caesarean section and their second vaginally

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis	128	12	6	146
Number of mothers eligible for VBAC and included in analysis	49 542	3 890	2 798	56 230
Number of women who have VBAC	12 449	564	740	13 753
Rate of attempted VBAC (among those eligible; adjusted) <sup>a</sup>	40.2%	34.6%	43.3%	40.0%
Rate of successful VBAC (among those attempted; adjusted) <sup>a</sup>	59.1%	48.2%	60.3%	58.5%
Overall VBAC rate (among those eligible; adjusted) <sup>a</sup>	24.9%	16.7%	26.7%	24.5%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 10** Case mix adjusted trust/board level proportion of secundiparous women who had their first baby by caesarean section and their second vaginally

\* The measure is restricted to secundiparous women because of the limitations of historical records, and because this is the largest group of women considering VBAC (vaginal birth after caesarean section). The rate presented here may therefore be smaller than other commonly reported VBAC rates, as it does not include those women who previously had a vaginal birth as well as a caesarean section.



## Discussion

The measures in this section that cover modes of birth should all be considered together to understand patterns of care within trusts or boards. These measures have been consistently reported for many years in the RCOG's indicators reports,<sup>40,41</sup> the [NMPA's first clinical report](#)<sup>3</sup> and by national providers of health statistics such as NHS Digital.<sup>42</sup> The rates shown here are broadly consistent with these previous findings and will be useful as a validity check as the NMPA moves towards using different data sources to report on births in England.

We continue to be unable to report results by Robson group<sup>43</sup> in any of the three countries because fetal presentation continues to be recorded less completely for caesarean births than for vaginal births, explained in full [in our report on this issue in the 2015/16 data](#).<sup>27</sup> We hope that reporting by Robson group will become possible as data quality improves.

This is the first time that we have been able to report on birth without intervention. At present, we are only able to report this measure for a limited number of trusts and boards owing to limited data availability, in particular on labour augmentation and anaesthesia.\* Omitting augmentation with drugs as a criterion allows the inclusion of Scotland and Wales, as well as a larger number of English trusts, enabling more maternity services to evaluate this aspect of their care. As most women who have augmentation of labour with drugs will also have epidural anaesthesia, overall rates resulting from the two definitions are quite similar and either definition of the measure provides an important balance to the rates of individual interventions found elsewhere in this report. The definition of the birth without intervention measure is subject to ongoing review in discussion with the NMPA's stakeholders.

It is important that the birth without intervention measure is not considered in isolation. For a small proportion of women who have a birth without intervention, this will not be through choice but through non-availability of, for example, epidural anaesthesia; and while birth without intervention may be associated with reduced complications for the mother and baby, complications may still occur. Measures of birth without complication are available elsewhere including in the Maternity Safety Thermometer in England,<sup>44</sup> which uses a monthly survey of maternity services. The NMPA will seek to collaborate with other national projects and stakeholders to develop a measure of birth without adverse outcome using data available in routinely collected datasets in Great Britain.

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\* This applies particularly in Wales where the data for all items required were only available for two boards and the number of women included in the measure is small.

## Maternal measures

### Key findings and recommendations

**KF9** There remains variation, beyond that which would be expected, in the proportion of women experiencing complications at birth in the form of a third or fourth degree tear, or a postpartum haemorrhage of 1500 ml or more.

**R9a** **National bodies should continue their work to develop and implement package interventions for prevention and management of third and fourth degree tears and postpartum haemorrhage.**

*(National bodies including the RCOG and RCM, and national governments and NHS bodies)*

**R9b** **All maternity services should review their clinical practices to ensure an accurate diagnosis and effective prevention and management of:**

- **postpartum haemorrhage**
- **obstetric anal sphincter injury**

**to minimise variations in care.**

*(Maternity service providers)*

In this section, we discuss measures of care and complications for mothers. This is a relatively heterogeneous group of measures that covers a variety of factors that affect women and their babies. These are smoking cessation in pregnancy, episiotomy, and three complications of birth: obstetric anal sphincter injury (OASI), postpartum haemorrhage of 1500 ml or more, and emergency (re) admission to hospital for the mother in the 42 days after birth.

Smoking cessation for women who are smoking at booking is a core aim of good antenatal care and an area identified for improvement as part of the NHS Long Term Plan.<sup>22</sup> Smoking is associated with poor fetal growth<sup>45–47</sup> and an increased chance of preterm birth<sup>47,48</sup> and stillbirth,<sup>49,50</sup> as well as respiratory problems for the baby after birth.

Vaginal birth may be accompanied by tearing of the vaginal skin and muscle, and uncommonly into the muscle or tissue of the anus. Some vaginal births are assisted by an episiotomy, a cut to the tissue around the vagina to expand the space available for the birth, which is recommended in instrumental birth and when the midwife or obstetrician caring for the woman giving birth has concerns about the baby's wellbeing.<sup>8</sup>

OASI is a major complication of vaginal birth, defined as a tear occurring during birth that extends into the anal sphincter and/or anal mucosa. These tears are also known as 'third degree' (extending into the anal sphincter) and 'fourth degree' (anal mucosa) tears.<sup>51</sup> In the UK, it is recommended that all third and fourth degree tears be repaired as soon as possible after birth in order to reduce the risk of long-term incontinence. Even with timely repair, the risk of complications is high: 20–40% of women will have symptoms of incontinence or urgency at 12 months after giving birth.<sup>52</sup> A care bundle aimed at reducing rates of third and fourth degree tears has recently been piloted and results are awaited.<sup>53</sup>

Obstetric haemorrhage is a major source of morbidity and one of the most common direct causes of maternal mortality. The most common cause of any postpartum haemorrhage is failure of the uterus to contract down after birth; this is more likely in women who are obese, have a multiple birth or

large baby, have a prolonged labour or caesarean birth, or who have had a postpartum haemorrhage before. A threshold of 1500 ml of blood loss is used to define severe obstetric haemorrhage for the purpose of the NMPA. \* Visual estimation often underestimates blood loss, and, in significant haemorrhage, blood collection drapes or weighing of swabs<sup>57</sup> should be used for a more accurate estimate. An apparently low rate of postpartum haemorrhage can, therefore, be due to poor practice in estimation. This measure cannot be reported for Scotland. †

Emergency readmission to hospital within 42 days of birth represents not only physical morbidity but also separates new families, with potential emotional and social consequences. The most common causes of maternal readmission are infection, wound breakdown, pain, anaemia and venous thromboembolism; rarely, readmission is due to surgical complications.

The rates of all three of these complications differ by mode of birth: third and fourth degree tears are more common in instrumental birth; haemorrhage in instrumental and caesarean birth; and readmission in caesarean birth. These measures should therefore be considered together with those in other sections.

## Smoking cessation

**What is measured:** Of those women who are recorded as being current smokers at their booking visit, the proportion who are no longer smokers by the time of birth. ‡

**Table 13** Proportion of women smoking at booking and birth

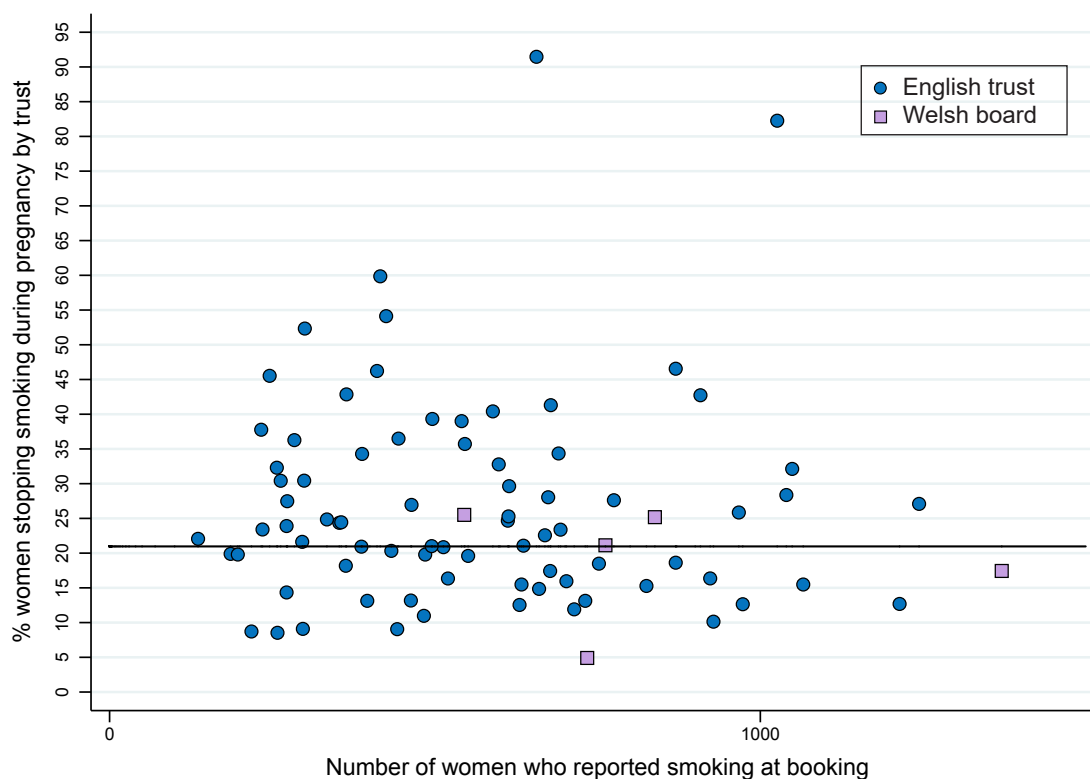
	England	Wales	England and Wales
Number of trusts/boards included in smoking at birth analysis	114	6	120
Number of women included in smoking at birth analysis	536 982	24 275	561 257
Number of women smoking at birth	58 301	4 008	62 309
Proportion of women smoking at birth <sup>a</sup>	10.9%	16.5%	11.1%
Number of trusts/boards included in smoking cessation analysis	100	6	106
Number of women included in smoking cessation analysis	55 694	4 285	59 979
Number of women not smoking at birth, who were smoking at booking	11 786	789	12 575
Proportion of women not smoking at birth, among those who were smoking at booking	21.2%	18.4%	21.0%

<sup>a</sup> This was derived from smoking status in late pregnancy or at the time of birth, as available.

\* This threshold was selected based on clinical significance,<sup>54</sup> a consensus process conducted by the National Perinatal Epidemiology Unit<sup>55</sup> and compatibility with the Maternity Services Data Set (MSDS) v1.5.<sup>56</sup>

† In Scotland's central maternity data, postpartum haemorrhage is recorded as a binary variable for blood loss of 500 ml or more. This does not match with the NMPA's definition of severe obstetric haemorrhage and therefore we do not report on this rate here. However, it is available on the NMPA website.

‡ In Scotland's central maternity data, smoking is recorded differently. Scotland could therefore not be included in this measure.



**Figure 11** Trust/board level proportions of women who were smoking at booking but not at birth

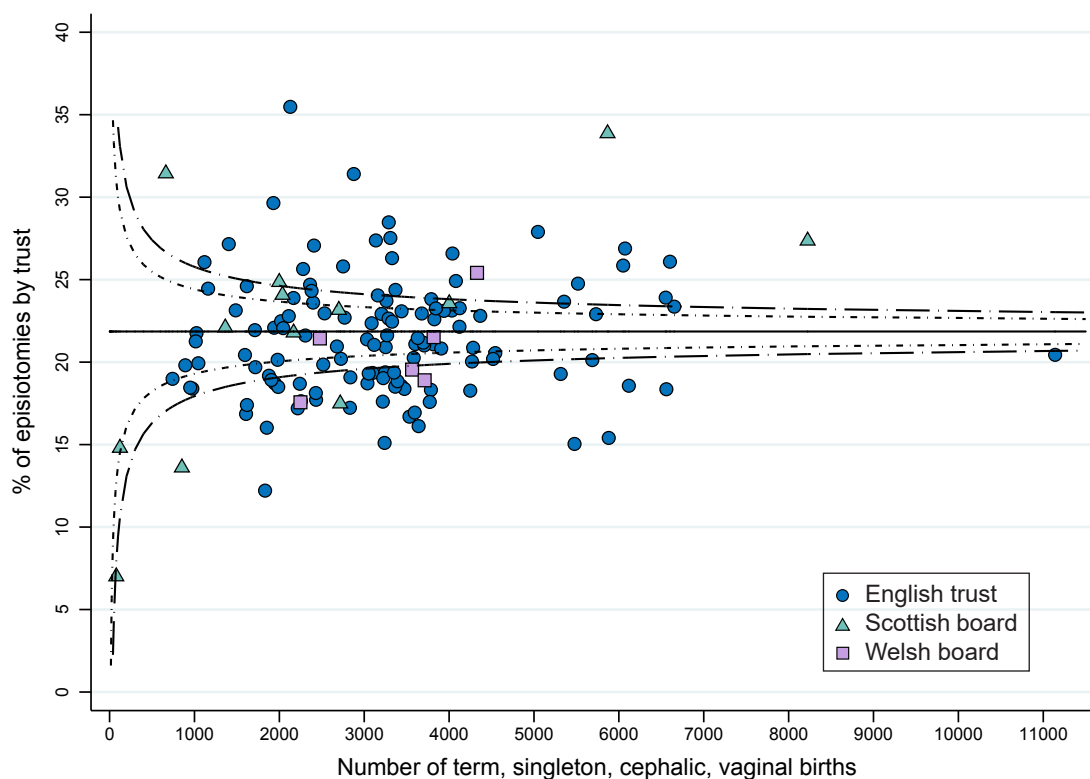
## Episiotomy

**What is measured:** Of women who give birth vaginally to a singleton baby in the cephalic position between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who have an episiotomy.

**Table 14** Proportion of women who have a vaginal birth of a singleton, cephalic baby at term, who have an episiotomy

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis	123	13	6	142
Number of mothers included in analysis	400 386	32 795	20 150	453 331
Number of women who have an episiotomy	86 882	8 083	4 116	99 081
Episiotomy rate (adjusted) <sup>a</sup>				
Overall	21.6%	25.6%	21.1%	21.9%
Spontaneous vaginal birth	8.3%	10.4%	8.6%	8.5%
Instrumental birth	86.1%	93.4%	88.7%	86.7%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 12** Case mix adjusted trust/board level proportions of women who have a vaginal birth of a singleton, cephalic baby at term, who have an episiotomy

### Third and fourth degree tears

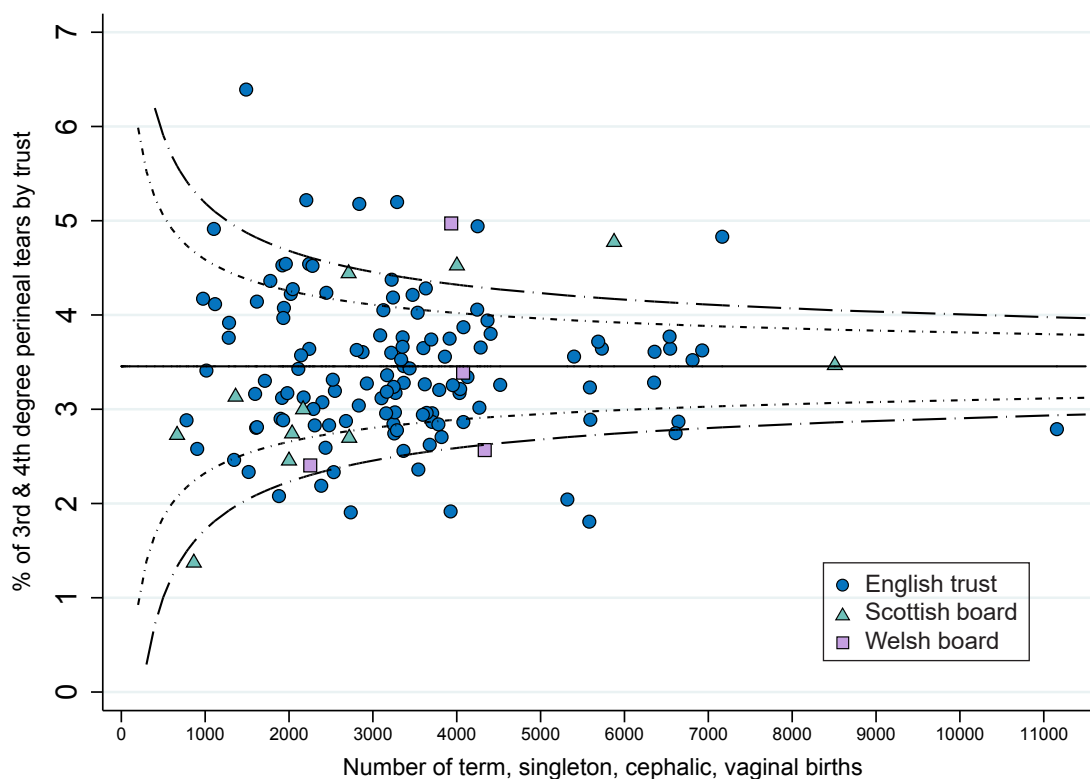
**What is measured:** Of women who give birth vaginally to a singleton baby in the cephalic position between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who sustain a third or fourth degree tear.

**Table 15** Proportion of women who have a vaginal birth of a singleton, cephalic baby at term, who sustain a third or fourth degree tear

	England	Scotland	Wales	GB total	
Number of trusts/boards included in analysis <sup>a</sup>	128	12	5	145	
Number of mothers included in analysis	426 534	33 036	17 075	476 645	
Number of women sustaining third or fourth degree tear	14 744	1 164	563	16 471	
Proportion overall sustaining third or fourth degree tear (adjusted) <sup>b</sup>	3.4%	3.6%	3.5%	3.5%	
Primiparous women (adjusted) <sup>b</sup>	Spontaneous vaginal birth	5.1%	5.0%	5.1%	5.1%
	Instrumental birth	7.5%	7.2%	7.7%	7.5%
Multiparous women (adjusted) <sup>b</sup>	Spontaneous vaginal birth	1.6%	1.9%	1.7%	1.6%
	Instrumental birth	4.3%	5.6%	4.2%	4.4%

<sup>a</sup> Although included in the analysis, the results of five English trusts and one Welsh board are not displayed on the funnel plot in this report or on the NMPA website. This is because the relevant trust/board's potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)).

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 13** Case mix adjusted trust/board level proportion of women who have a vaginal birth of a singleton, cephalic baby at term, who sustain a third or fourth degree tear\*

### Using the NMPA results

“The findings of the 2017 NMPA report highlighted that Stockport NHS Foundation Trust was an outlier for the proportion of vaginal births with a severe perineal tear during the period April 2015 to March 2016.

In response to the NMPA findings we implemented the Stockport Perineal Care Bundle within clinical practice. The local bundle was based upon the elements of the OASI (obstetric anal sphincter injury) care bundle, namely the provision of a local perineal care information leaflet for all women, undertaking episiotomy at 60 degrees when indicated, the implementation of Episissors<sup>†</sup> within practice, manual perineal protection during vaginal delivery and rectal examination following delivery.

As a result of the care bundle implementation, we have noted a reduction in the incidence of severe perineal tears within our Trust.”

*Stockport NHS Foundation Trust*

\* Although included in the analysis, the results of five English trusts and one Welsh board are not displayed on this funnel plot or on the NMPA website. This is because the relevant trust/board’s potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)).

† Any branded products mentioned are not nationally mandated tools and inclusion in this report does not constitute endorsement by the NMPA, its funders or commissioners. Alternative products may be available.

## Obstetric haemorrhage of 1500 ml or more

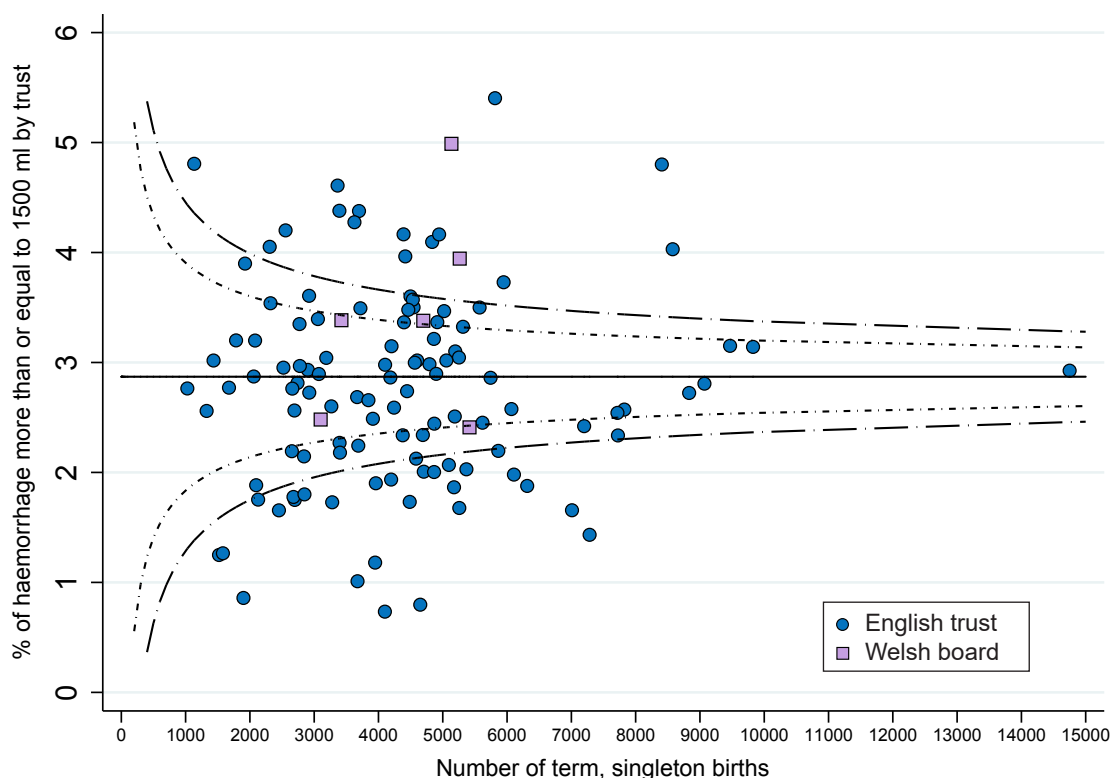
**What is measured:** Of women who give birth to a singleton baby between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who have an obstetric haemorrhage of 1500 ml or more.

**Table 16** Proportion of women who have a singleton baby at term, who have an obstetric haemorrhage of 1500 ml or more

	England	Wales	England and Wales
Number of trusts/boards included in analysis <sup>a</sup>	115	6	121
Number of mothers included in analysis	507 047	27 037	534 084
Number of women having a haemorrhage $\geq 1500$ ml	14 410	921	15 331
Overall proportion of women having a haemorrhage $\geq 1500$ ml (adjusted) <sup>b</sup>	2.8%	3.5%	2.9%
Proportion among women who had a vaginal birth (adjusted) <sup>b</sup>	2.4%	2.7%	2.4%
Proportion among women who had a caesarean birth (adjusted) <sup>b</sup>	4.2%	5.7%	4.3%

<sup>a</sup> Although included in the analysis, the results of two English trusts are not displayed on the funnel plot in this report or on the NMPA website. This is because the relevant trust's potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)).

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 14** Case mix adjusted trust/board level proportion of women who have a singleton baby at term, who have an obstetric haemorrhage of 1500 ml or more \*

\* Although included in the analysis, the results of two English trusts are not displayed on this funnel plot or on the NMPA website. This is because the relevant trust's potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)).

### Using the NMPA results

“The trust was identified as having a higher than expected postpartum haemorrhage rate for births in 2015/16. As a result we undertook case reviews and implemented several changes in practice. We continue to work with the Oxford Academic Health Science Network on the wider prevention and management of postpartum haemorrhage.”

*Royal Berkshire NHS Foundation Trust*

“We had a higher than expected rate of postpartum haemorrhage in the previous NMPA audit (2015/16 births). Action was taken to improve blood loss calculation and accuracy, documentation and multidisciplinary training. Following these changes in practice a follow-up audit of 2016/17 cases took place which showed a significant improvement in postpartum haemorrhage rates.”

*Yeovil District Hospital NHS Foundation Trust*

## Unplanned maternal readmission

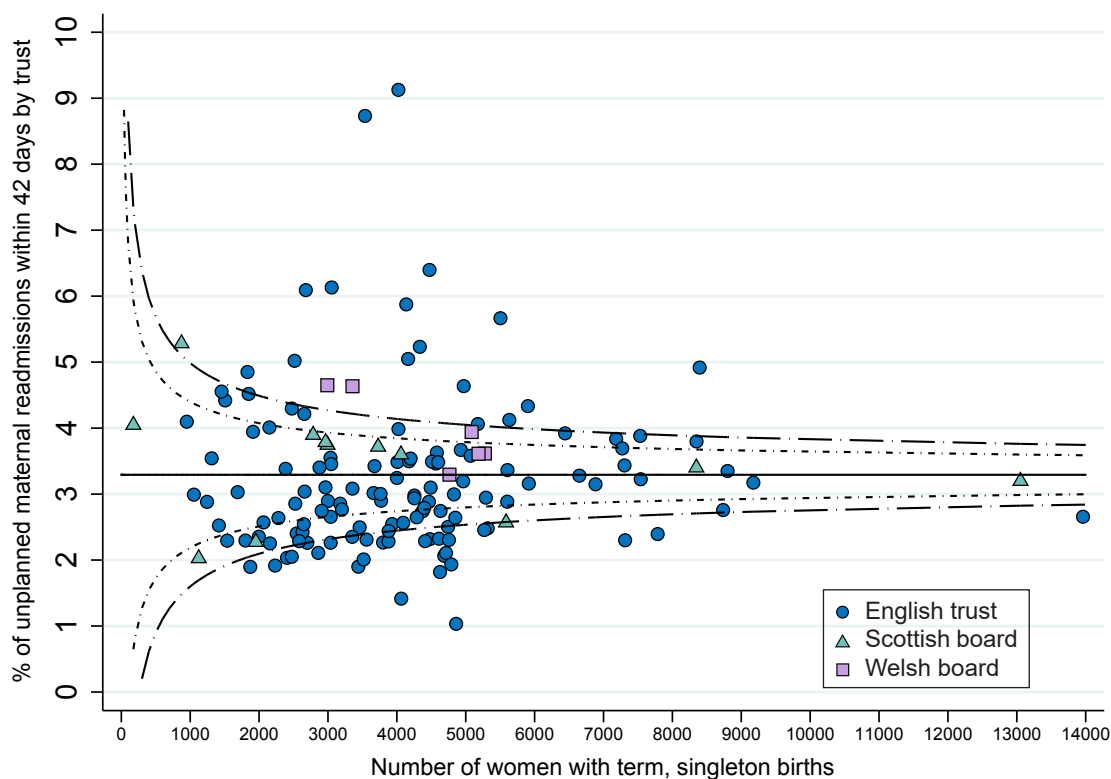
**What is measured:** Of women giving birth to a singleton baby between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, those who have an unplanned, overnight readmission to hospital within 42 days of giving birth, excluding those accompanying an unwell baby.

**Table 17** Proportion of women who have an unplanned, overnight readmission to hospital within 42 days of giving birth to a singleton baby at term

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis	127	13	6	146
Number of mothers included in analysis	524 979	47 757	26 661	599 397
Number of women with unplanned maternal readmissions within 42 days	17 139	1 584	1 014	19 737
Overall rate (adjusted) <sup>a</sup>	3.3%	3.3%	3.9%	3.3%
Proportion among women who had a vaginal birth (adjusted) <sup>a</sup>	2.9%	2.8%	3.5%	2.9%
Proportion among women who had a caesarean birth (adjusted) <sup>a</sup>	4.4%	4.7%	5.0%	4.5%

<sup>a</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).





**Figure 15** Case mix adjusted trust/board level proportions of women who have an unplanned, overnight readmission to hospital within 42 days of giving birth

## Discussion

It is important to consider the rates of these measures in context, together with other relevant measures. For example, the rate of third and fourth degree tears should be considered together with episiotomy, and the rate of haemorrhage together with the rates of different modes of birth. There remains large unexplained variation in the rates of third and fourth degree tears and of postpartum haemorrhage. Improvements in these areas require multiprofessional collaboration.

The OASI Care Bundle project is currently being evaluated for its effectiveness in reducing the rate of third and fourth degree tears.<sup>53</sup> Initiatives to reduce severe postpartum haemorrhage have been implemented in Scotland and in Wales with evidence of improvement, and the Patient Safety Collaborative in England has recommended the implementation of measures such as the more accurate estimation of blood loss after birth using specialist drapes.

It remains a significant concern that the quality of data collected about smoking during pregnancy and at the time of birth is poor, particularly in light of initiatives to reduce stillbirth. The NHS Long Term Plan in England identifies reducing maternal smoking as a key mechanism of reducing stillbirth.<sup>22</sup> Improved data collection in this area needs to remain a priority, as per recommendation 4 (p. xvii) in this report.

## Measures of care for the newborn baby

In this section, we report on measures relating to all newborns – skin-to-skin contact, babies receiving breast milk, and condition at birth.

The Apgar score is a five-component score used to summarise the condition of a newborn baby at 1, 5 and 10 minutes of age. An Apgar score of less than 7 at 5 minutes has been associated with an increased risk of cerebral palsy, epilepsy and developmental delay.<sup>58,59</sup> There are some concerns that Apgar scores may not always be correctly assigned and recorded. However, it is recorded almost universally,<sup>3</sup> unlike other forms of evaluation of the baby's condition, such as measurement of cord pH, which is usually only measured where there is clinical concern.

Early skin-to-skin contact has been shown to improve breastfeeding initiation and continuation rates for healthy newborns from 35 weeks of gestation. There is also evidence to suggest a positive impact on the stability of the cardio-respiratory system.<sup>60,61</sup> Information about skin-to-skin contact is only available for babies born in England because it is not captured in the Scottish or Welsh national datasets.

Breastfeeding is associated with significant benefits for mothers and babies. For the baby, it is associated with reduced incidence of childhood infections, diabetes and rates of obesity.<sup>62,63</sup> For the mother, it is associated with reduced weight gain, as well as a reduced incidence of breast cancer, ovarian cancer and type 2 diabetes.<sup>63,64</sup> The UK has low breastfeeding rates compared with the rest of Europe, with only 44% of women in England breastfeeding at 6–8 weeks.<sup>65</sup> This measure captures the proportion of babies given any breast milk, regardless of route and of additional formula feeding also given. It also captures whether babies received breast milk at their first feed and at the point of discharge from hospital. Data are not available in this form for Wales.\*

The UNICEF-UK Baby Friendly Initiative champions a range of interventions to support breastfeeding. This includes supporting early skin-to-skin contact. 61% of maternity services are fully accredited, with a further 30% working towards accreditation.<sup>66</sup>

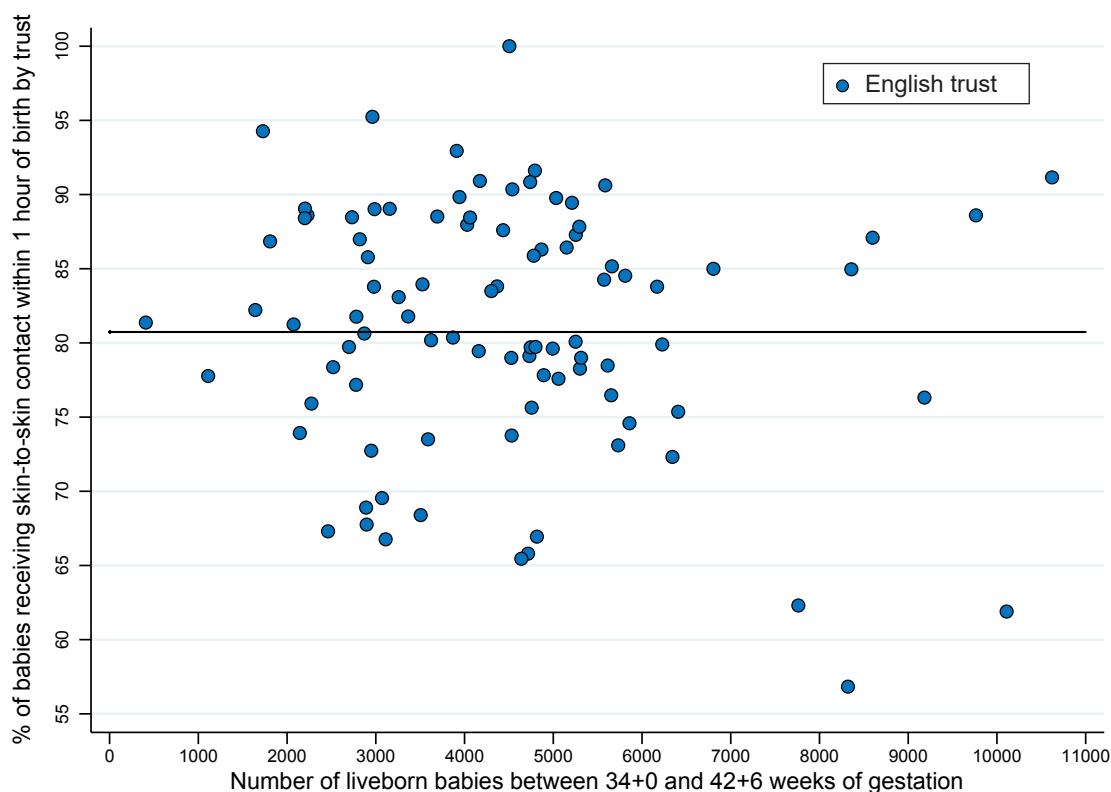
### Skin-to-skin contact within 1 hour of birth

**What is measured:** Of liveborn babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who receive skin-to-skin contact within 1 hour of birth.

**Table 18** Proportion of babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks who receive skin-to-skin contact within 1 hour of birth

	England
Number of trusts/boards included in analysis	93
Number of babies included in analysis	414 612
Number of babies receiving skin-to-skin contact within 1 hour of birth	334 742
Proportion of babies receiving skin-to-skin contact within 1 hour of birth	80.7%
Proportion in babies born between 34 <sup>+0</sup> and 36 <sup>+6</sup> weeks of gestation	56.0%
Proportion in babies born between 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation	82.2%

\* This information is recorded locally, but only feeding intention is captured in the central Maternity Indicators dataset (MIDs) in Wales.



**Figure 16** Trust level proportions of babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks who receive skin-to-skin contact within 1 hour of birth

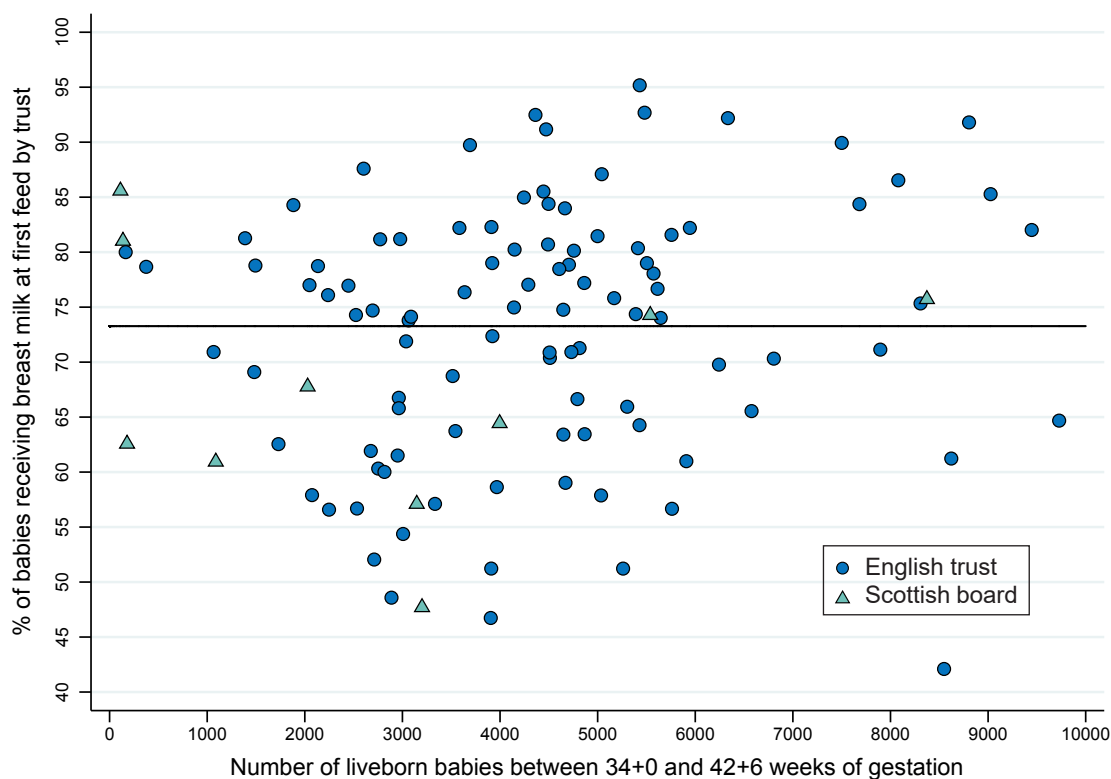
## Breast milk at first feed, and at discharge

**What is measured:** Of liveborn babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who receive any breast milk for their first feed, and at discharge from the maternity unit.\*

**Table 19** Proportion of babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks who receive breast milk at their first feed and at discharge

	England	Scotland	England and Scotland
Number of trusts/boards included in analysis	101	10	111
Number of babies included in breast milk at first feed analysis	446 794	27 800	474 594
Number of babies receiving breast milk at first feed	329 039	18 709	347 748
Number of babies included in breast milk at discharge analysis	441 270	49 656	490 926
Number of babies receiving breast milk at discharge	317 844	28 533	346 377
Overall proportion receiving breast milk at first feed	73.6%	67.3%	73.3%
Overall proportion receiving breast milk at discharge	72.0%	57.5%	70.6%
Proportion of babies born between 37 <sup>+0</sup> and 42 <sup>+6</sup> weeks of gestation who receive breast milk			
At first feed	74.4%	67.8%	74.0%
At discharge	72.6%	57.9%	71.2%
Proportion of babies born between 34 <sup>+0</sup> and 36 <sup>+6</sup> weeks of gestation who receive breast milk			
At first feed	60.0%	57.8%	59.9%
At discharge	60.4%	49.3%	59.1%

\* This measure uses only data available from the maternity dataset and does not include additional information that may be available for babies admitted to a neonatal unit.



**Figure 17** Trust/board level proportions of babies born between 34<sup>+0</sup> and 42<sup>+6</sup> weeks who receive breast milk at their first feed

### Using the NMPA results

“We used NMPA results to strengthen support for an adequate workforce for breastfeeding support in the community and on the postnatal ward. In addition we are undertaking prevention work in collaboration with public health on smoking and breastfeeding and a smoking project as part of the maternal and neonatal collaborative.”

*North Tees and Hartlepool NHS Foundation Trust*

## 5 minute Apgar score of less than 7

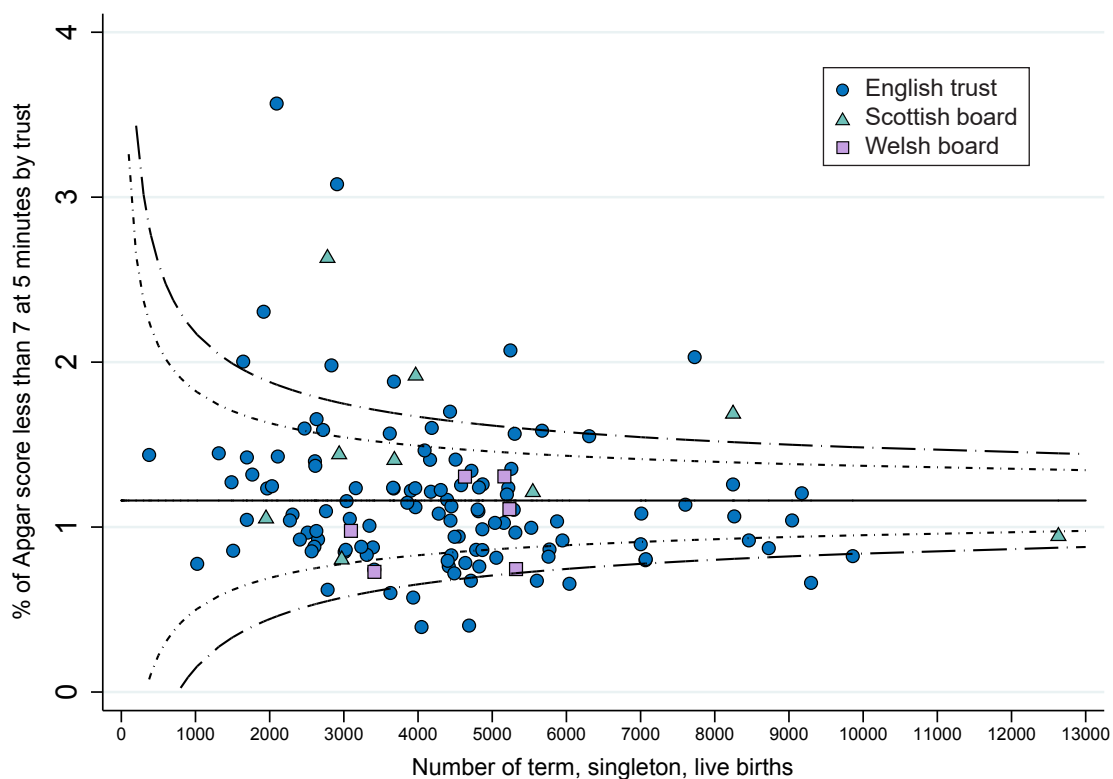
**What is measured:** Of liveborn, singleton babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who are assigned an Apgar score of less than 7 at 5 minutes of age.

**Table 20** Proportion of singleton babies born at term assigned an Apgar score of <7 at 5 minutes of age

	England	Scotland	Wales	GB total
Number of trusts/boards included in analysis <sup>a</sup>	119	13	6	138
Number of babies included in analysis	515 187	46 973	26 858	589 018
Number of babies with Apgar score <7 at 5 minutes	5 908	649	282	6 839
Proportion of babies with Apgar score <7 at 5 minutes (adjusted) <sup>b</sup>	1.1%	1.4%	1.0%	1.2%

<sup>a</sup> Although included in the analysis, the results of three English trusts and one Scottish board are not displayed on the funnel plot in this report or on the NMPA website. This is because the relevant trust/board's potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)). One further English result is not displayed because of a similar data quality issue.

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 18** Case mix adjusted trust/board level proportions of singleton babies born at term assigned an Apgar score of <7 at 5 minutes of age\*

### Using the NMPA results

“The maternity service has completed the investigations into the National Maternity and Perinatal Audit outlier information in regards to Apgar score of less than 7 at 5 minutes. A full investigation was undertaken and a report went to the trust board at the time with the findings and the action plan. This report was also discussed at the local commissioner meetings who provided external review. Audits and learning from the investigations have been shared and practice changes have been implemented where appropriate.”

*University Hospital Southampton NHS Foundation Trust*

“The NMPA results for 2015/16 births identified that our rate of babies with an Apgar score of less than 7 at 5 minutes was higher than expected. We asked midwives to undertake a competency assessment, and where required, additional training was provided. We introduced electronic documentation to aid Apgar scoring consistency and are conducting an ongoing audit of low Apgar scores and care provided.”

*City Hospitals Sunderland NHS Foundation Trust*

\* Although included in the analysis, the results of three English trusts and one Scottish board are not displayed on this funnel plot or on the NMPA website. This is because the relevant trust/board’s potential outlier status was deemed likely to be the result of data quality issues following review (see [NMPA Outlier Policy](#)). One further English result is not displayed because of a similar data quality issue.

## Discussion

There remains substantial variation in rates of babies receiving breast milk and skin-to-skin contact within 1 hour of birth. This was also noted in the previous year's data.<sup>3,9</sup> While some of this may be due to unknown recording differences underlying the data provided, it may also reflect differences in practice between sites, and the [recommendations made in our previous report](#) remain relevant (see also recommendation 1, p. xvi). The variable quality of the data hampers national monitoring of the effectiveness of these interventions to promote breastfeeding. Rates of babies receiving breast milk and skin-to-skin contact were lower among late preterm babies. The increased provision of transitional care in recent years may help to improve this by keeping mothers and babies together.<sup>23</sup>

While there is relatively narrow variation in the proportion of babies with Apgar scores of <7 at 5 minutes, there remain a number of trusts or boards that lie outside the range that would be expected to occur due to chance alone.

Routinely collected maternity datasets contain only limited information relating to babies, which currently limits the neonatal measures that the NMPA can report based on these data alone to the three described in this section. This highlights the value of linking NMPA data to the NNRD, which provides richer detail about babies admitted to neonatal care as described in the next section.

## Measures of care for newborn babies who require additional neonatal care

### Key findings and recommendations

**KF10** 5.8% of babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation (term), and 41.9% of those born between 34<sup>+0</sup> and 36<sup>+6</sup> weeks (late preterm), are admitted to a neonatal unit. There is substantial variation in these rates, even after adjustment for maternal case mix factors, perhaps reflecting different organisational provision for babies requiring additional care after birth.

**R10** **Maternity and neonatal service providers should together review their rates of late preterm and term admissions to neonatal units and consider whether any of their admissions may be avoidable. The NMPA endorses the recommendations made by the ATAIN programme to address avoidable term admissions.**

*(Maternity and neonatal service providers)*

**KF11** 5.8 in 1000 babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation receive mechanical ventilation in the first 3 days of life. There are a number of trusts and boards with levels of ventilation that are higher than expected, even after adjustment for maternal case mix factors.

**R11** **Maternity and neonatal service providers with higher than expected levels of mechanical ventilation between 37<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any changes to clinical practice identified.**

*(Maternity and neonatal service providers)*

**KF12** 1.7 in 1000 babies born between 35<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation develop an encephalopathy, a component of neonatal brain injury, in the first 3 days of life. Following adjustment for case mix, there are a number of trusts and boards with higher levels of encephalopathy than expected.

**R12a** **Maternity and neonatal service providers with higher than expected rates of encephalopathy between 35<sup>+0</sup> and 42<sup>+6</sup> weeks should work together to explore reasons behind the variation and implement any identified actions and changes to clinical practice.**

*(Maternity and neonatal service providers)*

**R12b** **National projects working in the area of neonatal brain injury (NNAP, NMPA, Each Baby Counts) should work together to develop an agreed, jointly used, measurable definition for neonatal encephalopathy as a component of neonatal brain injury to ensure consistent measurement.**

*(NMPA, NNAP, Each Baby Counts, Healthcare Safety Investigation Branch, other national projects)*

This section reports on measures that have been constructed through linkage of the NMPA dataset to the NNRD dataset produced by the Neonatal Data Analysis Unit (NDAU) at Imperial College London. These measures therefore describe neonatal processes and outcomes with all babies born as their denominator. Details about the linkage process can be found in the NMPA Neonatal Technical Report.<sup>25</sup>

Admission to a neonatal unit is necessary when a baby requires a level of care higher than that which can be provided in a postnatal ward environment. Admission to a neonatal unit also necessitates separating the mother and baby, and the cost of neonatal intensive care is high, with cost per cot estimated to be around £1,300 per day.<sup>67,68</sup> One method of reducing avoidable admissions of term and late preterm babies to neonatal units is by expanding the provision of transitional care settings, which provide some additional care to the baby beyond what would be traditionally provided on a postnatal ward, and which enables babies to stay together with their mothers.<sup>20</sup> Babies admitted to neonatal transitional care are not included in this analysis.

Mechanical ventilation refers to invasive ventilation with an endotracheal tube and ventilator. Therefore, babies requiring non-invasive ventilatory support such as CPAP (continuous positive airway pressure) are not included in this measure. The time frame for this measure is limited to the first 72 hours of life in order to reflect morbidity that is more likely to be attributed to events around the time of birth.

Neonatal encephalopathy is a heterogeneous, clinically defined syndrome characterised by disturbed brain function in the earliest days of life in a baby born at or beyond 35 weeks of gestation. It is manifested by a reduced level of consciousness or by seizures, and is often accompanied by difficulty with initiating and maintaining breathing and by depression of tone and reflexes.<sup>69</sup> The measure used by the NMPA is the same as used by NNAP. However, rates in the two audits are slightly different because the NMPA numerator includes babies admitted for less than 3 days, the denominator is acquired from baby-level linked data rather than aggregated statistics, and the NMPA results are adjusted for maternal characteristics.\* This measure will not capture all forms of neonatal brain injury. There would be expected to be substantial overlap between babies included in the numerator for this measure and babies included in a measure designed to capture babies who require neonatal therapeutic hypothermia ('cooling').

Results presented for admission rates and mechanical ventilation are for the financial year 2016/17. However, in order to achieve the requisite statistical power, the rates of neonatal encephalopathy are calculated for the years 2015/16 and 2016/17 combined. All three measures are reported by trust or board of birth, even if the baby was transferred to another unit for neonatal care. Results are adjusted for maternal characteristics as described in the [NMPA Measures Technical Specification](#). The markers on the funnel plots for neonatal unit admissions and mechanical ventilation indicate whether the trust or board does or does not provide neonatal surgery,<sup>†</sup> as this may influence their case mix and results. It was not possible to adjust for neonatal surgery at an individual level.

All results in this section relate to England and Scotland only. It was not possible to include Wales as the NMPA was not able to obtain permission in time to receive identifying information for births in Wales, which is required to link the NMPA's maternity data to the NNRD. Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and therefore should be interpreted with caution.

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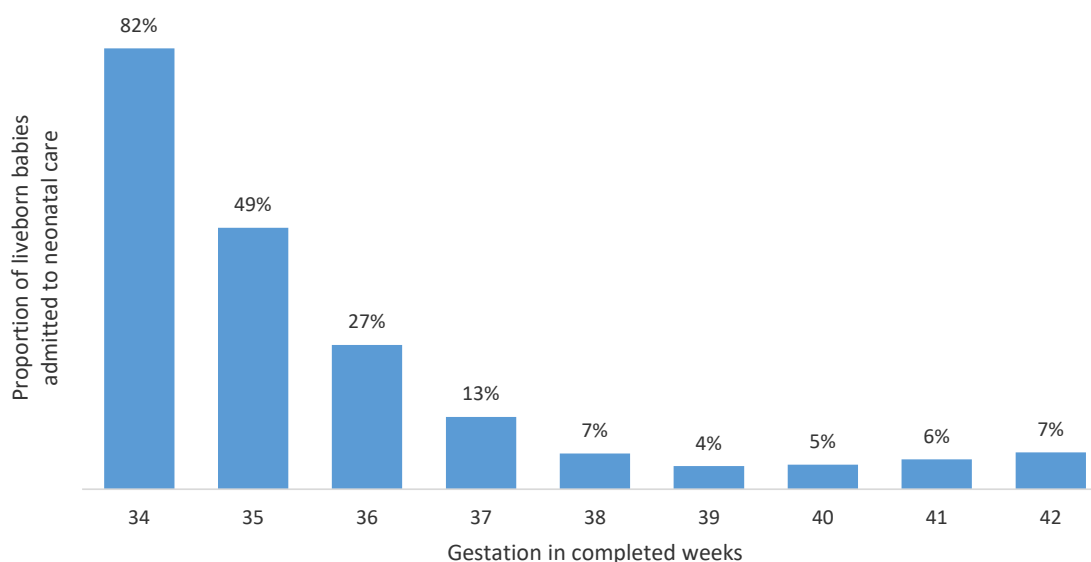
\* The reporting period is also different, with NNAP reporting by calendar year and the NMPA by financial year.

† Either providing neonatal surgery within the trust/board, or pre- and postoperative care in close collaboration with another nearby organisation, in line with the approach by MBRRACE-UK.<sup>70</sup>



## Babies admitted to a neonatal unit

The NNRD records almost all admissions to neonatal care in Great Britain. Some trusts and boards also use the same electronic system to record admissions to transitional care, but, as this is not universal, it is not possible to estimate national rates of transitional care admission.



**Figure 19** Proportion of liveborn babies admitted to neonatal care by gestational age in completed weeks

## Rates of admission to a neonatal unit

**What is measured:** Of liveborn, singleton babies born between

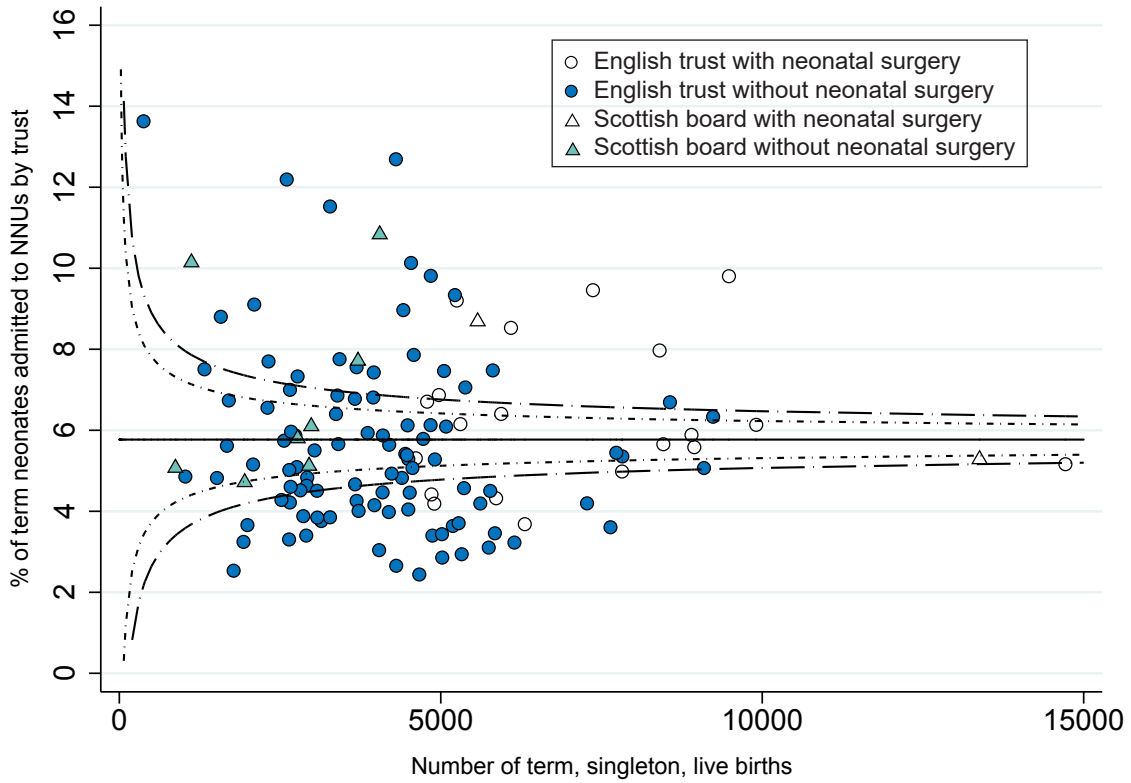
- (a) 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation (term babies)
  - (b) 34<sup>+0</sup> and 36<sup>+6</sup> weeks of gestation (late preterm babies),
- the proportion who are admitted to a neonatal unit.

**Table 21** Proportion of singleton babies born at term and late preterm who are admitted to a neonatal unit

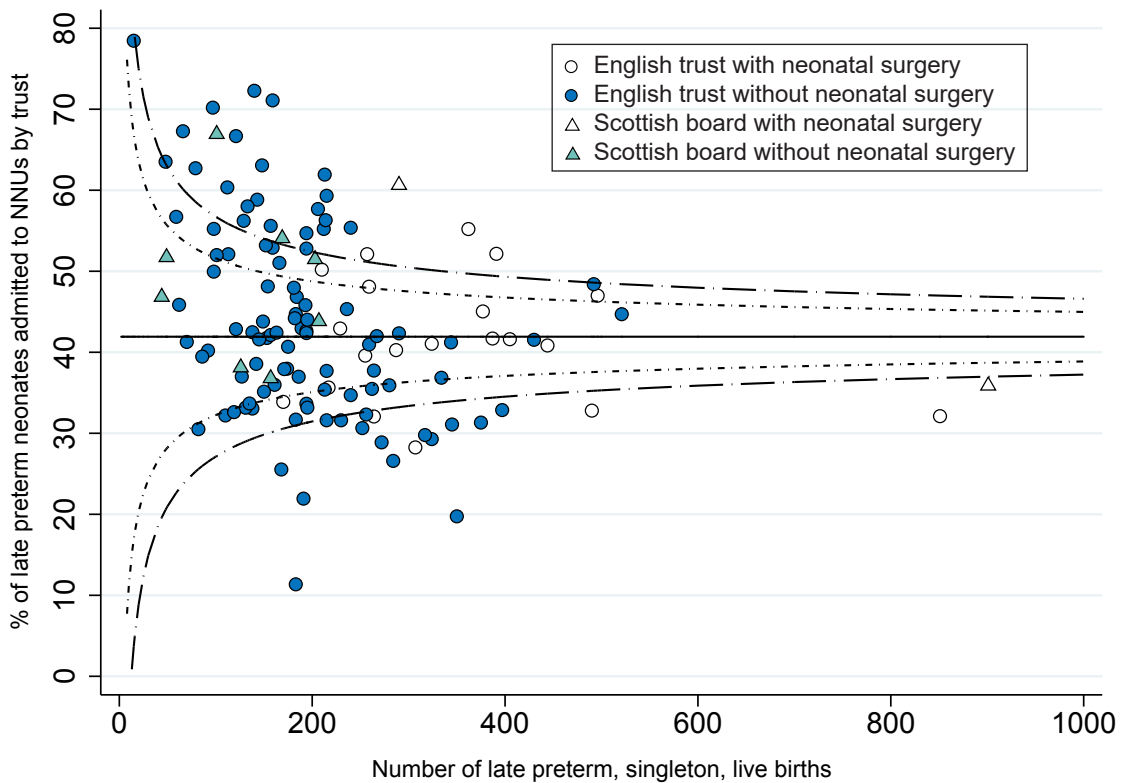
	England	Scotland <sup>a</sup>	England and Scotland
Number of trusts/boards included in term admissions analysis	118	12	130
Number of term babies included in analysis	535 527	39 665	575 192
Number of term babies admitted to a neonatal unit	30 576	2 614	33 190
Proportion of term babies admitted to a neonatal unit (adjusted) <sup>b</sup>	5.7%	6.7%	5.8%
Number of trusts/boards included in late preterm admissions analysis	118	12	130
Number of late preterm babies included in analysis	25 727	2 251	27 978
Number of late preterm babies admitted to a neonatal unit	10 717	1 012	11 729
Proportion of late preterm babies admitted to a neonatal unit (adjusted) <sup>b</sup>	41.7%	44.6%	41.9%

<sup>a</sup> Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and should therefore be interpreted with caution.

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 20** Case mix adjusted trust/board level proportions of singleton babies born at term who are admitted to a neonatal unit



**Figure 21** Case mix adjusted trust/board level proportions of singleton babies born late preterm ( $34^{+0}$ – $36^{+6}$  weeks) who are admitted to a neonatal unit

## Proportion of term babies receiving mechanical ventilation

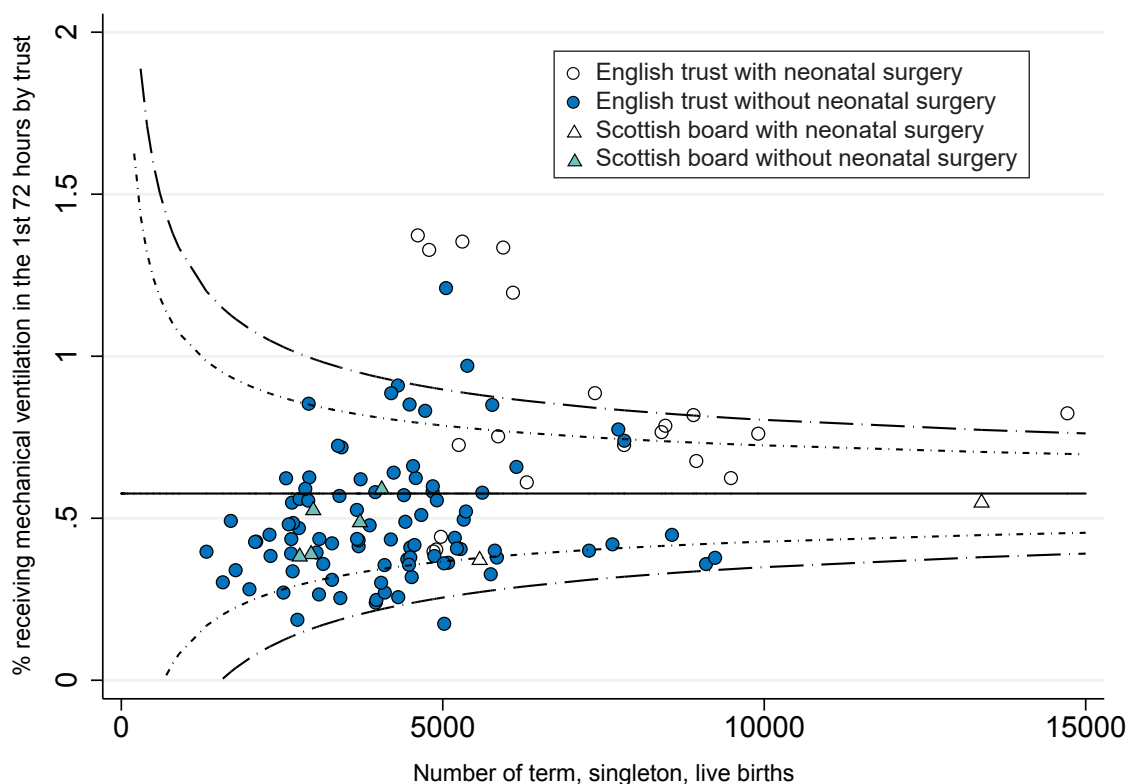
**What is measured:** Of liveborn, singleton babies born between 37<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation, the proportion who receive mechanical ventilation in the first 72 hours of life.

**Table 22** Proportion of singleton babies born at term who receive mechanical ventilation in the first 72 hours of life

	England	Scotland <sup>a</sup>	England and Scotland
Number of trusts/boards included in analysis	118	12	130
Number of term babies included in analysis	535 527	39 665	575 192
Number of babies receiving mechanical ventilation	3 139	176	3 315
Proportion of term babies receiving mechanical ventilation (adjusted) <sup>b</sup>	0.58%	0.47%	0.58%

<sup>a</sup> Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and should therefore be interpreted with caution

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 22** Case mix adjusted trust/board level proportions of singleton babies born at term who receive mechanical ventilation in the first 72 hours of life

## Proportion of babies who develop an encephalopathy

**What is measured:** The proportion of singleton babies born at 35<sup>+0</sup> to 42<sup>+6</sup> weeks of gestation with encephalopathy in the first 72 hours of life, defined as

Within the first 72 hours of life the baby shows two or more of the following neurological signs in the same day:

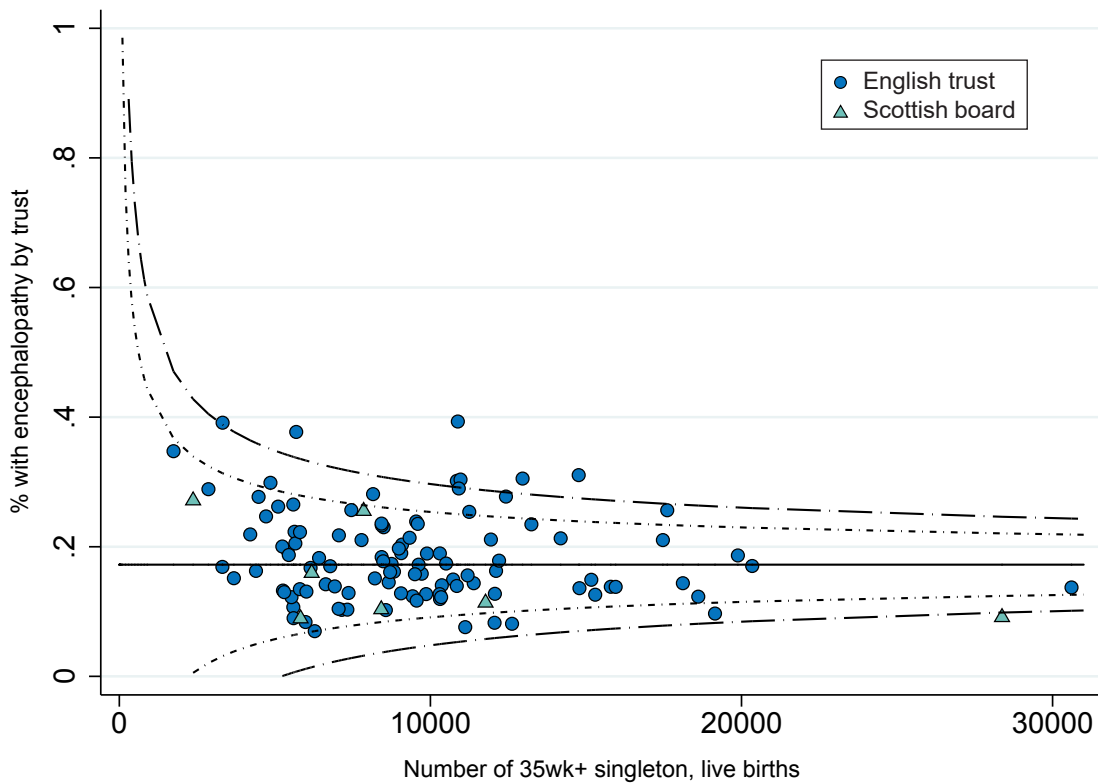
- 1 abnormal tone
- 2 reduced consciousness (lethargic or comatose)
- 3 convulsions (seizures).

**Table 23** Proportion of singleton babies born between 35<sup>+0</sup> and 42<sup>+6</sup> weeks of gestation who develop encephalopathy in the first 72 hours of life (2015/16 and 2016/17 combined)

	England	Scotland <sup>a</sup>	England and Scotland
Number of trusts/boards included in analysis	113	12	125
Number of babies included in analysis	1 042 839	83 813	1 126 652
Number of babies with encephalopathy	1849	93	1942
Proportion of babies with encephalopathy (adjusted) <sup>b</sup>	0.18%	0.12%	0.17%

<sup>a</sup> Scottish figures do not include births in Edinburgh and Lothian owing to data availability, and should therefore be interpreted with caution

<sup>b</sup> Country level results are adjusted for case mix (unadjusted rates can be obtained using the numerators and denominators provided in the table).



**Figure 23** Case mix adjusted trust/board level proportions of singleton babies with encephalopathy (2015/16 and 2016/17 combined)

## Discussion

This first linkage between maternity and neonatal data provides the opportunity to explore neonatal measures of effective maternity care, adjusted for maternal risk factors such as maternal obesity, socio-economic status and comorbidities.

Between 39 and 34 weeks, the proportion of babies admitted to a neonatal unit increases with each decreasing week of gestational age. Although babies born at 37 weeks are considered term, the proportion of these babies admitted to a neonatal unit is double the proportion admitted to a neonatal unit at 38 weeks of gestation. This finding may be related to iatrogenic deliveries of babies in the early term period due to underlying maternal or neonatal factors, such as maternal diabetes. It is not possible to draw conclusions about whether the increased admission rate in this early term group is due to these underlying factors or due to the gestational age of these babies.

The proportion of term and late preterm babies admitted to neonatal units varies widely between trusts. This degree of variation suggests that a number of factors may contribute to neonatal unit admissions including not only neonatal morbidity but also clinical decision making on the part of neonatal, obstetric and midwifery teams, and the availability and quality of alternatives to neonatal unit admission such as neonatal transitional care. There may also be factors relating to coding and data quality. Sites that reported the provision of transitional care in the NMPA organisational survey<sup>23</sup> had a lower rate of admission to a neonatal unit for late preterm babies than those without this provision (40.5% vs 44.7%). For term babies, a clinically significant difference in rates of admission was not seen.

Both the measures for encephalopathy and for mechanical ventilation in term babies can be considered to be potential markers of severe neonatal morbidity; however, they should be used for benchmarking only, and each case requires local investigation. There is relatively little variation between services, but a number have higher rates than would be expected due to chance. Trusts and boards providing neonatal surgery may perhaps be expected to have higher rates of mechanical ventilation.

Currently, there are several different measures of potential neonatal encephalopathy in use.<sup>71</sup> The NMPA has chosen to align its reporting with that of NNAP. However, other projects such as Each Baby Counts and the Healthcare Safety Investigation Branch (HSIB) use different definitions.<sup>21</sup> Agreement between these national projects would simplify interpretation and improve the validity of comparisons between organisations.

# Conclusions

This report gives a national picture of services in 2016/17 and builds on our previous report from 2015/16. It is not possible to speak of trends based on just two years, but we highlight areas that require monitoring, in particular around induction of labour, timing of birth, and timely delivery of babies that are small for gestational age. In our outlier measures, there is clear evidence of change between years among trusts that were high outliers in 2015/16. Change may be due to quality improvement initiatives within these units, which should be commended.

In this report we have included four new measures. These are birth without intervention and three measures that rely on linkage to the NNRD: admission rates to neonatal units, mechanical ventilation among babies born at term and encephalopathy among babies born after 35 weeks. These should be considered as experimental and requiring investigation by trusts in the first instance. Nonetheless, publication of these provides an important opportunity for benchmarking against national rates and we would urge local services to continue to monitor these events, and to work in multidisciplinary teams to address them.

This second clinical report from the NMPA demonstrates overall stability in the availability of data. It is positive that the completeness of the data received by the NMPA has increased, both in terms of births captured and of individual data items. This suggests that electronic maternity records are being used more widely and effectively.

For our next clinical report we will move to using a different data source in England, the Maternity Services Data Set (MSDS).<sup>56</sup> However, the richness of the information that can be derived from the key data items used by the NMPA to derive these indicators suggests that even as the landscape of data collection changes, there are clear areas for focus to improve data quality.

There is much to build on in this report and the previous report, and it is our hope that as the NMPA becomes more embedded it will increasingly be used for local, regional and national improvement.

# Appendix 1

## Data sources used by the NMPA

The NMPA uses data routinely collected in the course of maternity care and links these datasets together to produce a central maternity and neonatal dataset. A different approach to obtaining data was used in each participating country, reflecting the status and maturity of centralised national maternity datasets.

### Scotland

The Scottish Morbidity Record 2 (SMR-02) contains information on clinical and demographic characteristics and outcomes for all women admitted as inpatients or day cases to Scottish maternity units. The register is subjected to regular quality assurance checks. The extract used for this report comprised SMR-02 records linked with the Scottish Birth Record and Scottish Morbidity Record 1 (SMR-01).

### Wales

In Wales, the Maternity Indicators dataset (MIDs) captures a selected subset of data items from the maternity IT systems in Welsh health boards. The dataset is managed by the NHS Wales Informatics Service (NWIS), which provided an extract of MIDs booking and birth data and some information from the Child Health Database to the NMPA. These data were then linked at record level with Admitted Patient Care (APC) records from the Patient Episode Database for Wales (PEDW).

### England

The English Maternity Services Data Set (MSDS), managed by NHS Digital, is the most recently developed central maternity dataset. The coverage of this dataset has increased but was not yet sufficient for the purpose of this report, so all eligible English trusts were asked to provide the NMPA with a data extract from their electronic maternity record systems according to a detailed specification. This specification was based on national code definitions and drew on the MSDS specification as much as possible. Maternity information system birth records were then linked to Hospital Episode Statistics (HES) inpatient records to allow longitudinal follow-up of mothers and babies.

The NMPA will switch to using the MSDS as the primary data source for England from the next clinical report onwards, i.e. for births from 1 April 2017, in order to minimise the burden on trusts to submit data directly to the NMPA. Submission to the MSDS has been mandatory since April 2015.

## Neonatal data

The measures related to babies admitted to a neonatal unit are based on linkage of the NMPA dataset to a data extract from the National Neonatal Research Database (NNRD), provided by the Neonatal Data Analysis Unit (NDAU) at Imperial College London. Electronic patient data recorded at participating neonatal units that collectively form the United Kingdom Neonatal Collaborative (UKNC) are transmitted to the NDAU to form the NNRD. The NNRD is a Clinical Dataset (The National Neonatal Data Set) within the NHS Data Dictionary. Details of all data items are searchable on the [NHS Data Dictionary website](#).



# Appendix 2

## Selection of audit measures for the NMPA

The suitability of a measure for inclusion in a national clinical audit depends on a number of explicit criteria: validity, fairness, sufficient statistical power and data availability. In addition to these criteria, it is also important for a set of audit measures to be balanced. The audit therefore covers various dimensions of care to give a balanced overall picture of the service.

Details of the development of these measures are available in the [first NMPA clinical report](#) and the [NMPA neonatal technical report](#). The NMPA consults widely; it has a large Clinical Reference Group and a Women and Families Involvement Group, and liaises with other stakeholders on specific topics. We are always open to suggestions for additional measures for inclusion in the audit.

Measures are evaluated on the basis of four criteria:

- 1 **validity** – that differences in the rates of the indicator are likely to reflect differences in the quality of maternity care
- 2 **statistical power** – that the event is sufficiently common that it is possible to identify variation outside of an expected range in the appropriate time period
- 3 **technical specification** – that available information can correctly identify those women who have the event, and their associated features and outcomes
- 4 **fairness** – that it is possible to accurately adjust for the case mix of cases treated by each maternity unit, trust or board.

An example of such an evaluation is given in our [Intensive Care Sprint Audit report](#).<sup>72</sup>

# Appendix 3

## Trusts and boards participating in the NMPA clinical audit on births in 2016/17

Individual trust/board and site level results can be found on the [NMPA website](#).  
Trust and boards below reflect those in existence during 2016/17.

### England

Airedale NHS Foundation Trust  
Ashford and St Peter's Hospitals NHS Foundation Trust  
Barking, Havering and Redbridge University Hospitals NHS Trust  
Barnsley Hospital NHS Foundation Trust  
Barts Health NHS Trust  
Basildon and Thurrock University Hospitals NHS Foundation Trust  
Bedford Hospital NHS Trust  
Birmingham Women's and Children's NHS Foundation Trust  
Blackpool Teaching Hospitals NHS Foundation Trust  
Bolton NHS Foundation Trust  
Bradford Teaching Hospitals NHS Foundation Trust  
Brighton and Sussex University Hospitals NHS Trust  
Buckinghamshire Healthcare NHS Trust  
Burton Hospitals NHS Foundation Trust<sup>\*</sup>  
Calderdale and Huddersfield NHS Foundation Trust  
Cambridge University Hospitals NHS Foundation Trust  
Central Manchester University Hospitals NHS Foundation Trust<sup>†</sup>  
Chelsea and Westminster Hospital NHS Foundation Trust  
Chesterfield Royal Hospital NHS Foundation Trust  
City Hospitals Sunderland NHS Foundation Trust  
Colchester Hospital University NHS Foundation Trust<sup>‡</sup>  
Countess of Chester Hospital NHS Foundation Trust  
County Durham and Darlington NHS Foundation Trust  
Croydon Health Services NHS Trust  
Dartford and Gravesham NHS Trust  
Derby Teaching Hospitals NHS Foundation Trust<sup>\*</sup>  
Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust  
Dorset County Hospital NHS Foundation Trust  
East and North Hertfordshire NHS Trust  
East Cheshire NHS Trust  
East Kent Hospitals University NHS Foundation Trust  
East Lancashire Hospitals NHS Trust

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\* Merged to form University Hospitals of Derby and Burton NHS Foundation Trust in July 2018.

† Merged to form Manchester University NHS Foundation Trust in October 2017.

‡ Merged to form East Suffolk and North Essex NHS Foundation Trust in July 2018.

East Sussex Healthcare NHS Trust  
Epsom and St Helier University Hospitals NHS Trust  
Frimley Health NHS Foundation Trust  
Gateshead Health NHS Foundation Trust  
George Eliot Hospital NHS Trust  
Great Western Hospitals NHS Foundation Trust  
Guy's and St Thomas' NHS Foundation Trust  
Hampshire Hospitals NHS Foundation Trust  
Harrogate and District NHS Foundation Trust  
Heart of England NHS Foundation Trust\*  
Hinchingsbrooke Health Care NHS Trust†  
Homerton University Hospital NHS Foundation Trust  
Hull University Teaching Hospitals NHS Trust  
Imperial College Healthcare NHS Trust  
Ipswich Hospital NHS Trust‡  
Isle of Wight NHS Trust  
Kettering General Hospital NHS Foundation Trust  
King's College Hospital NHS Foundation Trust  
Kingston Hospital NHS Foundation Trust  
Lancashire Teaching Hospitals NHS Foundation Trust  
Leeds Teaching Hospitals NHS Trust  
Lewisham and Greenwich NHS Trust  
Liverpool Women's NHS Foundation Trust  
London North West University Healthcare NHS Trust  
Luton and Dunstable University Hospital NHS Foundation Trust  
Maidstone and Tunbridge Wells NHS Trust  
Medway NHS Foundation Trust  
Mid Cheshire Hospitals NHS Foundation Trust  
Mid Essex Hospital Services NHS Trust  
Milton Keynes University Hospital NHS Foundation Trust  
Norfolk and Norwich University Hospitals NHS Foundation Trust  
North Bristol NHS Trust  
North Cumbria University Hospitals NHS Trust  
North Middlesex University Hospital NHS Trust  
North Tees and Hartlepool NHS Foundation Trust  
Northampton General Hospital NHS Trust  
Northern Devon Healthcare NHS Trust  
Northern Lincolnshire and Goole NHS Foundation Trust  
Northumbria Healthcare NHS Foundation Trust  
Nottingham University Hospitals NHS Trust  
Oxford University Hospitals NHS Foundation Trust  
Peterborough and Stamford Hospital Trust†  
Poole Hospital NHS Foundation Trust§  
Portsmouth Hospitals NHS Trust  
Royal Berkshire NHS Foundation Trust  
Royal Cornwall Hospitals NHS Trust

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\* Merged with University Hospital Birmingham NHS Foundation Trust in April 2018.

† Merged to form North West Anglia NHS Foundation Trust in April 2017.

‡ Merged to form East Suffolk and North Essex NHS Foundation Trust in July 2018.

§ The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust (a trust without an OU) data were submitted together with those of Poole Hospital NHS Foundation Trust, and are included in the results for the latter.

Royal Devon and Exeter NHS Foundation Trust  
Royal Free London NHS Foundation Trust  
Royal Surrey County Hospital NHS Foundation Trust  
Royal United Hospitals Bath NHS Foundation Trust  
Salisbury NHS Foundation Trust  
Sandwell and West Birmingham Hospitals NHS Trust  
Sheffield Teaching Hospitals NHS Foundation Trust  
Sherwood Forest Hospitals NHS Foundation Trust  
South Tees Hospitals NHS Foundation Trust  
South Tyneside NHS Foundation Trust  
South Warwickshire NHS Foundation Trust  
Southend University Hospital NHS Foundation Trust  
Southport and Ormskirk Hospital NHS Trust  
St George's University Hospitals NHS Foundation Trust  
St Helens and Knowsley Teaching Hospitals NHS Trust  
Stockport NHS Foundation Trust  
Surrey and Sussex Healthcare NHS Trust  
Tameside and Glossop Integrated Care NHS Foundation Trust  
Taunton and Somerset NHS Foundation Trust  
The Dudley Group NHS Foundation Trust  
The Hillingdon Hospitals NHS Foundation Trust  
The Mid Yorkshire Hospitals NHS Trust  
The Newcastle upon Tyne Hospitals NHS Foundation Trust  
The Pennine Acute Hospitals NHS Trust  
The Princess Alexandra Hospital NHS Trust  
The Rotherham NHS Foundation Trust  
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust\*  
The Royal Wolverhampton NHS Trust  
The Shrewsbury and Telford Hospital NHS Trust  
Torbay and South Devon NHS Foundation Trust  
United Lincolnshire Hospitals NHS Trust  
University College London Hospitals NHS Foundation Trust  
University Hospital of South Manchester NHS Foundation Trust†  
University Hospital Southampton NHS Foundation Trust  
University Hospitals Bristol NHS Foundation Trust  
University Hospitals Coventry and Warwickshire NHS Trust  
University Hospitals of Leicester NHS Trust  
University Hospitals of Morecambe Bay NHS Foundation Trust  
University Hospitals of North Midlands NHS Trust  
University Hospitals Plymouth NHS Trust  
Walsall Healthcare NHS Trust  
Warrington and Halton Hospitals NHS Foundation Trust  
West Hertfordshire Hospitals NHS Trust  
West Suffolk NHS Foundation Trust  
Western Sussex Hospitals NHS Foundation Trust  
Weston Area Health NHS Trust  
Whittington Health NHS Trust

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\* The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust (a trust without an OU) data were submitted together with those of Poole Hospital NHS Foundation Trust, and are included in the results for the latter.

† Merged to form Manchester University NHS Foundation Trust in October 2017.

Wirral University Teaching Hospital NHS Foundation Trust  
Worcestershire Acute Hospitals NHS Trust  
Wrightington, Wigan and Leigh NHS Foundation Trust  
Wye Valley NHS Trust  
Yeovil District Hospital NHS Foundation Trust  
York Teaching Hospital NHS Foundation Trust

## Scotland

NHS Ayrshire and Arran  
NHS Borders  
NHS Dumfries and Galloway  
NHS Fife  
NHS Forth Valley  
NHS Grampian  
NHS Greater Glasgow and Clyde  
NHS Highland  
NHS Lanarkshire  
NHS Lothian  
NHS Orkney  
NHS Shetland  
NHS Tayside  
NHS Western Isles

## Wales

Abertawe Bro Morgannwg University Health Board\*  
Aneurin Bevan Health Board  
Betsi Cadwaladr University Health Board  
Cardiff and Vale University Health Board  
Cwm Taf University Health Board  
Hywel Dda Health Board  
Powys Teaching Health Board

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\* Health board name and boundary change from April 2019 to Swansea Bay University Health Board, with the Princess of Wales Hospital now under Cwm Taf University Health Board.

# Appendix 4

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# References

1. National Perinatal Epidemiological Unit. Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK) [[www.npeu.ox.ac.uk/mbrance-uk](http://www.npeu.ox.ac.uk/mbrance-uk)].
2. Royal College of Paediatric and Child Health, National Neonatal Audit Programme (NNAP) [[www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme](http://www.rcpch.ac.uk/work-we-do/quality-improvement-patient-safety/national-neonatal-audit-programme)].
3. NMPA Project Team. *National Maternity and Perinatal Audit: Clinical Report 2017 – Revised Version. Based on Births in NHS Maternity Services between 1st April 2015 and 31st March 2016*. London: RCOG; 2018 [[www.maternityaudit.org.uk/downloads/NMPA Clinical Report 2018.pdf](http://www.maternityaudit.org.uk/downloads/NMPA_Clinical_Report_2018.pdf)].
4. NHS Resolution. *Maternity Incentive Scheme – Year Two*. 2018 [<https://resolution.nhs.uk/wp-content/uploads/2018/12/maternity-incentive-scheme-year-two.pdf>].
5. Primary Record Standard Board. *Maternity Record Standard, 2019* [<https://theprsb.org/standards/maternityrecord/>].
6. National Institute for Health and Care Excellence. *Smoking: Acute, Maternity and Mental Health Services*. Public health guideline 48. NICE; 2013 [[www.nice.org.uk/guidance/ph48](http://www.nice.org.uk/guidance/ph48)].
7. NHS England. *Saving Babies' Lives Version Two: A Care Bundle for Reducing Perinatal Mortality*. NHSE; 2019 [[www.england.nhs.uk/wp-content/uploads/2019/07/saving-babies-lives-care-bundle-version-two-v5.pdf](http://www.england.nhs.uk/wp-content/uploads/2019/07/saving-babies-lives-care-bundle-version-two-v5.pdf)].
8. National Institute for Health and Care Excellence. *Intrapartum Care for Healthy Women and Babies*. Clinical guideline 190. NICE; 2014 (updated 2017) [[www.nice.org.uk/guidance/cg190](http://www.nice.org.uk/guidance/cg190)].
9. NHS England. National Maternity Review. *Better Births: Improving Outcomes of Maternity Services in England – A Five Year Forward View for Maternity Care*. London: NHSE; 2016 [[www.england.nhs.uk/publication/better-births-improving-outcomes-of-maternity-services-in-england-a-five-year-forward-view-for-maternity-care/](http://www.england.nhs.uk/publication/better-births-improving-outcomes-of-maternity-services-in-england-a-five-year-forward-view-for-maternity-care/)].
10. Scottish Government. *The Best Start: A Five-Year Forward Plan for Maternity and Neonatal Care in Scotland*. Edinburgh: Scottish Government; 2017 [[www.gov.scot/publications/best-start-five-year-forward-plan-maternity-neonatal-care-scotland-9781786527646/](http://www.gov.scot/publications/best-start-five-year-forward-plan-maternity-neonatal-care-scotland-9781786527646/)].
11. National Institute for Health and Care Excellence. *Weight Management Before, During and After Pregnancy*. Public health guideline 27. NICE; 2010 [[www.nice.org.uk/guidance/ph27](http://www.nice.org.uk/guidance/ph27)].
12. Royal College of Obstetricians and Gynaecologists. *The Investigation and Management of the Small-for-Gestational-Age Fetus*. Green-top Guideline No 31. London: RCOG; 2013 [[www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg31/](http://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg31/)].
13. Scottish Patient Safety Programme. *Maternity and Children Quality and Improvement Programme – Stillbirth*. 2013 [<https://ihub.scot/improvement-programmes/scottish-patient-safety-programme-spsp/maternity-and-children-quality-improvement-collaborative-mcqic/maternity-care/stillbirth/>].
14. National Institute for Health and Care Excellence. *Inducing Labour*. NICE Clinical guideline 70. NICE; 2008 [[www.nice.org.uk/guidance/cg70](http://www.nice.org.uk/guidance/cg70)].
15. National Institute for Health and Care Excellence. *Caesarean Section*. NICE Quality standard 32. NICE; 2013. [[www.nice.org.uk/guidance/qs32](http://www.nice.org.uk/guidance/qs32)].
16. NHS Improvement. *Maternal and Neonatal Health Safety Collaborative* [<https://improvement.nhs.uk/resources/maternal-and-neonatal-safety-collaborative/>].
17. Maternity Network Wales. *OBS Cymru, the Obstetric Bleeding Strategy for Wales, 2016* [[www.1000livesplus.wales.nhs.uk/obs-cymru](http://www.1000livesplus.wales.nhs.uk/obs-cymru)].
18. Maternity and Children Quality Improvement Collaborative. *Postpartum Haemorrhage 4-Stage Approach: Practical Guide*. 2018 [[https://ihub.scot/media/5690/pph-4-stage-practical-guide\\_final.pdf](https://ihub.scot/media/5690/pph-4-stage-practical-guide_final.pdf)].
19. NHS Improvement. *Avoiding Term Admissions into Neonatal Units, 2017* [<https://improvement.nhs.uk/resources/preventing-avoidable-admissions-full-term-babies/>].
20. British Association of Perinatal Medicine. *A Framework for Neonatal Transitional Care*. BAPM; 2017 [[www.bapm.org/resources/24-neonatal-transitional-care-a-framework-for-practice-2017](http://www.bapm.org/resources/24-neonatal-transitional-care-a-framework-for-practice-2017)].
21. Royal College of Obstetricians and Gynaecologists. *Each Baby Counts: 2015 Full Report*. London: RCOG; 2017 [[www.rcog.org.uk/globalassets/documents/guidelines/research--audit/each-baby-counts-2015-full-report.pdf](http://www.rcog.org.uk/globalassets/documents/guidelines/research--audit/each-baby-counts-2015-full-report.pdf)].
22. NHS England. *The NHS Long Term Plan*. NHS; 2019 [[www.longtermplan.nhs.uk/wp-content/uploads/2019/01/nhs-long-term-plan-june-2019.pdf](http://www.longtermplan.nhs.uk/wp-content/uploads/2019/01/nhs-long-term-plan-june-2019.pdf)].

23. NMPA Project Team. *National Maternity and Perinatal Audit: Organisational Report 2017*. London: RCOG; 2017 [[www.maternityaudit.org.uk/downloads/NMPA%20organisational%20report%202017.pdf](http://www.maternityaudit.org.uk/downloads/NMPA%20organisational%20report%202017.pdf)].
24. Welsh Government. *Maternity Care in Wales. A Five Year Vision for the Future (2019-2024)*. Cardiff: Welsh Government; 2019 [<https://gov.wales/sites/default/files/publications/2019-06/maternity-care-in-wales-a-five-year-vision-for-the-future-2019-2024.pdf>].
25. Aughey H, NMPA Project Team. *Technical Report: Linking the National Maternity and Perinatal Audit Data Set to the National Neonatal Research Database for 2015/16*. London: RCOG; 2019 [[www.maternityaudit.org.uk/FilesUploaded/NMPA%20Neonatal%20sprint%20report.pdf](http://www.maternityaudit.org.uk/FilesUploaded/NMPA%20Neonatal%20sprint%20report.pdf)].
26. Spiegelhalter DJ. Funnel plots for comparing institutional performance. *Statistics in Medicine* 2005;24(8):1185–202.
27. NMPA Project Team. *A Preliminary Investigation Into the Effect of Missing Data on the Published NMPA 2015/16 Clinical Results*. 2018. [[www.maternityaudit.org.uk/downloads/NMPA%20Preliminary%20report%202015.12.17.pdf](http://www.maternityaudit.org.uk/downloads/NMPA%20Preliminary%20report%202015.12.17.pdf)].
28. Office for National Statistics. Births by parents' characteristics in England and Wales: 2016 [[www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthsbyparentscharacteristicsinenglandandwales/2016](http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthsbyparentscharacteristicsinenglandandwales/2016)].
29. Dhanjal MK, Kenyon AT. *Induction of Labour at Term in Older Mothers*. Scientific Impact Paper No. 34. London: RCOG; 2013 [[www.rcog.org.uk/globalassets/documents/guidelines/scientific-impact-papers/sip\\_34.pdf](http://www.rcog.org.uk/globalassets/documents/guidelines/scientific-impact-papers/sip_34.pdf)].
30. National Institute for Health and Care Excellence. *Diabetes in Pregnancy: Management from Preconception to the Postnatal Period*. NICE guideline 3; 2015 [[www.nice.org.uk/guidance/ng3](http://www.nice.org.uk/guidance/ng3)].
31. National Institute for Health and Care Excellence. *Hypertension in Pregnancy: Diagnosis and Management*. NICE guideline 133. NICE; 2019 [[www.nice.org.uk/guidance/ng133](http://www.nice.org.uk/guidance/ng133)].
32. Cole TJ, Williams AF, Wright CM. Revised birth centiles for weight, length and head circumference in the UK-WHO growth charts. *Annals of Human Biology* 2011;38(1):7–11.
33. Clifford S, Giddings S, Southam M, Gardosi, J. The Growth Assessment Protocol: a national programme to improve patient safety in maternity care. *MIDIRS Midwifery Digest* 2013;23:4:516–523 [[www.perinatal.org.uk/gap/Resources/GAP\\_article\\_MIDIRS\\_Dec\\_2013.pdf](http://www.perinatal.org.uk/gap/Resources/GAP_article_MIDIRS_Dec_2013.pdf)].
34. NHS England. *Saving Babies' Lives: A Care Bundle for Reducing Stillbirth*. NHSE; 2016 [[www.england.nhs.uk/wp-content/uploads/2016/03/saving-babies-lives-car-bundl.pdf](http://www.england.nhs.uk/wp-content/uploads/2016/03/saving-babies-lives-car-bundl.pdf)].
35. Roberts C, Banfield P. *Welsh Initiative for Stillbirth Reduction: Progress Report*. 2014 [[www.1000livesplus.wales.nhs.uk/opendoc/239279](http://www.1000livesplus.wales.nhs.uk/opendoc/239279)].
36. Norman JE, Heazell AEP, Rodriguez A, et al. Awareness of fetal movements and care package to reduce fetal mortality (AFFIRM): a stepped wedge, cluster-randomised trial. *The Lancet* 2018;392:1629–38 [[www.thelancet.com/journals/lancet/article/PIIS0140-6736\(18\)31543-5/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31543-5/fulltext)].
37. Mullins E, Lees C, Brocklehurst P. Is continuous electronic fetal monitoring useful for all women in labour? *BMJ* 2017;359:j5423.
38. Brocklehurst P, Field DJ, Juszczak E, et al. The INFANT trial. *The Lancet* 2017;390(10089):28.
39. Maternity Care Working Party. *Making Normal Birth a Reality: Consensus Statement*. Royal College of Midwives, Royal College of Obstetricians and Gynaecologists, National Childbirth Trust; 2007.
40. Carroll FE, Knight H, Cromwell DA, et al. *Patterns of Maternity Care in English NHS Trusts 2013/14*. London: RCOG; 2016 [[www.rcog.org.uk/globalassets/documents/guidelines/research--audit/maternity-indicators-2013-14\\_report2.pdf](http://www.rcog.org.uk/globalassets/documents/guidelines/research--audit/maternity-indicators-2013-14_report2.pdf)].
41. Knight H, Cromwell D, van der Meulen J, et al. *Patterns of Maternity Care in English NHS Hospitals 2011/12*. London: RCOG; 2013 [[www.rcog.org.uk/globalassets/documents/guidelines/research--audit/patterns-of-maternity-care-in-english-nhs-hospitals-2011-12\\_0.pdf](http://www.rcog.org.uk/globalassets/documents/guidelines/research--audit/patterns-of-maternity-care-in-english-nhs-hospitals-2011-12_0.pdf)].
42. NHS Digital. *NHS Maternity Statistics, England 2017–18*. 2018 [<https://digital.nhs.uk/data-and-information/publications/statistical/nhs-maternity-statistics/2017-18>].
43. Robson MS. Classification of caesarean sections. *Fetal and Maternal Medicine Review* 2001;12(1):23–39.
44. NHS Improvement. *Maternity Safety Thermometer 2019* [[www.safetythermometer.nhs.uk/index.php/maternity](http://www.safetythermometer.nhs.uk/index.php/maternity)].
45. Jones G, Riley M, Dwyer T. Maternal smoking during pregnancy, growth, and bone mass in prepubertal children. *Journal of Bone and Mineral Research* 1999;14(1):146–51 [<https://asbmr.onlinelibrary.wiley.com/doi/full/10.1359/jbmr.1999.14.1.146>].
46. Pringle PJ, Geary MPP, Rodeck CH, et al. The influence of cigarette smoking on antenatal growth, birth size, and the insulin-like growth factor axis. *Journal of Clinical Endocrinology and Metabolism* 2005;90(5):2556–62 [<https://academic.oup.com/jcem/article/90/5/2556/2836679>].

47. Robison RG, Kumar R, Arguelles LM, et al. Maternal smoking during pregnancy, prematurity and recurrent wheezing in early childhood. *Pediatric Pulmonology* 2012;47(7):666–73 [[www.ncbi.nlm.nih.gov/pmc/articles/PMC3756665/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3756665/)].
48. Dahlin S, Gunnerbeck A, Wikström AK, et al. Maternal tobacco use and extremely premature birth – a population-based cohort study. *BJOG: An International Journal of Obstetrics and Gynaecology* 2016;123(12):1938–46 [<https://obgyn.onlinelibrary.wiley.com/doi/full/10.1111/1471-0528.14213>].
49. Bjørnholt SM, Leite M, Albieri V, et al. Maternal smoking during pregnancy and risk of stillbirth: results from a nationwide Danish register-based cohort study. *Acta Obstetrica et Gynecologica Scandinavica* 2016;95(11):1305–12 [<https://obgyn.onlinelibrary.wiley.com/doi/full/10.1111/aogs.13011>].
50. Marufu TC, Ahankari A, Coleman T, et al. Maternal smoking and the risk of still birth: systematic review and meta-analysis. *BMC Public Health* 2015;15(1):239 [<https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-015-1552-5>].
51. Sultan AH, Kamm MA, Hudson CN, et al. Anal-sphincter disruption during vaginal delivery. *New England Journal of Medicine* 1993;329(26):1905–11 [[www.nejm.org/doi/10.1056/NEJM199312233292601](http://www.nejm.org/doi/10.1056/NEJM199312233292601)].
52. Royal College of Obstetricians and Gynaecologists. The Management of Third- and Fourth-Degree Perineal Tears. Green-top Guideline No. 29. London: RCOG; 2015 [[www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg29/](http://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg29/)].
53. Bidwell P, Thakar R, Sevdalis N, et al. A multi-centre quality improvement project to reduce the incidence of obstetric anal sphincter injury (OASI): study protocol. *BMC Pregnancy and Childbirth* 2018;18(1):331 [[www.ncbi.nlm.nih.gov/pmc/articles/PMC6090598/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC6090598/)].
54. Mavrides E, Allard S, Chandraran E, Collins P, Green L, Hunt BJ, Riris S, Thomson AJ on behalf of the Royal College of Obstetricians and Gynaecologists. *Prevention and Management of Postpartum Haemorrhage*. Green-top Guideline No. 52. *BJOG* 2016;124:e106–e149 [[www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg52/](http://www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg52/)].
55. Bunch K, Allin B, Knight M. *Development of a Core Set of Maternity Dashboard Metrics*. Oxford: National Perinatal Epidemiology Unit, University of Oxford; 2016.
56. NHS Digital. *Maternity Services Data Set (MSDS)*. 2019 [<https://digital.nhs.uk/data-and-information/data-collections-and-data-sets/data-sets/maternity-services-data-set>].
57. Patel A, Goudar SS, Geller SE, et al. Drape estimation vs. visual assessment for estimating postpartum hemorrhage. *International Journal of Gynecology and Obstetrics* 2006;93(3):220–24.
58. Persson M, Razaz N, Tedroff K, et al. Five and 10 minute Apgar scores and risks of cerebral palsy and epilepsy: population based cohort study in Sweden. *BMJ* 2018;360:k207 [[www.bmj.com/content/360/bmj.k207](http://www.bmj.com/content/360/bmj.k207)].
59. Stuart A, Olausson PO, Källen K. Apgar Scores at 5 Minutes After Birth in Relation to School Performance at 16 Years of Age. *Obstetrics and Gynecology* 2011;118(2 Pt 1):201–8.
60. Dabrowski GA. Skin-to-skin contact: giving birth back to mothers and babies. *Nursing for Women's Health* 2007;11(1):64–71 [[https://nwhjournal.org/article/S1751-4851\(15\)30152-5/fulltext](https://nwhjournal.org/article/S1751-4851(15)30152-5/fulltext)].
61. Moore ER, Anderson GC, Bergman N, et al. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database of Systematic Reviews* 2012;5(5):CD003519 [[www.ncbi.nlm.nih.gov/pmc/articles/PMC3979156/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3979156/)].
62. Horta BL, Mola CLd, Victora CG. Breastfeeding and intelligence: a systematic review and meta-analysis. *Acta Paediatrica* 2015;104(S467):14–19 [<https://onlinelibrary.wiley.com/doi/full/10.1111/apa.13139>].
63. Horta BL, Victora C. *Long-term Effects of Breastfeeding: a Systematic Review*. Geneva: World Health Organization; 2013 [[https://apps.who.int/iris/bitstream/handle/10665/79198/9789241505307\\_eng.pdf;jsessionid=0C3BE01216B4575BF6D212EE5D873BE4?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/79198/9789241505307_eng.pdf;jsessionid=0C3BE01216B4575BF6D212EE5D873BE4?sequence=1)].
64. Dieterich CM, Felice JP, O'Sullivan E, et al. Breastfeeding and health outcomes for the mother-infant dyad. *Pediatric Clinics of North America* 2013;60(1):31–48 [[www.ncbi.nlm.nih.gov/pmc/articles/PMC3508512/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3508512/)].
65. Public Health England. Official Statistics: Breastfeeding prevalence at 6 to 8 weeks after birth, 2018 [[www.gov.uk/government/statistics/breastfeeding-at-6-to-8-weeks-after-birth-2017-to-2018-quarterly-data](http://www.gov.uk/government/statistics/breastfeeding-at-6-to-8-weeks-after-birth-2017-to-2018-quarterly-data)].
66. UNICEF. Baby Friendly Initiative: Awards Table 2018 [[www.unicef.org.uk/babyfriendly/about/accreditation-statistics-and-awards-table/](http://www.unicef.org.uk/babyfriendly/about/accreditation-statistics-and-awards-table/)].
67. NHS Improvement. National schedule of reference costs. 2018 [<https://improvement.nhs.uk/resources/reference-costs/>].
68. Adams E. The new NCCMDS, Neonatal HRGs and Reference Costs – a guide for clinicians. BAPM; 2016.

69. ACOG. Executive summary: Neonatal encephalopathy and neurologic outcome, second edition. Report of the American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. *Obstetrics and Gynecology* 2014;123(4):896–901 [[https://journals.lww.com/greenjournal/fulltext/2014/04000/Executive\\_Summary\\_\\_Neonatal\\_Encephalopathy\\_and.38.aspx](https://journals.lww.com/greenjournal/fulltext/2014/04000/Executive_Summary__Neonatal_Encephalopathy_and.38.aspx)].
70. Draper ES, Gallimore ID, Kurinczuk JJ, Smith PW, Boby T, Smith LK, Manktelow BN, on behalf of the MBRRACE-UK Collaboration. *MBRRACE-UK Perinatal Mortality Surveillance Report, UK Perinatal Deaths for Births from January to December 2016*. Leicester: The Infant Mortality and Morbidity Studies, Department of Health Sciences, University of Leicester; 2018 [<https://www.npeu.ox.ac.uk/downloads/files/mbrance-uk/reports/MBRRACE-UK%20Perinatal%20Surveillance%20Full%20Report%20for%202016%20-%20June%202018.pdf>].
71. Gale C, Statnikov Y, Jawad S, et al. Neonatal brain injuries in England: population-based incidence derived from routinely recorded clinical data held in the National Neonatal Research Database. *Archives of Disease in Childhood – Fetal and Neonatal Edition* 2018;103(4):F301 [<https://fn.bmj.com/content/103/4/F301>].
72. Jardine J, NMPA Project Team. *Maternity Admissions to Intensive Care in England, Wales and Scotland in 2015/16: A Report from the National Maternity and Perinatal Audit*. London: RCOG; 2019 [[www.maternityaudit.org.uk/FilesUploaded/NMPA\\_Intensive\\_Care\\_sprint\\_report.pdf](http://www.maternityaudit.org.uk/FilesUploaded/NMPA_Intensive_Care_sprint_report.pdf)].



**National Maternity and Perinatal Audit**

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