Maternal, Newborn and Infant Clinical Outcome Review Programme

MBRRACE-UK

Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

Perinatal Mortality Surveillance Report

UK Perinatal Deaths for births from January to December 2013

June 2015

University of Oxford · HQIP · University of Leicester · TIMMS · University of Birmingham · Sands · UCL · University of Liverpool · npeu National Perinatal Epidemiology Unit

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for births from

January to December 2013

Bradley N Manktelow, Lucy K Smith, T Alun Evans,
Pauline Hyman-Taylor, Jennifer J Kurinczuk, David J Field,
Peter W Smith, Elizabeth S Draper
on behalf of the MBRRACE-UK collaboration

June 2015

Department of Health Sciences
University of Leicester
22-28 Princess Road West
Leicester, LE1 6TP

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Foreword

We welcome this report of perinatal deaths for births in 2013 as the continuation of national surveillance of perinatal mortality established in the early 1990s. This report represents one element of the work of the Maternal, Newborn and Infant Clinical Outcome Review Programme now run by the MBRRACE-UK collaboration. Many changes have been implemented in the process of data collection for this new report which has presented challenges for Trusts and Health Boards including the new web-based data entry system and the expansion of the criteria to include deaths of babies born at the earliest extremes of gestational age. We are pleased to see that despite the short gap in data for England in 2010-12 clinical staff remain fully supportive of this important national surveillance programme.

The findings are generally heartening with an overall improvement in the rates of stillbirths and neonatal deaths continuing the trend from 2003 onwards. These findings are very welcome especially against the background of the increasing medical complexity of the maternity population. However, the overall findings mask the wide variation in rates seen across the UK. This variation remains despite the fact that the new analytical methods introduced by MBRRACE-UK take into account aspects of case-mix to enable 'fairer' comparisons in mortality outcomes between services which provide care for high risk and low risk pregnancies and also adjust for the random variation in rates which occur due to the small number of births in some areas.

There is a clear message to both commissioners and care providers where mortality rates are highlighted as 'red' - being more than 10% higher than the national average - and we endorse the MBRRACE-UK recommendation that these organisations should review both their data quality and the care they provide. We also agree that organisations with rates denoted as 'amber' - being up to 10% higher than the UK average - should also consider a review of both their data and care provision.

The benchmarks identified for this first report by MBRRACE-UK to denote clinical performance defined by mortality levels are based on the national average figures. If however, we as a nation aspire to prevent an increasing number of these deaths then we need to achieve the lower mortality rates experienced by many of our European neighbours. This report should act as the starting point for a national dialogue about the mortality rates we aspire to achieve. The confidential enquiry into term antepartum stillbirths which will be published by MBRRACE-UK later this year will help identify the improvements in care needed to reduce mortality rates and will support the country-specific initiatives which are already underway which aim, in particular, to reduce stillbirth rates.

The difficulties of making robust international comparisons are also clearly highlighted in this report with the first difficulty being differences in the definitions of perinatal deaths. MBRRACE-UK aimed to address this with the collection of all deaths from 22^{+0} weeks of gestational age onwards. Unfortunately the wide variation between Trusts and Heath Boards in reporting these deaths to MBRRACE-UK made it impossible for them to be included in the reported rates. Although relatively few in number, deaths at these early extremes of gestation have a significant effect on mortality rates and it will only be possible to make robust comparisons across the UK and internationally when all these deaths are included. Non-responding organisations have been highlighted in the report and we fully support the MBRRACE-UK recommendation that these

organisations need to identify mechanisms to ensure that all eligible deaths are reported to MBRRACE-UK and given the recommendations from the recent Morecambe Bay Investigation report this needs to be a high priority for all organisations.

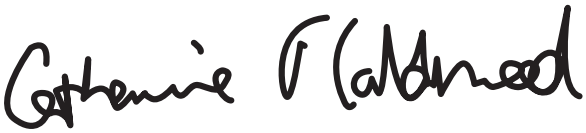
The new approaches to perinatal data collection and analysis introduced by MBRRACE-UK have the potential to substantially improve our understanding of the rates and variations in perinatal mortality rates across the UK and thus the identification of preventive measures. This can only be achieved by the continued wholehearted engagement of staff in Trusts and Health Boards and improvements in the quality of the data provided by some organisations. As identified by the Morecambe Bay Investigation, investment in data provision and monitoring is key to ensuring that we provide the highest quality of care for all women and their babies at this pivotal moment in their family life.

Professor Dame Sally C Davies
Chief Medical Officer - England

Jane Cummings
Chief Nursing Officer – England

Dr Ruth Hussey
Chief Medical Officer – Wales

Professor Jean White
Chief Nursing Officer – Wales



Dr Catherine Calderwood
Chief Medical Officer – Scotland

Fiona McQueen
Chief Nursing Officer - Scotland

Dr Michael McBride
Chief Medical Officer – Northern Ireland

Charlotte McArdle
Chief Nursing Officer – Northern Ireland

Definitions used in this report

Late fetal loss	A baby delivered between 22^{+0} and 23^{+6} weeks gestational age showing no signs of life, irrespective of when the death occurred.
Stillbirth	A baby delivered at or after 24^{+0} weeks gestational age showing no signs of life, irrespective of when the death occurred.
Antepartum stillbirth	A baby delivered at or after 24^{+0} weeks gestational age showing no signs of life and known to have died before the onset of care in labour.
Intrapartum stillbirth	A baby delivered at or after 24^{+0} weeks gestational age showing no signs of life and known to be alive at the onset of care in labour.
Neonatal death	A live born baby (born at 20^{+0} weeks gestational age or later, or with a birthweight of 400g or more where an accurate estimate of gestation is not available) who died *before* 28 completed days after birth.
Early neonatal death	live born baby (born at 20^{+0} weeks gestational age or later, or with a birthweight of 400g or more where an accurate estimate of gestation is not available) who died *before* 7 completed days after birth.
Late neonatal death	A live born baby (born at 20^{+0} weeks gestational age or later, or with a birthweight of 400g or more where an accurate estimate of gestation is not available) who died *from* 7 completed days but *before* 28 completed days after birth.
Perinatal death	A stillbirth or early neonatal death.
Extended perinatal death	A stillbirth or neonatal death.
Post-neonatal death	A live born baby (born at 20^{+0} weeks gestational age or later, or with a birthweight of 400g or more where an accurate estimate of gestation was not available) who died *from* 28 completed days but *before* 1 year after birth.
Termination of pregnancy	The deliberate ending of a pregnancy, normally carried out before the embryo or fetus is capable of independent life.

Key Findings

1. There were 4,722 extended perinatal deaths (3,286 stillbirths and 1,436 neonatal deaths) occurring in the UK to babies born at 24^{+0} weeks gestational age or greater in 2013 (excluding terminations of pregnancy). The extended perinatal mortality rate was 6.0 per 1,000 total births, comprising 4.2 stillbirths per 1,000 total births and 1.8 neonatal deaths per 1,000 live births.*
2. Even after accounting for variation due to the number of births and adjustment for case-mix differences significant variation in rates of extended perinatal mortality across the UK persists. Amongst organisations responsible for commissioning care, stabilised & adjusted rates varied from 5.4 to 7.1 per 1,000 total births.*
3. The analysis of the mortality associated with the 2013 birth cohort has identified particular areas in the UK where more detailed local review of stillbirth and neonatal death rates is required. In future years, with more consistent data entry, areas with high mortality rates and the nature of this excess mortality will be identified with greater accuracy and reported by MBRRACE-UK.
4. Pregnancies to women living in areas with the highest levels of social deprivation in the UK are over 50% more likely to end in stillbirth or neonatal death. Babies of Black or Black British and Asian or Asian British ethnicity had the highest risk of extended perinatal mortality with rates of 9.8 and 8.8 per 1,000 total births respectively. Both these findings show that inequalities in perinatal outcomes persist in the UK.
5. Engagement of Trusts and Health Boards in the process of reporting data on stillbirths and neonatal deaths was inconsistent. Some clearly had established structures of good practice to monitor and review such deaths and report data to MBRRACE-UK in a timely fashion. Others appeared to have no such systems in place and only reported data after multiple requests. In some cases this occurred over one year after the death even when there were no outside factors (such as a Coroner or Procurator Fiscal inquest) that might have prevented access to some of the necessary information.
6. There are systematic differences in how clinicians certify babies born at 22^{+0} to 23^{+6} weeks gestational age with, for example, the percentage of neonatal deaths who were born at this early gestation varying from 11% to 28% across Operational Delivery Networks in England. Such variation in practice can have a significant impact on families' experiences of access to maternity leave, support services and benefits.
7. The incomplete reporting of late fetal losses at 22^{+0} to 23^{+6} weeks gestational age to MBRRACE-UK by care providers prevents robust estimation of neonatal and extended perinatal mortality rates based on standard international criteria as recommended by the World Health Organization (all births from 22^{+0} weeks gestational age).
8. Inconsistency in the registration of intrauterine deaths prior to 24^{+0} weeks but who only deliver after 24^{+0} weeks of gestational age has the potential to have a major influence on national routine statistics. These effects will only be fully accounted for by Trusts and Health Boards engaging with the MBRRACE-UK data collection and reporting all these deaths.

* Since these rates exclude deaths to births at less than 24^{+0} weeks gestational age, they are not necessarily directly comparable to other previously published data.

Recommendations

1. All organisations which have been identified as having a stabilised & adjusted stillbirth, neonatal or extended perinatal mortality rate that fall in the red band should conduct a local review in order to check their data and to identify factors which might be responsible for their reported high stabilised & adjusted mortality rate. (Page 50)
2. Organisations whose stabilised & adjusted stillbirth, neonatal or extended perinatal mortality rate fall within the amber band should similarly consider carrying out a local review. (Page 50)
3. NHS England, NHS Scotland, NHS Wales, Health and Social Care in Northern Ireland, in conjunction with professional bodies and national healthcare advisors responsible for clinical standards in the relevant specialties should establish national aspirational targets for rates of stillbirths, neonatal deaths, and extended perinatal deaths against which all services can be assessed in future. This could be based on a stepwise approach working towards rates achieved by the current best performing countries in Europe. (Page 19)
4. Units should ensure that a post-mortem examination is offered in all cases of stillbirth and neonatal death In order to improve future pregnancy counselling of parents. (Page 72)
5. In order that Trusts and Health Boards can comply with the recommendations arising from the Morecambe Bay Investigation, they should fully engage with the MBRRACE-UK data collection so as to ensure the "*systematic recording and tracking of perinatal deaths*". (Page 15)
6. In order that data are of the highest quality, Trusts and Health Boards must collaborate with each other in the provision of information to MBRRACE-UK about mothers and babies who change provider units during pregnancy and after delivery. (Page 15)
7. It is essential that all Trusts and Health Boards provide data which are complete, accurate and reported in a timely manner in order that the most accurate comparative mortality estimates can be calculated and used for quality assurance. In particular by:
   a) Improving the provision of maternal data for neonatal deaths;
   b) Working closely with MBRRACE-UK to improve the classification of cause of death. (Page 70)
8. All organisations responsible for maternity services should report to MBRRACE-UK all births between 22^{+0} and 23^{+6} weeks gestational age who do not survive the neonatal period. (Page 53)

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Executive Summary

Background

This is the first UK perinatal surveillance report produced under the auspices of the Maternal, Newborn and Infant Clinical Outcome Review Programme (MNI-CORP). The programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of NHS England, NHS Wales, the Scottish Government Health and Social Care Directorate, the Northern Ireland Department of Health, Social Services and Public Safety (DHSSPS), the States of Guernsey, the States of Jersey, and the Isle of Man Government. The report has been produced by MBRRACE-UK - a collaboration led from the National Perinatal Epidemiology Unit at the University of Oxford with members from the University of Leicester, who lead the perinatal aspects of the work, University of Liverpool, University of Birmingham, University College London, a general practitioner from Oxford, and Sands, the stillbirth and neonatal death charity. Previously this work has been carried out under different organisational arrangements and providers. The last of the previous reports was produced by the Centre for Maternal and Child Enquiries (CMACE) in 2011 relating to deaths in 2009.

The scope of the MNI-CORP has four main elements. This report focuses on:

> **Surveillance of all late fetal losses (22^{+0} to 23^{+6} weeks gestational age), stillbirths and neonatal deaths.**

Important changes in the approach to surveillance

MBRRACE-UK has introduced two important changes to the data collection compared to previous surveillance reports:

1. **The introduction of a new system for classifying deaths.** Following consultation with experts the Cause of Death and Associated Conditions (CODAC) classification system was chosen as it was felt this would provide: a) a greater understanding of the factors associated with antepartum stillbirths; b) sufficient detail about cause of death to allow the effect of serious congenital anomalies (which show considerable geographic variation) to be adequately identified and, where appropriate, excluded from the analyses.
2. **The widening of inclusion criteria to include all late fetal losses as well as neonatal deaths at 22^{+0} to 23^{+6} weeks gestational age.** Such losses, which have been collected at times in the past, are not part of the statutory 'death certification' process. However, there is evidence that these babies contribute significantly to local variation in mortality rates and data about these babies are essential for international comparisons to be meaningful.

Methods

Once the contract for the perinatal aspects of the MNI-CORP was in place in the summer of 2012 the following were undertaken in order that data collection could recommence for 2013:

a) Creation of an agreed dataset to be collected for each death;

b) Establishment of a secure on-line data entry system (the system went live in April 2013);

c) Acquisition of the necessary approvals to receive, hold and analyse the data from Trusts and Health Boards.

d) Acquisition of approvals, and the establishment of systems, to access routine data (for the purposes of cross checking and providing denominators) from each of the four countries of the UK and the Crown Dependencies. For Northern Ireland much of this process was carried out locally.

e) Establishing MBRRACE-UK Lead Reporters within all of the relevant Trusts and Health Boards in order that deaths could be reported and information on data completeness and quality fed back.

Analysis

The interpretation of any mortality rate is affected by the extent to which there is variation in the disease severity of the cases cared for by a particular organisation or geographical area when compared to elsewhere. In order to provide a more reliable comparison, the data produced in this report are shown both as crude mortality rates as well as after 'stabilisation & adjustment'. This method of adjustment takes into account the effects of chance variation and allows for key factors which are known to increase the risk of perinatal mortality in order to identify those organisations which, statistically, have mortality rates above or below a particular benchmark. In this report, data are presented compared to the UK average as the benchmark and those whose stabilised & adjusted rates are more than 10% above this figure have been highlighted.

This process is most reliable when used for large organisations rather than individual providers and hence the data for a variety of organisational structures have been reported.

Historical Perspective

The information that forms the basis of Section 1.5 of the report is from national registration systems (the ONS Child Mortality Statistics, GRO and NISRA). The mortality trends are broadly encouraging with a decline in rates of stillbirth and neonatal death. However the lack of consistency and detail in reporting means the data are difficult to interpret with confidence as the following might be responsible for the observed fall:

3. Variation in the management of babies born at 22^{+0} to 23^{+6} weeks gestational age;
4. Changes to the professional advice regarding the certification of babies born at or after 24^{+0} weeks gestational age believed to have died before 24^{+0} weeks gestational age;

The effect of deaths due to lethal congenital anomalies is also unclear from these data; with particular localities often having increased rates from this cause because of local cultural or religious groupings who do not access termination of pregnancy, or national legislation in Northern Ireland.

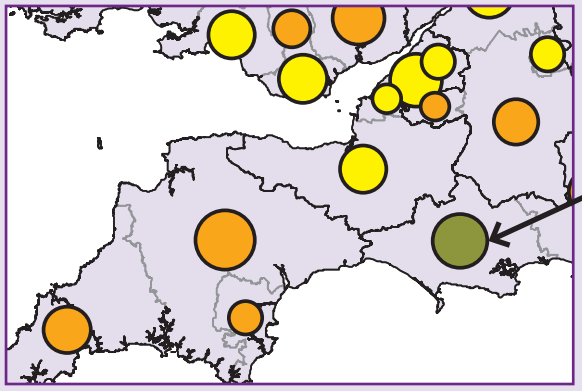
Stabilised & adjusted mortality

The main findings of the report are represented in a combination of maps and tables showing both the crude and the stabilised & adjusted mortality data for stillbirths, neonatal deaths and extended perinatal deaths (stillbirth and neonatal deaths combined). Babies born at less than 24^{+0} weeks gestational age have been excluded. The data in the main report are shown for the relevant commissioning and service delivery organisations with deaths analysed based on the mother's address at the time the death occurred. There are separate maps for stillbirths, neonatal deaths and extended perinatal deaths and for each type of mortality a pair of maps is presented: one showing the crude rate and the other showing the stabilised & adjusted

rate. The size of each circle on the map broadly represents the size of population covered by the particular organisation and the colour represents the comparison to the appropriate UK average rate. Aspirational rates have also been included based on estimated equivalent rates in the Nordic countries (Norway, Sweden, Denmark, Finland, and Iceland): 3.0 stillbirths per 1,000 births; 1.3 neonatal deaths per 1,000 live births; 4.3 extended perinatal deaths per 1,000 births:

- Dark green: ● - lower than the 'aspirational' target.
- Light green: ● - more than 10% lower than the UK average
- Yellow: ● - up to 10% lower than the UK average
- Amber: ● - up to 10% higher than the UK average
- Red: ● - more than 10% higher than the UK average

Within the tables particular emphasis has been given to the extended perinatal death rate which has been colour coded based on comparison to the UK average following the same principle as described for the maps. An example of the how the tables and maps appear is shown below:



Stabilised & adjusted extended perinatal mortality rate more than 10% lower than the UK average.

Clinical Commissioning Group (CCG)	Total births	Mortality rate per 1,000 births *						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted	Crude	Stabilised & adjusted	Crude	Stabilised & adjusted #	
Dorset	7,516	2.13	3.99 (3.28 to 3.95)	1.33	1.60 (1.24 to 1.84)	3.46	5.33 (4.14 to 6.73)	●
North, East, West Devon	9,047	3.87	4.23 (3.98 to 4.35)	1.66	1.93 (1.85 to 2.27)	5.53	6.16 (5.53 to 6.99)	●
Somerset	5,455	2.02	4.03 (3.61 to 4.43)	1.65	1.83 (1.77 to 2.49)	3.67	5.57 (4.67 to 6.38)	●

It would be helpful for all relevant stakeholders to consider the appropriate benchmark for these data (which may well be lower than the current choice of UK average). However, for those organisations currently falling above or close to the 'red band' a more detailed local review is recommended to assess the deaths that were potentially avoidable or local factors that might explain the high rate.

Perinatal Mortality Surveillance Report

MBRRACE-UK
Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK

Lay summary 2013

Babies' deaths in the UK - the national picture for 2013

The number of babies who died either before, during or shortly after birth in 2013 was 5,700.

This means that every day in the UK around 15 families were devastated by the death of their baby.

Between 2003 and 2013, the rate and the number of stillbirths and neonatal deaths fell in the UK. The fall equates to more than 1,000 fewer deaths, despite the fact that the birth rate has risen by 12% in the same period.

Nevertheless, the UK mortality rate for babies of 7.3 per 1,000 births is high when compared with some of our European neighbours. If the UK could match mortality rates achieved in Sweden and Norway, for instance, the lives of at least 1,000 babies could be saved every year.

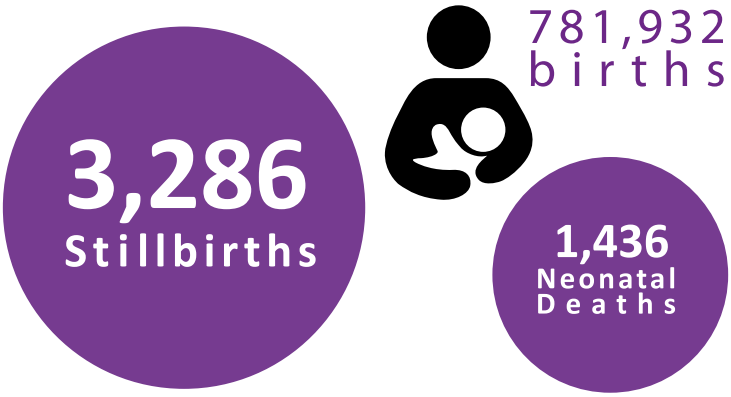
Stillbirth: is a death occurring before or during birth once a pregnancy has reached 24 weeks.

Neonatal death: is a baby born at any gestation who lives, even briefly, but dies within four weeks.

Mortality rate: is the number of babies who die per 1,000 births.

The focus of this report

Since deaths of babies born at 22 to 23 weeks of pregnancy are not all officially registered, the report focuses on babies who were born after 24 weeks of pregnancy. The rate for these deaths is 6 per 1,000. This report also excludes terminations of pregnancy



Looking forward

Future reports will build on this, MBRRACE-UK's first *Perinatal Mortality Surveillance Report*. By setting a high standard for information to be collected, MBRRACE-UK aims to better understand the causes, risks and inequalities which impact on the health and survival rates of babies, so that organisations can measure whether they are providing the right care. The ultimate goal of the work is to support the NHS in improving the quality of services women and babies receive

MBRRACE-UK is a team of researchers, clinicians and charity representatives.

Across the UK: babies' deaths after 24 weeks of pregnancy

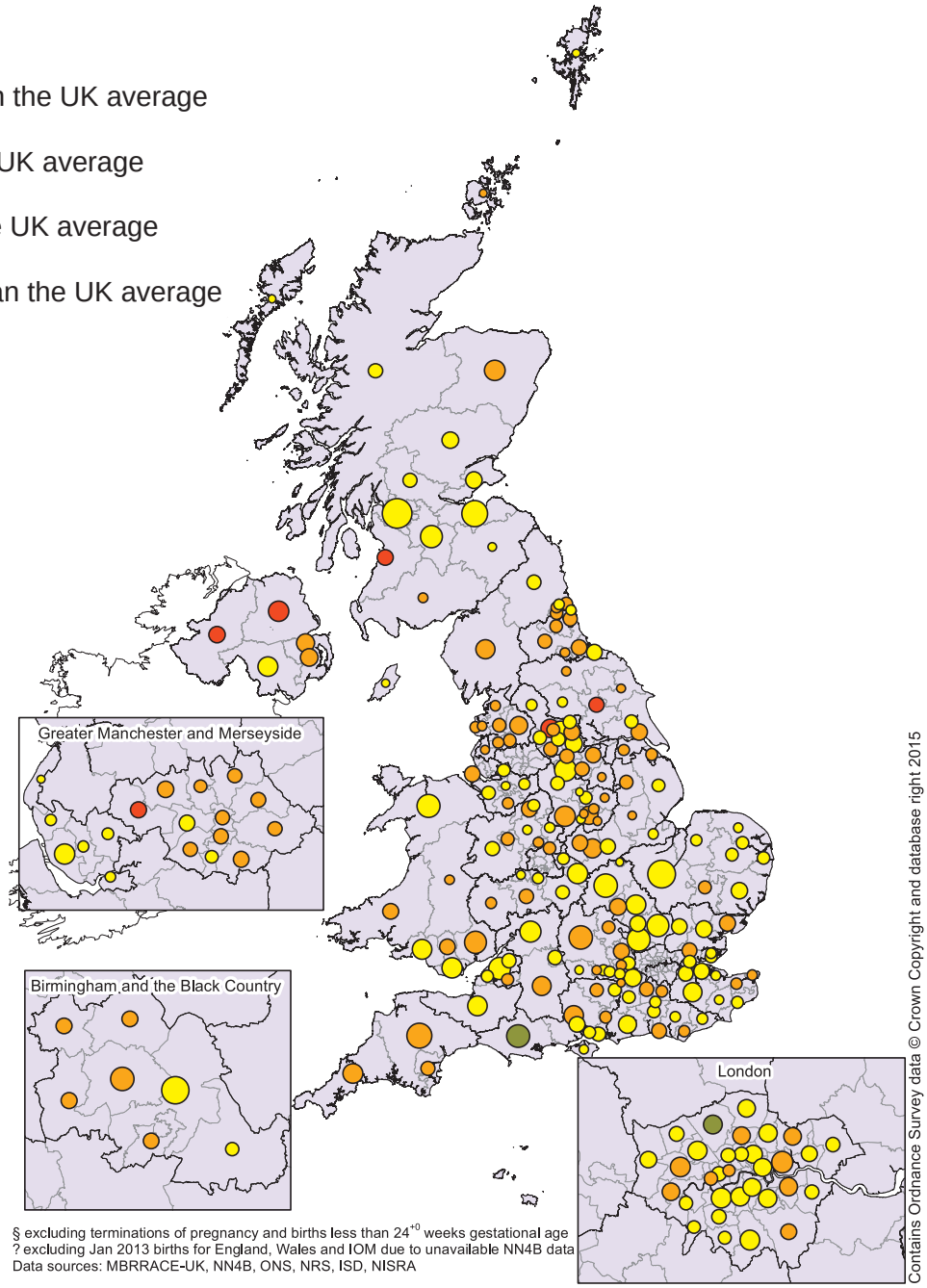
How to read the map

Each dot represents an organisation responsible for local health care; the larger the dot, the greater the number of babies born in hospitals run by that organisation. Mortality rates have taken into account the number of high risk pregnancies that are cared for by each organisation.

The UK average mortality rate for babies born after 24 weeks of pregnancy is approximately 6 deaths per 1,000 births. About half of the organisations will be above the average and half below the average.

The colours represent:

- more than 10% lower than the UK average
- up to 10% lower than the UK average
- up to 10% higher than the UK average
- more than 10% higher than the UK average



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
? excluding Jan 2013 births for England, Wales and IOM due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

The report recommends that a national 'target' should be set for the UK for reducing the number of babies who die, aiming for a rate closer to that achieved in the best performing European countries.

Which babies are most at risk?

Black or Black British
Asian or Asian British
>50%
Higher risk

Teenage mothers
& mothers over 40
39%
Higher risk

Mothers living
in poverty
57%
Higher risk

We know the rate of death is influenced by risks such as poverty, ethnicity and the age of the mum. However, even when we take account of these, there are big differences across the UK in the numbers and rates of babies who die.

In the whole of the UK, only Barnet and Dorset had mortality rates substantially lower than the UK average. No organisation had rates matching the lowest mortality rates in Europe.

Local rates varied across the UK

5.4 to **7.1** Stillbirths and neonatal deaths per 1,000 births

This variation is **not explained** by differences in poverty, ethnicity, or the age of the mother

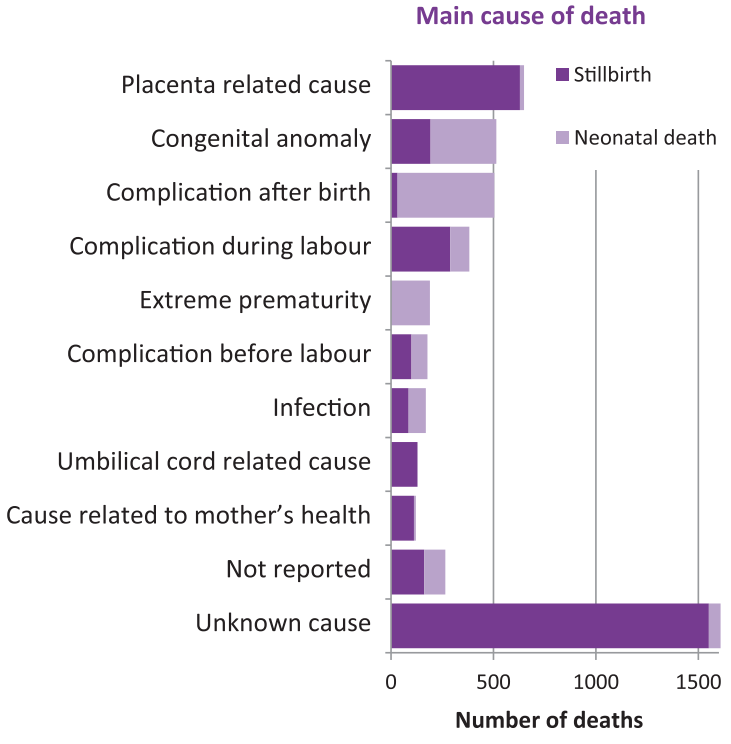
The report recommends that in all those organisations where the mortality rate is higher than the UK average, organisations should review the quality of care mum and baby received to understand whether the death might have been prevented.

Even where rates are below the UK average, local reviews should be carried out. This will help units reach standards for preventing deaths similar to those in other European countries.

Why do babies die?

All babies' deaths are classified to help us understand what the underlying causes are so that care can be targeted to prevent future deaths. This is done by recording the main reason for the death (see right). But there may be other problems that have contributed. A baby who dies of an infection, for example, may also have a congenital abnormality which makes that baby more vulnerable to infection. The system used by MBRRACE-UK also records these underlying factors.

As hospital staff become used to this system of classifying deaths, fewer deaths will be described as 'unknown' in future reports.



Other risks and factors

Just as ethnicity, poverty and the age of the mum affect the risk of a baby dying, other factors carry risks too.

10 X

Higher risk for babies born before 32 weeks

3 X

Higher risk for twins

1 in 3

Deaths occur among babies delivered at term

1 in 12

Deaths are as a result of complications during delivery

While being born too early is a risk, one in three babies who died in 2013 had reached term (37 weeks gestation or more). In some cases issues to do with care may play a role: one in 12 babies died either during or after birth, because of a complication in labour.

Understanding all these factors will help units target better care.

Improving the information

Complete and accurate information are vital for MBRRACE-UK to help improve care for mothers and babies

The information collected from units across the country needs to be complete and accurate in order to understand why babies die every year so that lives can be saved in future years. Some information for 2013 was missing, including **important information about the mothers' ethnicity and health or whether families consented to post mortem examination**.

This report didn't include analysis of babies born before 24 weeks because organisations didn't always report babies who died between 22 and 23 weeks. Around 700 deaths at this gestation were reported but it is likely that a further 300 deaths were not.

The report recommends that all organisations provide complete and accurate information to MBRRACE-UK. This is important so that reports in future years can reflect a true picture of the differences in care across the country.

Only by having accurate information can health providers understand where and how to target improvements in quality of care to save lives.

The lay summary was written by Charlotte Bevan on behalf of the MBRRACE-UK lay summary writing group: Zoe Chivers from Bliss, Jane Plumb from Group B Strep Support, Maureen Treadwell from the Birth Trauma Association; and Elizabeth Draper, Pauline Hyman-Taylor, Jenny Kurinczuk and Lucy Smith from MBRRACE-UK.

Contents

Figures

Tables

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Abbreviations

BMI	Body Mass Index
CCG	Clinical Commissioning Group
CESDI	Confidential Enquiry into Stillbirth and Deaths in Infancy
CEMACH	Confidential Enquiries into Maternal and Child Health
CHI	Community Health Index
CI	Confidence interval
CMACE	Centre for Maternal and Child Enquiries
CMS	Centers for Medicare & Medicaid Services
CODAC	Cause Of Death & Associated Conditions
CORP	Clinical Outcome Review Programme
FAQ	Frequently Asked Question
GRO	General Register Office for Scotland
GSS	Government Statistical Service
HQIP	Healthcare Quality Improvement Partnership
ISD	Information Services Division
LCG	Local Commissioning Group
MBRRACE-UK	Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK
MNI-CORP	Maternal, Newborn and Infant Clinical Outcome Review Programme
MPMN	Maternal and Perinatal Mortality Notification
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIMACH	Northern Ireland Maternal and Child Health
NIMATS	Northern Ireland Maternity Information System
NISRA	Northern Ireland Statistics and Research Agency
NN4B	NHS Numbers for Babies
NRS	National Records of Scotland
ODN	Operational Delivery Network
ONS	Office for National Statistics
RCOG	Royal College of Obstetricians and Gynaecologists
SMR	Standardised mortality ratio
WHO	World Health Organization

Acknowledgements

It is with grateful thanks that the MBRRACE-UK collaboration would like to acknowledge the contribution of the many healthcare professionals and staff from the health service and other organisations who were involved in the notification of deaths and the provision of other information. Without the generous contribution of their time and expertise it would not have been possible to produce this report. It is only through this national collaborative effort that it has been possible to conduct this national perinatal mortality surveillance and to continue the longstanding UK tradition of national self-audit to improve care for women, babies and their families.

We would particularly like to thank all MBRRACE-UK Leads Reporters and other staff in NHS Trusts, Health Boards and Health & Social Care Trusts across the UK, and those from the Crown Dependencies, whose contribution made it possible to carry out this surveillance. Due to the large number of individuals involved all Lead Reporters are acknowledged and listed in Appendix A1.

Members of the MBRRACE-UK collaboration:

Jenny Kurinczuk, Professor of Perinatal Epidemiology, Director of the National Perinatal Epidemiology Unit, Lead for MBRRACE-UK, University of Oxford

Charlotte Bevan, Senior Research and Prevention Advisor, Sands

Peter Brocklehurst, Professor of Women's Health, Director of the UCL EGA Institute for Women's Health

Elizabeth Draper, Professor of Perinatal and Paediatric Epidemiology, Perinatal Programme Co-lead for MBRRACE-UK, University of Leicester

David Field, Professor of Neonatal Medicine, Perinatal Programme Co-lead for MBRRACE-UK, University of Leicester

Ron Gray, Associate Professor, National Perinatal Epidemiology Unit, University of Oxford

Sara Kenyon, Reader in Evidence Based Maternity Care, University of Birmingham

Marian Knight, Professor of Maternal and Child Population Health, NIHR Research Professor and Honorary Consultant in Public Health, Maternal Programme Lead for MBRRACE-UK, University of Oxford

Bradley Manktelow, Senior Research Fellow in Statistics, University of Leicester

Jim Neilson, Professor of Obstetrics & Gynaecology, University of Liverpool

Maggie Redshaw, Associate Professor, National Perinatal Epidemiology Unit, University of Oxford

Janet Scott, Head of Research and Prevention, Sands

Judy Shakespeare, Retired General Practitioner, Oxford

Lucy Smith, NIHR Senior Research Fellow in Perinatal Health Inequalities, University of Leicester

Members of the Leicester based MBRRACE-UK team:

Hollie Burton, Administrative Support

Caroline Ellershaw, Administrative Support

Alun Evans, Statistician

Ian Gallimore Administrative Support

Janet Hood, Administrative Support

Pauline Hyman-Taylor, Perinatal Programme Manager/Research Fellow

Helen Jukes, Administrative Support

Frances Mielewczyk, Administrative Support

Members of the Oxford based MBRRACE-UK team:

Lucila Canas Bottos, Programmer

Oliver Hewer, Data Co-ordinator

Marketa Laube, Deputy Programme Manager

Sarah Lawson, Head of IT and Information Security, NPEU

Carl Marshall, Programmer

Charlotte McClymont, Programme Manager

Joanne Oakley, Administrator

Scott Redpath, Project Assistant

Peter Smith, Senior MBRRACE-UK Programmer and Data Manager

Office for National Statistics

Christine Coutes, Joanne Copsey, Karen J Williams, Sue Dewane, Joanne Evans,

Health and Social Care Information Centre

Steven Dodd

National Records of Scotland

Julie Ramsay, Mary McDonald, Kirsten Monteath

Information Services Division Scotland, NHS National Statistics Scotland

Rachael Wood, Carole Morris, Susan Frame, Celina Davis, Sian Nowell, Kirsten Monteath, Jim Chalmers

Health Improvement Scotland

Leslie Marr, Chris Lennox, Jan Warner

All Wales Perinatal Service

Kim Rolfe, Emma Barton, Sailesh Kotecha

Northern Ireland Maternal and Child Health, HSC Public Health Agency

Heather Reid, Joanne Gluck, Malcolm Buchanan, Tony Crockford, Sinead Magill

Health and Social Services Department, States of Guernsey

Jenny Cataroche, Stephen Bridgman

Health Intelligence Unit, Public Health Services, Jersey

Jessica Pringle

Noble's Hospital, Isle of Man

Barbara Scott

MBRRACE-UK Death Classification Expert Group

Philip Banfield, Consultant Obstetrician and Gynaecologist, Glan Clwyd Hospital

Sanjeev Deshpande, Consultant Neonatologist, Shropshire Women & Children's Centre, Princess Royal Hospital

Elizabeth Draper, Professor of Perinatal and Paediatric Epidemiology, Perinatal Programme Co-Lead for MBRRACE-UK, University of Leicester

David Field, Professor of Neonatal Medicine, Perinatal Programme Co-Lead for MBRRACE-UK, University of Leicester

Jason Gardosi, Honorary Professor of Maternal and Perinatal Health University of Warwick, Director of the Perinatal Institute, West Midlands

Steve Gould, Consultant Paediatric Pathologist, Oxford University Hospitals NHS Trust

Sara Kenyon, Reader in Evidence Based Maternity Care, University of Birmingham

Sailesh Kotecha, Head of Department and Professor of Paediatrics and Child Health, Cardiff University, Director of the All Wales Perinatal Survey

Jenny Kurinczuk, Professor of Perinatal Epidemiology, Director of the National Perinatal Epidemiology Unit, Lead for MBRRACE-UK, University of Oxford

Chris Lennox, Consultant Obstetrician and Gynaecologist, Health Improvement Scotland

Shantini Paranjothy, Clinical Senior Lecturer, Institute of Primary Care & Public Health, Cardiff University

Janet Scott, Head of Research and Prevention, Sands

Neil Sebire, Professor of Paediatric and Developmental Pathology at ICH/UCL, Consultant Paediatric Pathologist, Great Ormond Street Hospital

Gordon Smith, Professor and Head of Department, Obstetrics and Gynaecology, Cambridge University, The Rosie Hospital

Lucy Smith, NIHR Senior Research Fellow in Perinatal Health Inequalities, University of Leicester

Claire Thornton, Consultant Neonatal and Paediatric Pathologist, Royal Victoria Hospital, Belfast Health and Social Care Trust

The Maternal, Newborn and Infant Clinical Outcome Review Independent Advisory Group:

Catherine Calderwood (Chair until March 2015), National Clinical Director for Maternity and Women's Health for NHS England and Medical Advisor for Women and Children's Health for the Scottish Government

Alan Fenton, Consultant in Neonatal Medicine, Newcastle upon Tyne (member from March 2014; Chair from March 2015)

Janice Allister, General Practitioner, Peterborough

David Bogod, Consultant Anaesthetist, Nottingham University Hospitals NHS Trust (member until March 2014)

Zoe Boreland, Midwifery and Children's advisor, Department of Health, Social Services and Public Safety Northern Ireland (member March 2014 to September 2014)

Cath Broderick, Lay Representative (member from October 2013)

Roch Cantwell, Consultant Psychiatrist, Southern General Hospital, Glasgow (member until March 2013)

Richard Cooke, Professor of Neonatal Medicine, Liverpool Women's Hospital NHS Foundation Trust (member until October 2012)

Andy Cole, Chief Executive, Bliss (member until March 2014)

Jacqueline Cornish, National Clinical Director Children, Young People and Transition to Adulthood, NHS England (member from March 2014)

Phillip Cox, Consultant Perinatal Pathologist, Birmingham Women's Hospital

Caroline Davey, Chief Executive, Bliss (member from March 2015)

Helen Dolk, Professor of Perinatal Epidemiology, Director of the Centre for Maternal, Fetal and Infant Research, Institute for Nursing Research, University of Ulster

Polly Ferguson, Lay member (member until March 2013)

Roshan Fernando, Consultant Anaesthetist and Honorary Senior Lecturer, University College London Hospitals NHS Foundation Trust (member from September 2014)

Bryan Gill, Consultant in Neonatal Medicine and Medical Director, Leeds (member until March 2014)

Melissa Green, Interim Chief Executive, Bliss (member from May 2014 to September 2014)

David James, Clinical Co-director at the National Collaborating Centre for Women's and Children's Health (member until September 2014)

Mervi Jokinen, Practice and Standards Development Adviser, Royal College of Midwives

Jim Livingstone, Northern Ireland Department of Health, Social Services and Public Safety (member until March 2013)

Heather Livingston, Department of Health, Social Services and Public Safety, Northern Ireland (member until March 2014)

Heather Mellows, Professional Advisor in Obstetrics, Department of Health (England) (member until March 2013)

Liz McDonald, Consultant Perinatal Psychiatrist and Clinical Lead for Perinatal Psychiatry, East London Foundation Trust (member from October 2013)

Edward Morris, Consultant in Obstetrics and Gynaecology, Norfolk & Norwich University Hospital and Honorary Senior Lecturer, University of East Anglia

Heather Payne, Senior Medical Officer for Maternal and Child Health, Welsh Government

Nim Subhedar, Consultant Neonatologist, Liverpool Women's Hospital NHS Foundation Trust (member from October 2013)

Michele Upton, Patient Safety Domain, NHS England (member from September 2014)

Jason Waugh, Consultant and Lead for Obstetric Medicine, Newcastle Upon Tyne

David Williams, Consultant Obstetric Physician, The Institute for Women's Health, University College London Hospital

Paddy Woods, Deputy Chief Medical Officer, Department of Health, Social Services and Public Safety, Northern Ireland (member from March 2015)

Healthcare Quality Improvement Partnership:

Jenny Mooney, Business Manager, Clinical Outcome Review Programmes (to May 2014), Director of Operations, National Clinical Audit and Patient Outcome Programmes

Lorna Pridmore, Clinical Outcome Review Programmes Facilitator

Tina Strack, Associate Director, Clinical Outcome Review Programmes

MBRRACE-UK Third Sector Stakeholder Group and representatives who attended meetings:

Jane Abbott, BLISS

Beverley Beech, Association for Improvement in the Maternity Services (AIMS)

Jenny Chambers, Intrahepatic Cholestasis of Pregnancy (ICP) Support

Caroline Davey, BLISS

Jane Denton, Multiple Birth Foundation

Jane Fisher, Antenatal Results and Choices (ARC)

Pauline Hull, electivecesarean.com

Penny Kerry, Miscarriage Association

Beckie Lang, Tommy's

Neal Long, Stillbirth and neonatal death charity (Sands)

Sarah McMullen, NCT

Jane Plumb, Group B Strep Support

Andrea Priest, Best Beginnings

Gwynne Rayns, National Society for the Prevention of Cruelty to Children (NSPCC)

Jean Simons, Lullaby Trust (formerly FSID)

Cheryl Titherly, Antenatal Results and Choices (ARC)

Maureen Treadwell, Birth Trauma Association

MBRRACE-UK Royal College and Professional Association Stakeholder Group and representatives who attended meetings:

Carmel Bagness, Royal College of Nursing

Patrick Cadigan, Royal College of Physicians

Hilary Cass, Royal College of Paediatrics and Child Health

Paul Clyburn, Obstetric Anaesthetists Association & Royal College of Anaesthetists

Sanjeev Deshpande, British Association of Perinatal Medicine

Denise Evans, Neonatal Nurses Association

Roshan Fernando, Obstetric Anaesthetists Association & Royal College of Anaesthetists

Jacque Gerrard, Royal College of Midwives

Steve Gould, British and Irish Paediatric Pathology Association

Diane Hulbert, College of Emergency Medicine

Sarah Johnson, Royal College of Obstetricians and Gynaecologists

Hannah Knight, Royal College of Obstetricians and Gynaecologists

Lucy Mackillop, Royal College of Physicians

Lisa Nandi, British Association of Perinatal Medicine

Lesley Page, Royal College of Midwives

David Richmond, Royal College of Obstetricians and Gynaecologists

Jane Sandall, British Maternal Fetal Medicine Society

Neil Sebire, Royal College of Pathologists

Lorraine Tinker, Royal College of Nursing

1. Purpose of MBRRACE-UK

1.1. Monitoring Perinatal Deaths across the UK

The UK programme to monitor perinatal deaths commenced in 1993 with the establishment of the Confidential Enquiry into Stillbirth and Deaths in Infancy (CESDI) to address the relatively high stillbirth and infant mortality rates in the UK through mortality surveillance and confidential enquiries. Subsequent organisational and administrative changes resulted in the process being run by the Confidential Enquiries into Maternal and Child Health (CEMACH) from 2003 to 2008 and the Centre for Maternal and Child Enquiries (CMACE) in 2009. In 2010, as a result of European procurement legislation, the programme was opened to competitive tender and renamed the Maternal, Neonatal and Infant Clinical Outcome Review Programme (MNI-CORP). The contract was awarded to 'Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK' (MBRRACE-UK) by the Healthcare Quality Improvement Partnership (HQIP) on 30th May 2012. MBRRACE-UK is a collaboration led from the National Perinatal Epidemiology Unit at the University of Oxford with members from the University of Leicester, who lead the perinatal aspects of the work, University of Liverpool, University of Birmingham and University College London, and with collaborators representing general practice and Sands, the stillbirth and neonatal death charity (1).

The four elements of the MNI-CORP programme are set out in Box 1. This report describes the third element: *"surveillance of all late fetal losses (22^{+0} to 23^{+6} weeks gestational age), stillbirths, and neonatal deaths".*

Box 1: Scope of the Maternal, Newborn and Infant Clinical Outcome Review Programme

1. Surveillance and confidential enquiries of all maternal deaths – that is deaths of women who are pregnant or who die up to 1 year after their pregnancy ends.
2. Confidential enquiries of an annual rolling programme of topic specific serious maternal morbidity.
3. Surveillance of all late fetal losses (22^{+0} to 23^{+6} weeks gestational age), stillbirths, and neonatal deaths.
4. Confidential enquiries of topics related to aspects of stillbirth, infant death or serious infant morbidity.

1.2. Events since the last national report in 2009

The transition of the contract from CMACE to MBRRACE-UK was delayed whilst the need for continuation of the programme was reviewed and this led to an interruption to the system for perinatal surveillance data collection. CMACE had used a paper based system of data collection with regional oversight and verification. They published a report based on the 2009 national data but ceased operations before work on the 2010 data was complete. In the period before the new contract was in place arrangements were made by the Department of Health for death notifications in England to be made via an electronic portal (Maternal and Perinatal Mortality Notification - MPMN) through which a minimal perinatal mortality dataset was collected. This process was not subject to oversight of data quality and completeness and when the data were assessed it became apparent that a significant number of deaths had not being reported by maternity units and that the data quality was poor and incomplete in many cases. During this period data collection in Scotland, Wales and Northern Ireland continued through country-specific mechanisms.

Once the MNI-CORP contract was awarded to MBRRACE-UK a review of the data available for 2010, 2011 and 2012 was carried out. This evaluation considered the 2010 perinatal mortality data for England collected by CMACE and the data for 2011 and 2012 collected via the MPMN portal. The MNI-CORP Independent Advisory Group concluded that because of the extent of missing information these data were too incomplete to analyse further and report on a UK wide basis (2).

1.3. Important influences on early life mortality rates

Around the world stillbirth and neonatal mortality rates generally command attention from all those involved in the planning and delivery of the relevant services. Where rates are high and a marked change occurs it is generally safe to consider the figures at face value in terms of improvement or deterioration. In high income countries, such as the UK, the situation is different as the background stillbirth and neonatal mortality rates are relatively low and a variety of administrative, clinical and socio-demographic factors influence the measured rate. It is not a case of simply saying that a rate of 4.2 per 1,000 births for one organisation is bad and a rate of 4.0 per 1,000 births in another organisation is good as the difference may well be the result of local policies and demographic factors which affect how the most high risk pregnancies are managed and treated, and how deaths are recorded. For example, live births before 24^{+0} weeks gestational age that die shortly after birth, a common outcome at these low gestational ages, are counted by routine national data whereas babies born dead at these gestational ages are not. It has already been established that local decisions about how such babies are classified can lead to a difference of up to 2 per 1,000 in the recorded neonatal mortality rate (3). A different range of factors influence whether a woman diagnosed to have a fetus affected by a major congenital anomaly chooses to continue a pregnancy. Such factors include the family's cultural, ethnic and religious group. Higher rates of stillbirth or neonatal death in areas where, for religious reasons, a greater proportion of mothers choose to carry and deliver babies with lethal congenital anomalies cannot simply be dismissed as 'bad' as these deaths might, to some extent, not be preventable. In order to understand the extent to which these deaths in early life could and should be avoided the data available for classification need to be of the highest quality.

These issues have a major influence on stillbirth and neonatal mortality rates and are not amenable to intervention or 'correction' as they involve an element of patient choice. This is unlike rates of premature delivery where one of the most important risk factors is the mother's 'exposure' to social and economic deprivation (4). That significant variations in mortality exist between different areas of the UK, and between otherwise broadly similar countries, has been firmly established and this variation is to some extent correlated with maternal deprivation and associated behaviours and lifestyle factors. These societal differences translate into differences in stillbirth and neonatal mortality rates. Whilst behaviours and lifestyle factors can be targeted by prevention programmes there remains a proportion of the difference that results from the inherent population risk. It is clearly important to try and understand the extent to which high rates of stillbirth and neonatal death are the result of basic societal differences and those where improvements in maternity and neonatal care could reasonably be expected to reduce those rates.

In terms of considering the UK mortality rates over time and in relation to other countries, these factors have the potential to have had a major, but unquantified, influence on the overall mortality rates. In order to fully account for these factors in the data analysis would require detailed information on every UK birth, which is not currently available for the whole of the UK at present. In this report an alternative approach to the adjustment for the inherent differences that exist between the patients in different organisations (see Chapter 3) has been used. This relies on a combination of routine data and details reported through the MBRRACE-UK system. It will be clear from information presented later that, at present, the data quality

and completeness submitted by a significant number of Trusts and Health Boards for key elements, such as cause of death and the outcome of babies before 24^{+0} weeks gestational age, is simply not complete enough to allow us to take full account of these factors. Improved data quality and completeness about these key influences on mortality rates may, in the future, allow an enhanced approach to adjustment and provide guidance, with even more confidence, about organisations identified as having good or poor clinical performance based on mortality rates.

1.4. International comparison

It is against a background of underlying cultural and social differences that the rates of stillbirth and neonatal death in the UK should be considered in comparison to other, apparently similar, countries (5). For international comparisons, the situation is further confounded by the use of different definitions of mortality rates between countries with the cut–off for inclusion in routine national statistics varying from 20^{+0} to 28^{+0} weeks gestational age. Standardising the definitions used to those suggested by the World Health Organization (WHO) would be a key step, i.e. all births from 22^{+0} weeks gestational age.

Whilst the stillbirth and neonatal mortality rates in the UK appear relatively high in relation to other high income countries the lack of detail available about the deaths, both in the UK and elsewhere, limits our understanding of both the scale of the true difference and also what we might learn from other countries. It is particularly the latter point (i.e. what we might do differently) that it is most important to understand since, for example, if we could achieve the published Swedish rate of neonatal mortality in the UK it would result in up to 1,000 fewer deaths of babies each year.

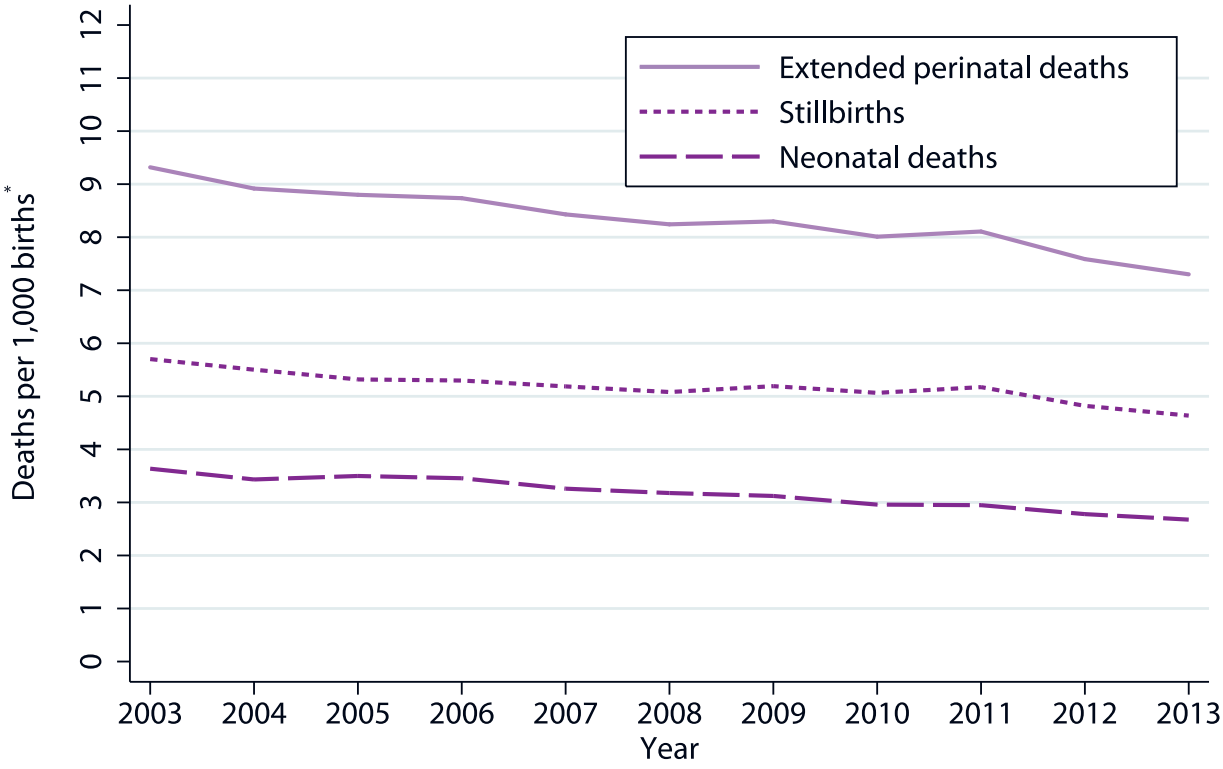
1.5. Historical data for the UK

Data regarding the trends in the major types of early life mortality in the UK during the last 10 years are shown in Figure 1. Similar data for each of the four countries of the UK are shown in Table 1.

These are routinely published data from the Office for National Statistics (ONS) for England and Wales, the General Register Office for Scotland (GRO) for Scotland and the Northern Ireland Statistics and Research Agency (NISRA) for Northern Ireland (6-9). The rates of neonatal death in Northern Ireland will partially reflect differences in the law relating to termination of pregnancy with a greater proportion of babies with severe congenital anomalies being carried to term but then dying after birth. The major influence of lethal congenital anomalies on mortality rates in Northern Ireland is demonstrated in Section 7.3. The high quality of the coding of deaths to the Cause of Death and Associated Condition (CODAC) classification system in Northern Ireland indicates that in 2013 around 30% of stillbirths and neonatal deaths were caused by lethal anomalies.

Stillbirth and the neonatal mortality rates (as well as their combined effect in the extended perinatal mortality rate) have shown similar improving trends over the period 2003 to 2013. In 2013 across the UK there were 782,431 total registered births with 3,628 stillbirths and 2,084 neonatal deaths, compared to 699,538 total births with 3,989 stillbirths and 2,529 neonatal deaths in 2003. Although there is more variation in the data from the individual countries (likely due to smaller numbers) the trend seems broadly consistent across the UK. However, the data from these sources do not allow us to gain a clear insight into the nature of the changes that have taken place. Although the improvement in neonatal mortality alone equates to more than 650 additional survivors across the UK in 2013 compared to 2003, it is difficult to accurately identify the factors that have led to this change, e.g. better care for premature babies, better care of babies with major congenital anomalies, fewer deaths from infection, or increased termination of fetuses identified as affected by a congenital anomaly.

Figure 1: Total stillbirth, neonatal and extended perinatal mortality rates from statutory registrations: United Kingdom, 2003 to 2013



Data sources: ONS, GRO & NISRA

*stillbirth and extended perinatal deaths are per 1,000 total births, neonatal deaths are per 1,000 live births

The stillbirth rate has shown a similar fall over time with the equivalent of 650 fewer stillbirths in 2013 compared to 2003. However, the change in the stillbirth rate seems to have been greatest from 2010. The lack of additional detail about the nature of the change is particularly frustrating in relation to stillbirth as the period from 2010 marks a time during which organisations such as Sands have been raising awareness of a range of initiatives designed to reduce stillbirth rates. However, it was also in 2010 that the Royal College of Obstetricians and Gynaecologists (RCOG) published renewed guidance on the registration of babies born after 24^{+0} weeks gestational age but known to have died before 24^{+0} weeks (this guidance was originally produced in 2005) (10, 11). This stated that these babies do not meet the legal definition of stillbirth requiring registration. Importantly, if such babies are not registered there are major implications for the mother, such as no formal certification that the baby ever existed and no entitlement to maternity leave benefits. It is possible that such changes in registration practice could account for much of the apparent change in stillbirth rate seen since 2010 but equally new approaches to care could be improving outcome. It is simply not possible to tell which the cause is at present. However, in order to investigate variations in the reporting of stillbirths around 24^{+0} weeks gestational age these deaths should be reported to MBRRACE-UK. It has been clear from queries received by the MBRRACE-UK data support team that there is continued confusion about these babies.

Table 1: Total stillbirth, neonatal and extended perinatal mortality rates from statutory registrations by country: United Kingdom, 2003 to 2013

Rate per 1,000 births	Country	Year of death										
		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Stillbirths †	**UK**	**5.70**	**5.50**	**5.32**	**5.30**	**5.19**	**5.08**	**5.19**	**5.07**	**5.17**	**4.82**	**4.64**
	England	5.74	5.47	5.35	5.35	5.18	5.07	5.17	5.08	5.23	4.81	4.65
	Scotland	5.61	5.84	5.34	5.29	5.63	5.38	5.34	4.93	5.08	4.70	4.16
	Wales	4.87	5.04	3.97	3.81	4.15	4.47	4.75	4.13	3.59	4.18	4.51
	Northern Ireland	5.07	5.51	5.34	5.09	4.94	4.61	5.13	5.26	4.67	5.11	4.51
Neonatal deaths ‡	**UK**	**3.64**	**3.43**	**3.50**	**3.46**	**3.26**	**3.18**	**3.12**	**2.96**	**2.95**	**2.78**	**2.68**
	England	3.65	3.45	3.45	3.49	3.24	3.18	3.10	2.93	2.94	2.78	2.67
	Scotland	3.39	3.08	3.49	3.09	3.25	2.80	2.79	2.55	2.71	2.55	2.34
	Wales	3.94	3.72	4.97	3.87	3.31	3.71	3.89	4.58	3.48	2.77	3.38
	Northern Ireland	3.06	3.09	2.88	2.68	3.31	2.95	3.09	2.73	2.75	2.75	2.40
Extended perinatal deaths †	**UK**	**9.32**	**8.92**	**8.80**	**8.74**	**8.43**	**8.24**	**8.30**	**8.01**	**8.11**	**7.59**	**7.30**
	England	9.37	8.90	8.79	8.82	8.40	8.24	8.25	8.00	8.16	7.58	7.31
	Scotland	8.99	8.90	8.82	8.36	8.86	8.17	8.12	7.46	7.78	7.24	6.49
	Wales	8.80	8.74	8.92	7.66	7.45	8.16	8.63	8.69	7.06	6.94	7.87
	Northern Ireland	8.11	8.58	8.21	7.75	8.24	7.54	8.20	7.97	7.41	7.85	6.90

† per 1,000 total births
‡ per 1,000 live births
Data sources: ONS, GRO, NISRA

The trends in stillbirth and perinatal mortality in the UK are improving over time but remain, in terms of crude rates, high when compared with our European neighbours with similar economies. In order to fully understand the nature of the problems that lead to these types of death in either late pregnancy, during delivery or soon after birth more detail is needed about all of the relevant deaths, both in terms of the cause of the death and the antecedent events. The MBRRACE-UK data collection, including the CODAC death classification, has the potential to provide the additional information needed to understand far more clearly the factors behind significantly high rates of loss in a geographical location or service.

1.6. Making mortality comparisons more reliable

A key aim of MBRRACE-UK has been to provide outcome data on rates of stillbirth and neonatal death that are accurate and reliable in terms of identifying variation in clinical performance as defined by mortality rates. The introduction of collection of information about all deaths between 22^{+0} and 23^{+6} weeks gestational age and more detailed classification of cause of death will be important factors in that process.

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2. MBRRACE-UK data collection

2.1. Deaths reported to MBRRACE-UK

Deaths to be reported to MBRRACE-UK since 1 January 2013 are:

- *Late fetal losses*: a baby delivered between 22^{+0} and 23^{+6} weeks gestational age showing no signs of life, irrespective of when the death occurred.
- *Stillbirths*: a baby delivered at or after 24^{+0} weeks gestational age showing no signs of life, irrespective of when the death occurred.
- *Neonatal deaths*: a live born baby (born at 20^{+0} weeks gestational age or later, or with a birthweight of 400g or more where an accurate estimate of gestation is not available) who died before 28 completed days after birth.

This definition also includes any late fetal loss, stillbirth or neonatal death resulting from a termination of pregnancy.

In an effort to ensure complete data collection in line with the WHO guidelines and to allow international comparisons, the eligibility criteria for MBRRACE-UK are based on gestational age at delivery irrespective of when the death occurred. Therefore, all births delivered from 22^{+0} weeks gestational age showing no signs of life must be reported, irrespective of when the death occurred: the date of delivery and date of confirmation of death are both reported for these deaths.

2.2. Information collected by MBRRACE-UK

In order to allow detailed exploration of the risk factors for perinatal mortality in the UK and make comparisons between organisations, comprehensive individual-level data on each death are required over and above the information available in routine data. Two key principles underpinned the choice of data items to be collected about all UK perinatal deaths. The first was to ensure continuity of data items with those collected in the past so that appropriate comparisons over time can be made. Second, additional data items were included that: a) would allow for better adjustment of the crude mortality rates than had previously been possible and b) provide a clearer insight into the health, social and life style factors most commonly associated with stillbirth or neonatal death.

The dataset relating to each death comprises information about the following:

- Mother's and baby's identifying information (to permit the cross checking of each death against other national databases and to facilitate the identification of duplicate records)
- Mother's health, lifestyle and previous pregnancy history
- Mother's antenatal care
- Labour and delivery
- Cause of death and post-mortem examination

Details of the dataset requested for each late fetal loss, stillbirth and neonatal death can be found in Appendix A2.1.

Approvals were obtained from all of the relevant administrative authorities in order to collect patient identifiable data without consent and to access information collected by statutory organisations (Appendix A2.2).

2.3. How data are reported to MBRRACE-UK

Previous organisations responsible for perinatal surveillance in the UK had collected data on paper forms via a regional structure of staff who monitored both the completeness and the quality of the data before it was submitted to the central office. In order to take advantage of improved approaches to data management and at the same time deal with the relevant issues around information governance, two important changes in the approach to data collection were introduced resulting in essential changes to previous practice:

a) The Trusts and Health Boards where the death occurred are now responsible for the reporting of the death and for the completeness and the quality of data reported to MBRRACE-UK;

b) There is on-line reporting of information to MBRRACE-UK about all deaths to a secure web-based electronic server that can both add the submitted data to a database of all deaths without the need for further data entry and also provide routine monitoring of data completeness.

The introduction of these changes represented major challenges. The establishment of on-line data reporting is outlined in Appendix A2.3. The secure, web-based data collection system was launched in April 2013 for the collection of eligible deaths from 1st January 2013 onwards.

While most Trusts and Health Boards quickly engaged fully with this new reporting system, others appeared to struggle and only reported data after multiple requests from MBRRACE-UK. In some cases the reporting of deaths occurred over one year after the death even when there were no outside factors (such as a Coroner or Procurator Fiscal inquest) that might have prevented access to some of the necessary information.

2.4. The role of MBRRACE-UK Lead Reporters

MBRRACE-UK Lead Reporters facilitate the dissemination of information and requests for further action to the appropriate individuals within each organisation, acting as key points of contact between the relevant organisation and MBRRACE-UK. A comprehensive network of Lead Reporters has been established across all UK delivery sites (more than 250, see Appendix A1). This is an essential role without which it would not be possible for data collection to happen. The range of individuals who take on this role vary significantly from unit to unit and include consultant obstetricians, consultant neonatologists, neonatal matrons, heads of midwifery, midwives, risk managers, audit staff and personal assistants to consultants.

2.5. How possible missing deaths are identified

In order to identify deaths that have not been reported to MBRRACE-UK, details of statutorily registered deaths are obtained from ONS, for England and Wales, and National Records of Scotland (NRS) for Scotland. The deaths reported to MBRRACE-UK are matched to these statutorily registered deaths in order to identify any which have not been reported to MBRRACE-UK. Trusts and Health Boards then are notified of any registered deaths that occurred in their care which cannot be identified on the MBRRACE-UK system and are asked to investigate and provide the information about the cases should they prove to be inadvertently missing from the system (see Appendix A2.4 for further details).

There are no routine easily accessible data sources for late fetal losses delivered at 22^{+0} to 23^{+6} weeks gestational age and, therefore, it is not possible to ensure that all of these deaths have been reported to MBRRACE-UK (see Chapter 5).

Due to differences in privacy legislation in Northern Ireland and the consequent differences in the implementation of data collection, Northern Ireland Maternal and Child Health (NIMACH) staff ensure full data reporting on our behalf using information from the Northern Ireland Maternity Information System (NIMATS). This ensures full data reporting and validation of their deaths.

For 2013, once the data cleaning and chasing was complete, there were only 149 out of 4,928 (3.0%) deaths registered to ONS and NRS which did not match to deaths reported to MBRRACE-UK. Most of these were deaths occurring outside National Health Service (NHS) establishments (e.g. home births, hospice deaths, and private hospital deaths). Despite full information not being available for these, they were included in the main analysis using the routine information from the official birth and death registration.

MBRRACE-UK Recommendation

In order that Trusts and Health Boards can comply with the recommendations arising from the Morecambe Bay Investigation, they should fully engage with the MBRRACE-UK data collection so as to ensure the "*systematic recording and tracking of perinatal deaths*" (12).

2.6. Identifying all of the births in the UK

Individual level information on all births in the UK is obtained in order to generate mortality rates adjusted for maternal, baby, and socio-demographic risk factors. Information for England and Wales (NHS Numbers for Babies (NN4B) and ONS birth registration data), Scotland (NRS and Information Services Division (ISD)) and Northern Ireland (NIMATS) were combined to give a single dataset of births for the whole UK. These data were then combined with the information on the deaths to obtain the final data for analysis (further details are given in Appendix A2.4).

2.7. Completeness of the data reported to MBRRACE-UK

Comprehensive information on each death is requested by MBRRACE-UK to allow detailed examination of the risk factors for perinatal mortality in the UK. Details of the completeness of key variables reported by Trusts and Health Boards for deaths to births in 2013 are given in Appendix A2.5.

The reporting of maternal and antenatal information can be difficult where, for whatever reason, care is transferred to another organisation during pregnancy or after delivery. Where death occurs after such a transfer accessing the mother's medical notes can be challenging. A facility has been introduced to the MBRRACE-UK on-line reporting system to allow reporters to request these data items from the Trust or Health Board which delivered the antenatal or intrapartum care by temporarily assigning the MBRRACE-UK record of that death to them.

MBRRACE-UK Recommendation

In order that data are of the highest quality, Trusts and Health Boards must collaborate with each other in the provision of information to MBRRACE-UK about mothers and babies who change provider units during pregnancy and after delivery.

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3. Methods for Reporting Perinatal Mortality Rates in the UK

3.1. The 2013 birth cohort

In this report rates of stillbirth, neonatal death and extended perinatal death are reported for births from 1 January 2103 to 31 December 2013, thus neonatal deaths of births in December 2013 which occurred in January 2014 are included. The reporting of mortality for a birth cohort is in contrast to statutory reporting, and previous perinatal mortality reports published by CMACE, where reports were based on deaths in a calendar year. The reporting of mortality for a birth cohort allows more accurate estimates of mortality rates to be produced.

3.2. Deaths included in reported mortality rates

In order to ensure comparability of mortality rates between organisations, **births less than 24^{+0} weeks gestational age and terminations of pregnancy were excluded from the reported mortality rates.** This avoids the influence of the wide disparity in the classification of babies born before 24^{+0} weeks gestational age as a neonatal death or a fetal loss (discussed in more detail in Chapter 5) and the known variation in the rate of termination of pregnancy for congenital anomaly between different sections of the population (see Section 7.3).

The intention for subsequent MBRRACE-UK reports is to account for all deaths from 22^{+0} weeks gestational age and, additionally, to identify the influence of deaths due to congenital anomalies. In order to achieve this it is essential that all Trusts and Health Boards provide data for all fetal losses between 22^{+0} and 23^{+6} weeks gestational age and work with MBRRACE-UK to improve the cause of death classification.

3.3. Organisations for which mortality rates are reported

Rates of stillbirth, neonatal death and extended perinatal death are reported for three groups of clinical and administrative organisations:

1. **Organisations responsible for population based care commissioning (Section 4.1):**
    - England: Clinical Commissioning Groups (CCG) (also amalgamated into NHS Commissioning Board Area Teams - Appendix A4.1) based on CCG of mother's registered General Practitioner
    - Scotland: Health Board based on postcode of mother's residence
    - Wales: Health Board based on postcode of mother's residence
    - Northern Ireland: Local Commissioning Group (LCG) based on postcode of mother's residence
    - Crown Dependencies: Isle of Man and Channel Islands based on mother's residence (births to mothers resident in the Bailiwick of Guernsey and the Bailiwick of Jersey are reported jointly due to the small number)
2. **Service delivery organisations based on place of birth (Section 4.2):**
    - England: Operational Delivery Network (ODN)
    - Scotland: Health Board
    - Wales: Health Board
    - Northern Ireland: Health and Social Care Trust
    - Crown Dependencies: Not reported

- Isle of Man - the place of birth for extended perinatal deaths was not reported
- Channel Islands - the place of birth for surviving babies was not available

3. **Local Government areas based on postcode of mother's residence (Appendix A4.2):**
   - England: Single tier authority, upper tier authority, London borough.
   - Scotland: Unitary authority
   - Wales: Local Authority
   - Northern Ireland: Reported for the whole country due to ongoing boundary changes.
   - Crown Dependencies: Isle of Man and Channel Islands (the Bailiwick of Guernsey and the Bailiwick of Jersey are reported jointly due to the small number)

3.4. Analysis of mortality rates

Three mortality outcomes are reported for each organisation: stillbirth, neonatal death, and extended perinatal death. These mortality rates are presented in two different ways: as a 'crude' mortality rate and as a 'stabilised & adjusted' mortality rate.

The **crude mortality rate** is the number of deaths divided by the number of total births (or live births in the case of neonatal mortality) for 2013 and provides a snapshot of the mortality in an organisation for that time period.

While the crude rate is informative in that it describes exactly what happened for the organisation, it can be potentially misleading when trying to highlight organisations where the mortality rate is higher than expected due to variation in the quality of care. First, the number of perinatal deaths for many organisations is likely to be small, as these deaths are rare, and there will be more deaths in some years than in others just by chance. This can lead to large fluctuations in the crude mortality rate, especially for organisations that have a very small number of births. Second, some organisations have more women at high risk of experiencing a stillbirth or neonatal death, for example areas of high socio-economic deprivation, and thus the case-mix of the population served can influence mortality rates even when high quality maternity and neonatal care is provided.

In order to be able to compare organisations more fairly, **stabilised & adjusted mortality rates** have been calculated and presented alongside the crude mortality rates. Where there are only a small number of births in an organisation it is difficult to be sure that any extreme value seen for the crude mortality rate is real and not just a chance finding. A ***stabilised*** rate allows for the effects of chance variation due to small numbers. For this reason, the stabilised & adjusted mortality rate will tend to be closer to the national mortality rate than will the crude mortality rate, especially for organisations with a small number of births.

The mortality rates are also ***adjusted*** to account for key factors which are known to increase the risk of perinatal mortality. The extent of the adjustment is limited to only those factors that are collected for all births across the whole UK: mother's age; socio-economic deprivation based on the mother's residence; baby's ethnicity; baby's sex; whether they are from a multiple birth; and gestational age at birth (neonatal deaths only). Therefore, some factors that might be associated with poor perinatal outcomes could not be taken into account in the adjustment, for example maternal smoking, body mass index (BMI). (See Appendix A3.2 for more details.)

The stabilised & adjusted rates, and corresponding 95% confidence intervals (CI), are estimated using statistical models derived from methodology developed in the USA by the Centers for Medicare & Medicaid Services (CMS) and used in their reporting (see Appendix A3 for more details) (13). This particular method has been used successfully in other healthcare settings.

It is important to remember that the mortality rates reported are not definitive measures of the quality of care received by any individual or group. Rather, they are estimates of the rate of mortality under particular circumstances: i.e. if all of the data collection was complete and accurate and if all of the assumptions that have gone into statistical modelling are also completely correct. While, in practice, this is never completely the case, the rates reported here are robust and will make an important contribution to the identification of variations in the quality of perinatal and neonatal care in the UK.

3.5. Identifying potentially high and low rates of death

The crude and the stabilised & adjusted mortality rates are presented as both tables and maps. In the maps, each organisation has been colour coded based on the extent to which their particular mortality rate is above, or below, the overall UK average mortality rate. Aspirational rates have also been included based on estimated equivalent rates in the Nordic countries (Norway, Sweden, Denmark, Finland, and Iceland): 3.0 stillbirths per 1,000 total births; 1.3 neonatal deaths per 1,000 live births; 4.3 extended perinatal deaths per 1,000 total births. The colour coding used is:

- Dark green: ● - lower than the 'aspirational' target.
- Light green: ● - more than 10% lower than the UK average
- Yellow: ● - up to 10% lower than the UK average
- Amber: ● - up to 10% higher than the UK average
- Red: ● - more than 10% higher than the UK average

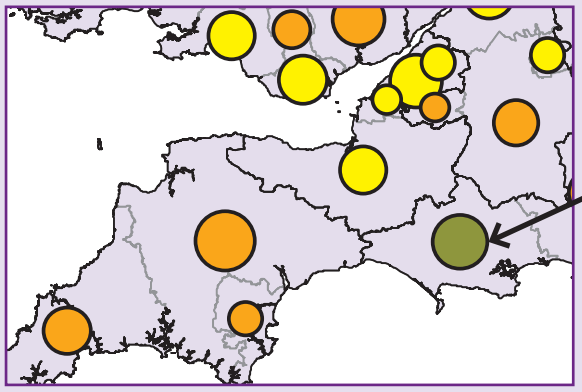
MBRRACE-UK Recommendation

NHS England, NHS Scotland, NHS Wales, Health and Social Care in Northern Ireland, in conjunction with professional bodies and national healthcare advisors responsible for clinical standards in the relevant specialties should establish national aspirational targets for rates of stillbirths, neonatal deaths, and extended perinatal deaths against which all services can be assessed in future. This could be based on a stepwise approach working towards rates achieved by the current best performing countries in Europe.

The size of each circle on the map represents the number of births in the population covered by the particular organisation, although there is a minimum size in order that the colour can be adequately seen.

The accompanying tables show the crude and the stabilised & adjusted rate for stillbirth, neonatal death and extended perinatal death for each organisation. In order to avoid the effect of any local policy decisions regarding the classification of live and stillbirth at the extremes of viability (which can have an effect on stillbirth and neonatal mortality rates), in the tables particular emphasis is given to the extended perinatal mortality rate. Each organisation has been colour coded based on their stabilised & adjusted extended perinatal mortality rate in an identical manner to the maps.

Figure 2: Example of the presentation of the mortality rates in this report (extracts from Figure 8 and Table 4)



Stabilised & adjusted extended perinatal mortality rate more than 10% lower than the UK average.

Clinical Commissioning Group (CCG)	Total births	Mortality rate per 1,000 births *						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted	Crude	Stabilised & adjusted	Crude	Stabilised & adjusted #	
Dorset	7,516	2.13	3.99 (3.28 to 3.95)	1.33	1.60 (1.24 to 1.84)	3.46	5.33 (4.14 to 6.73)	
North, East, West Devon	9,047	3.87	4.23 (3.98 to 4.35)	1.66	1.93 (1.85 to 2.27)	5.53	6.16 (5.53 to 6.99)	
Somerset	5,455	2.02	4.03 (3.61 to 4.43)	1.65	1.83 (1.77 to 2.49)	3.67	5.57 (4.67 to 6.38)	

3.6. Suppression of rates calculated when there are few deaths

In order to avoid disclosure of information which could potentially identify individuals, crude mortality rates based on a very small number of deaths have not been included in line with guidance from ONS (14) and Government Statistical Service (GSS) (15). In subsequent reports this should affect fewer organisations as more data will be available by combining years.

4. Perinatal death in 2013 in the UK

The data in this chapter relate to the information available about the rates of stillbirth, neonatal death and extended perinatal death (stillbirth and neonatal deaths combined) for the UK as a whole and the various health and administrative authorities responsible for health services in the four countries of the UK and the Crown Dependencies.

Table 2: Number of births, stillbirths, neonatal deaths and extended perinatal deaths by country: United Kingdom and Crown Dependencies, for births in 2013

Number *	UK ^	England	Scotland	Wales	Northern Ireland	Crown Dependencies
Total births	781,932	665,018	56,127	33,829	24,255	2,462
Live births	778,646	662,186	55,915	33,701	24,150	2,454
Stillbirths	3,286	2,832	212	128	105	8
Antepartum	2,834	2,451	176	109	93	4
Intrapartum	290	239	28	14	9	0
Unknown timing	162	142	8	5	3	4
Neonatal deaths	1,436	1,215	93	64	59	3
Early neonatal deaths	1,018	850	68	45	51	3
Late neonatal deaths	418	365	25	19	8	0
Perinatal deaths	4,304	3,682	280	173	156	11
Extended perinatal deaths	4,722	4,047	305	192	164	11

* excluding terminations of pregnancy and births <24^{+0} weeks gestational age
^ including the Crown Dependencies
Data sources: MBRRACE-UK, ONS, NN4B, NRS, ISD, NISRA

Table 3: Stillbirth, neonatal and extended perinatal mortality rates (95% CIs) by country: United Kingdom and Crown Dependencies, for births in 2013

Rate per 1,000 births *	UK ^	England	Scotland	Wales	Northern Ireland	Crown Dependencies
Stillbirths †	4.20 (4.06 to 4.35)	4.26 (4.1 to 4.42)	3.78 (3.3 to 4.32)	3.78 (3.18 to 4.5)	4.33 (3.58 to 5.24)	3.25 (1.65 to 6.40)
Antepartum †	3.62 (3.94 to 3.76)	3.69 (3.54 to 3.83)	3.14 (2.67 to3.60)	3.22 (2.62 to3.83)	3.83 (3.06 to 4.61)	1.62 (0.03 to 3.21)
Intrapartum †	0.37 (0.33 to 0.42)	0.36 (0.31 to 0.40)	0.50 (0.31 to 0.68)	0.41 (0.20 to 0.63)	0.37 (0.13 to 0.61)	0 (0.00 to 1.22)
Unknown timing†	0.21 (0.18 to 0.24)	0.21 (0.18 to 0.25)	0.14 (0.04 to 0.24)	0.15 (0.02 to 0.28)	0.12 (0.00 to 0.26)	1.62 (0.03 to 3.21)
Neonatal deaths ‡	1.84 (1.75 to 1.94)	1.83 (1.73 to 1.94)	1.66 (1.36 to 2.04)	1.90 (1.49 to 2.42)	2.44 (1.89 to 3.15)	1.22 (0.42 to 3.59)
Early neonatal deaths ‡	1.31 (1.23 to 1.39)	1.28 (1.2 to 1.37)	1.22 (0.96 to 1.54)	1.34 (1 to 1.79)	2.11 (1.61 to 2.78)	1.22 (0.42 to 3.59)
Late neonatal deaths ‡	0.54 (0.49 to 0.59)	0.55 (0.5 to 0.61)	0.45 (0.3 to 0.66)	0.56 (0.36 to 0.88)	0.33 (0.17 to 0.65)	0 (0.00 to 2.60)
Perinatal deaths †	5.50 (5.34 to 5.67)	5.54 (5.36 to 5.72)	4.99 (4.44 to 5.61)	5.11 (4.41 to 5.93)	6.43 (5.5 to 7.52)	4.47 (2.50 to 7.98)
Extended perinatal deaths †	6.04 (5.87 to 6.21)	6.09 (5.9 to 6.28)	5.43 (4.86 to 6.08)	5.68 (4.93 to 6.53)	6.76 (5.81 to 7.87)	4.47 (2.50 to 7.98)

† per 1,000 total births
‡ per 1,000 live births
* excluding terminations of pregnancy and births <24^{+0} weeks gestational age
^ including the Crown Dependencies
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

In the UK in 2013 there were 781,932 births at 24^{+0} weeks or greater gestational age (excluding terminations of pregnancy). Of these births 3,286 resulted in stillbirths (4.20 per 1,000 total births) and 1,436 neonatal deaths (1.84 per 1,000 live births). Table 2 shows the number of stillbirths, neonatal deaths and extended perinatal deaths for the UK and Crown Dependencies as a whole and separately for the four countries of the UK and the Crown Dependencies. The associated mortality rates are shown in Table 3. Comparing England, Scotland, Wales and Northern Ireland revealed no major differences in the rates; the number of babies born in the Crown Dependencies is too few to permit reliable comparison with the four countries of the UK. The slightly higher rate of stillbirth and neonatal death in Northern Ireland was not significantly different to other parts of the UK and may well reflect differences in the law in Northern Ireland relating to termination of pregnancy.

4.1. Mortality rates by NHS organisation responsible for population based care commissioning

As set out in the Section 3.4, an important feature of this report is to present data that have been adjusted to take account of fundamental differences between the parts of the country being compared (e.g. very deprived versus very affluent areas) or services being compared (care organisations treating low risk women versus those providing high risk care).

The geographical distribution of stillbirth, neonatal and extended perinatal mortality rates by CCG (England), Health Board (Scotland and Wales), LCG (Northern Ireland), and Crown Dependency are presented in a series of maps (Figure 3 to Figure 8). A pair of maps is presented for each mortality outcome: one presents the crude rate and the other the stabilised & adjusted rate. The colour coding for each organisation

represents the extent to which it is above or below the UK average mortality rate (see Section 3.5 for details). The maps are followed by Table 4 which gives numeric values of the crude and the stabilised & adjusted rates.

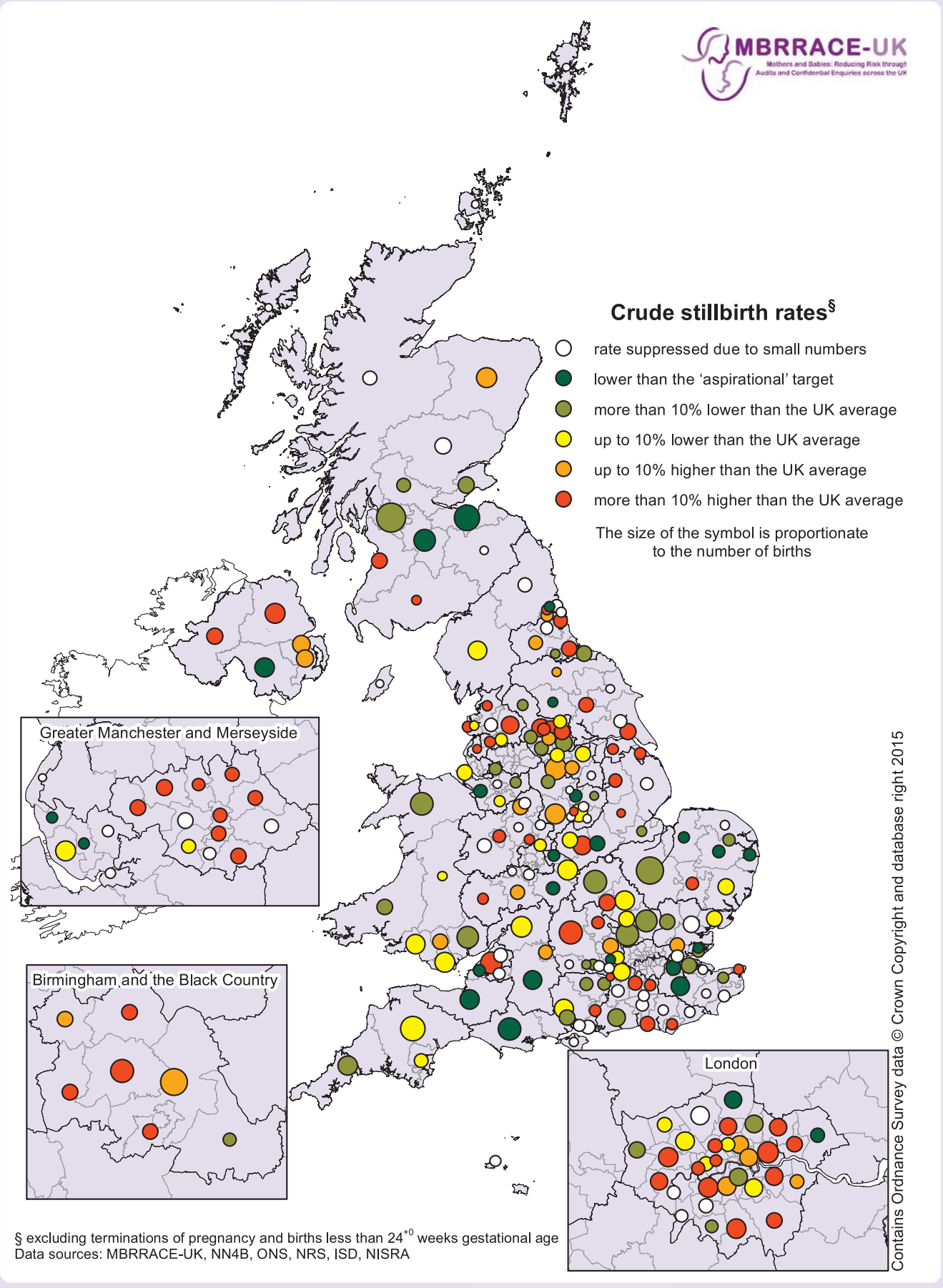
The process of stabilisation and adjustment has a major effect in terms of smoothing apparently extreme (high or very low) crude mortality rates by taking into account known influences on stillbirth and neonatal mortality. Organisations will need to work with their relevant care providers to try to understand more fully their rates of mortality. Section 4.3 details how local organisations should respond to these data.

There are also some organisations where mortality rates deteriorate as a result of the stabilisation and adjustment. While some of these will be organisations with low crude mortality rates just by chance, some will be organisations where rates are relatively low but where the characteristics of their population are such that rates should be even lower, e.g. they serve a low risk population.

Within the Report these data are repeated for other organisational structures (see Section 3.3 for more details):

- Maps and table for the service delivery organisation based on the place of birth (Section 4.2)
- Tables for Local Area Teams (England only) (Appendix A4.1)
- Maps and table for Local Authority based on mother's residence (Appendix A4.2)

Figure 3: Crude stillbirth rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence: United Kingdom and Crown Dependencies, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 4: Stabilised & adjusted stillbirth rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence: United Kingdom and Isle of Man, for births in 2013

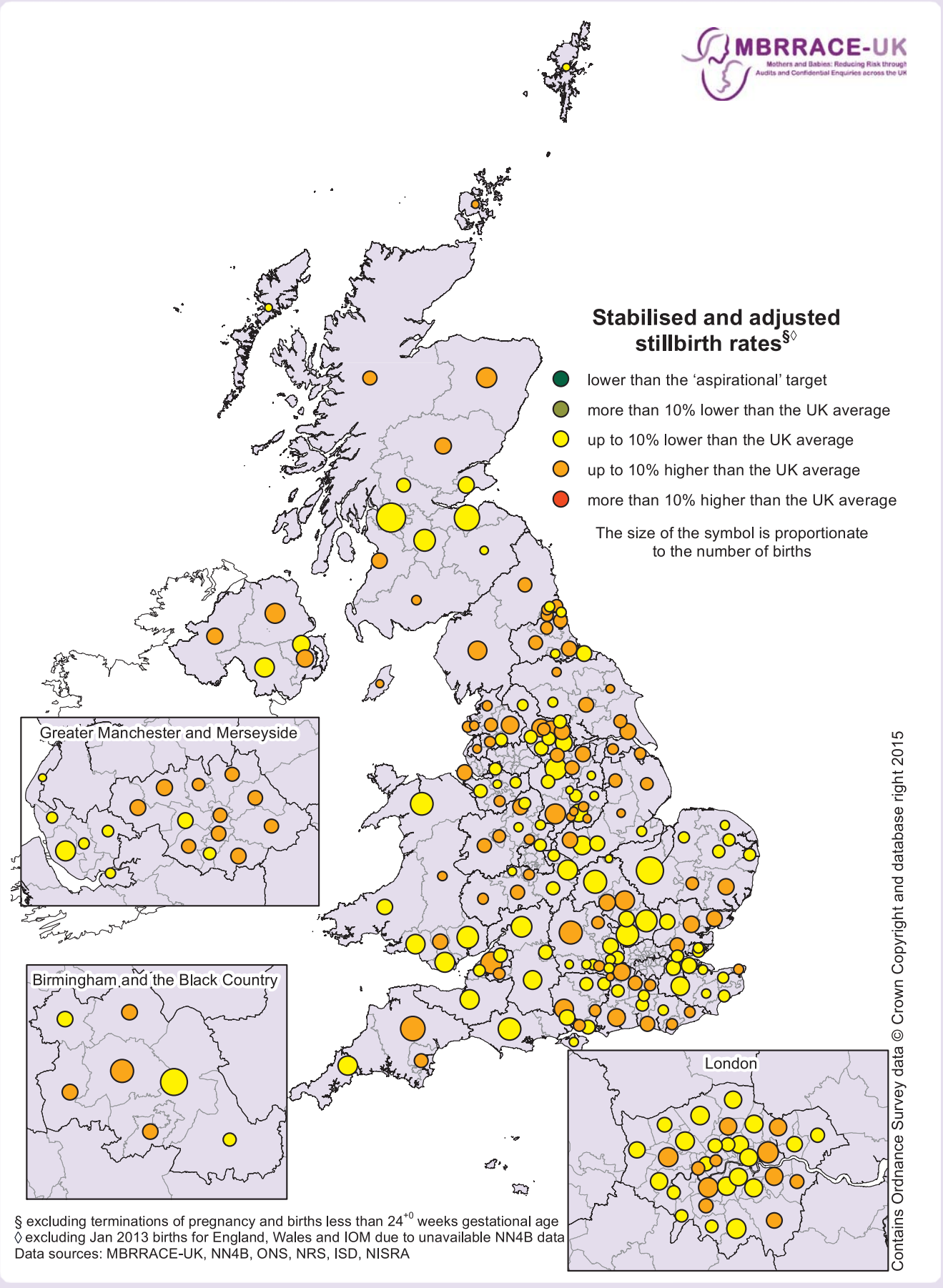


Figure 5: Crude neonatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2013

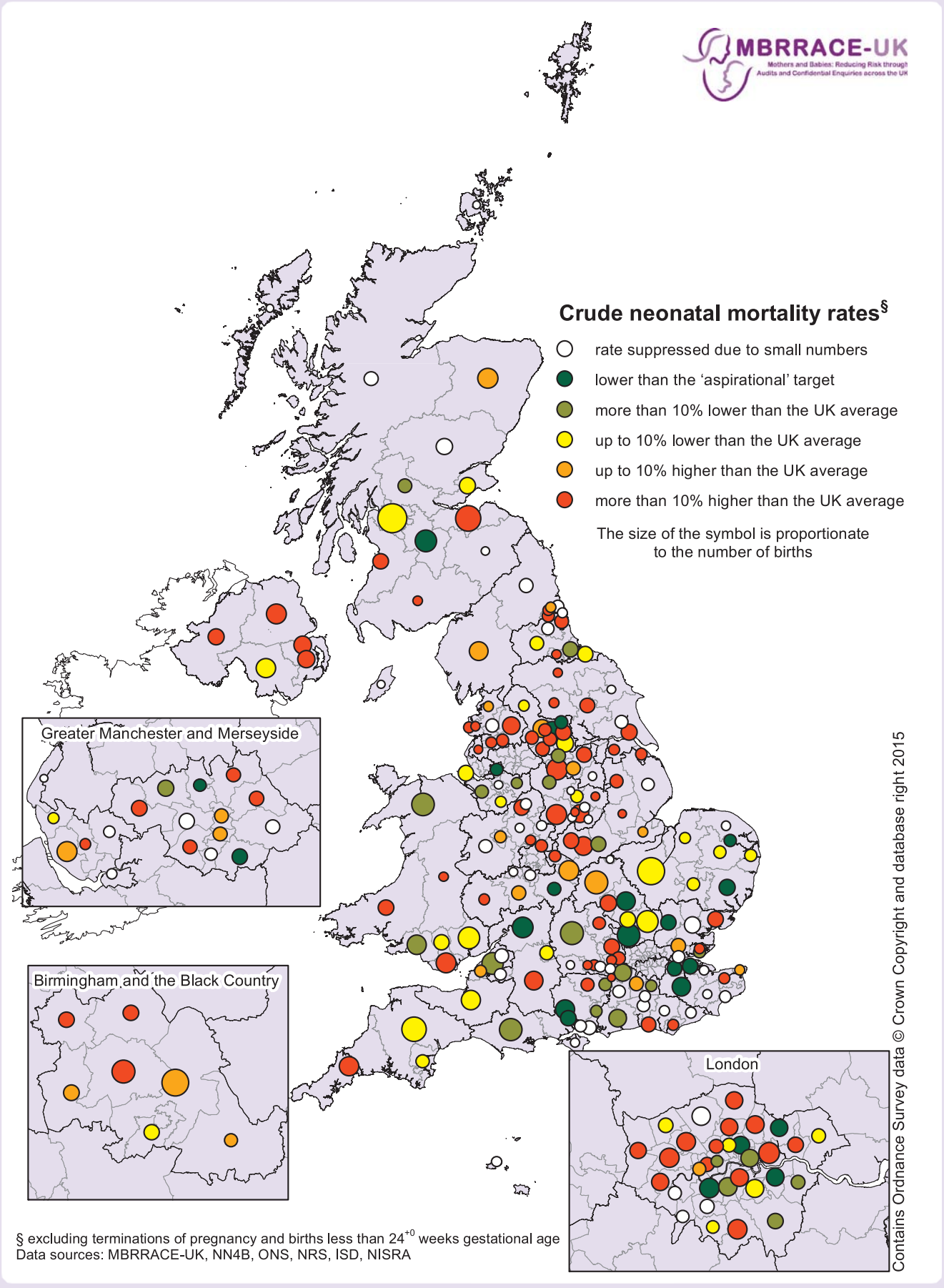
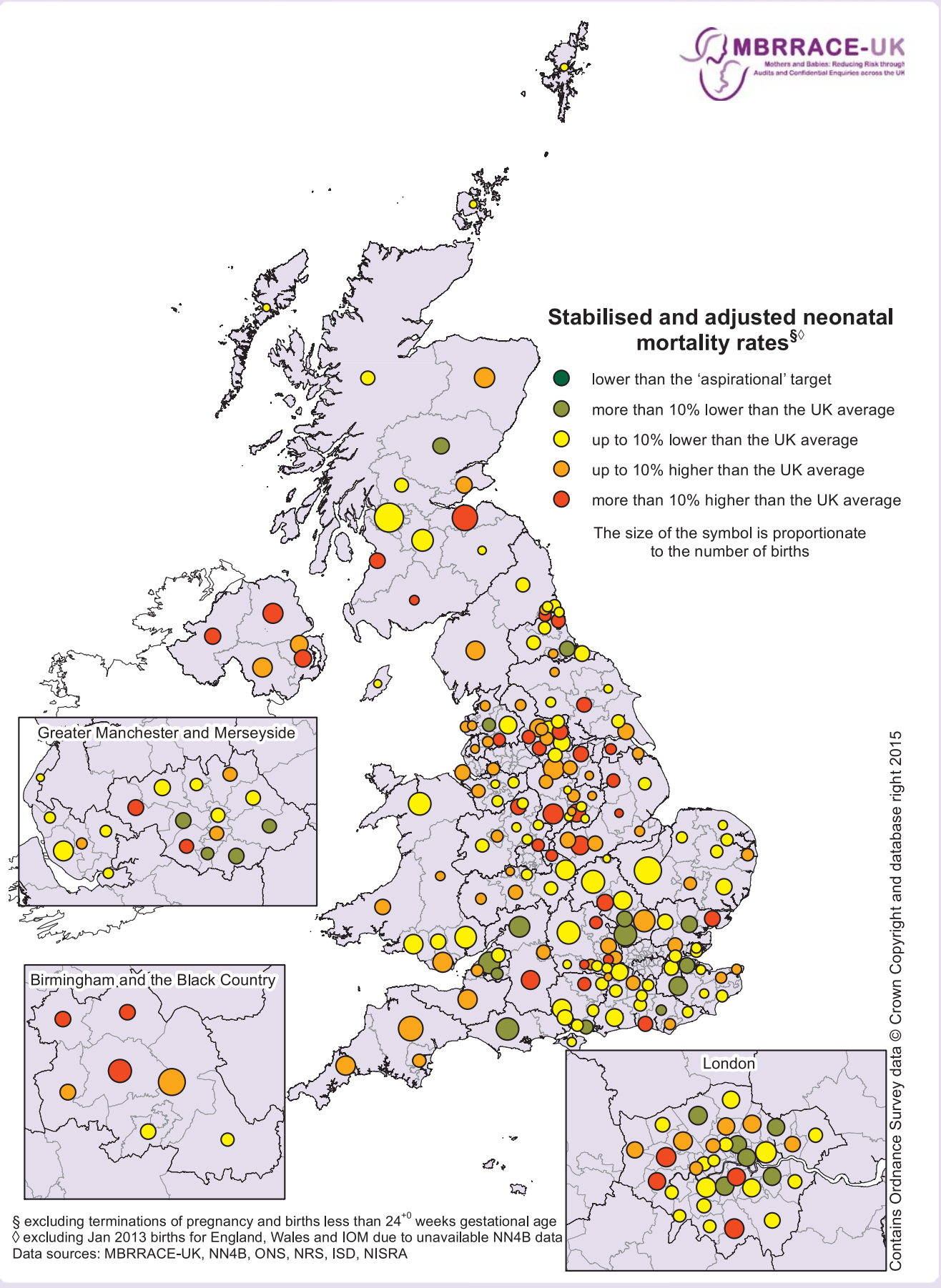
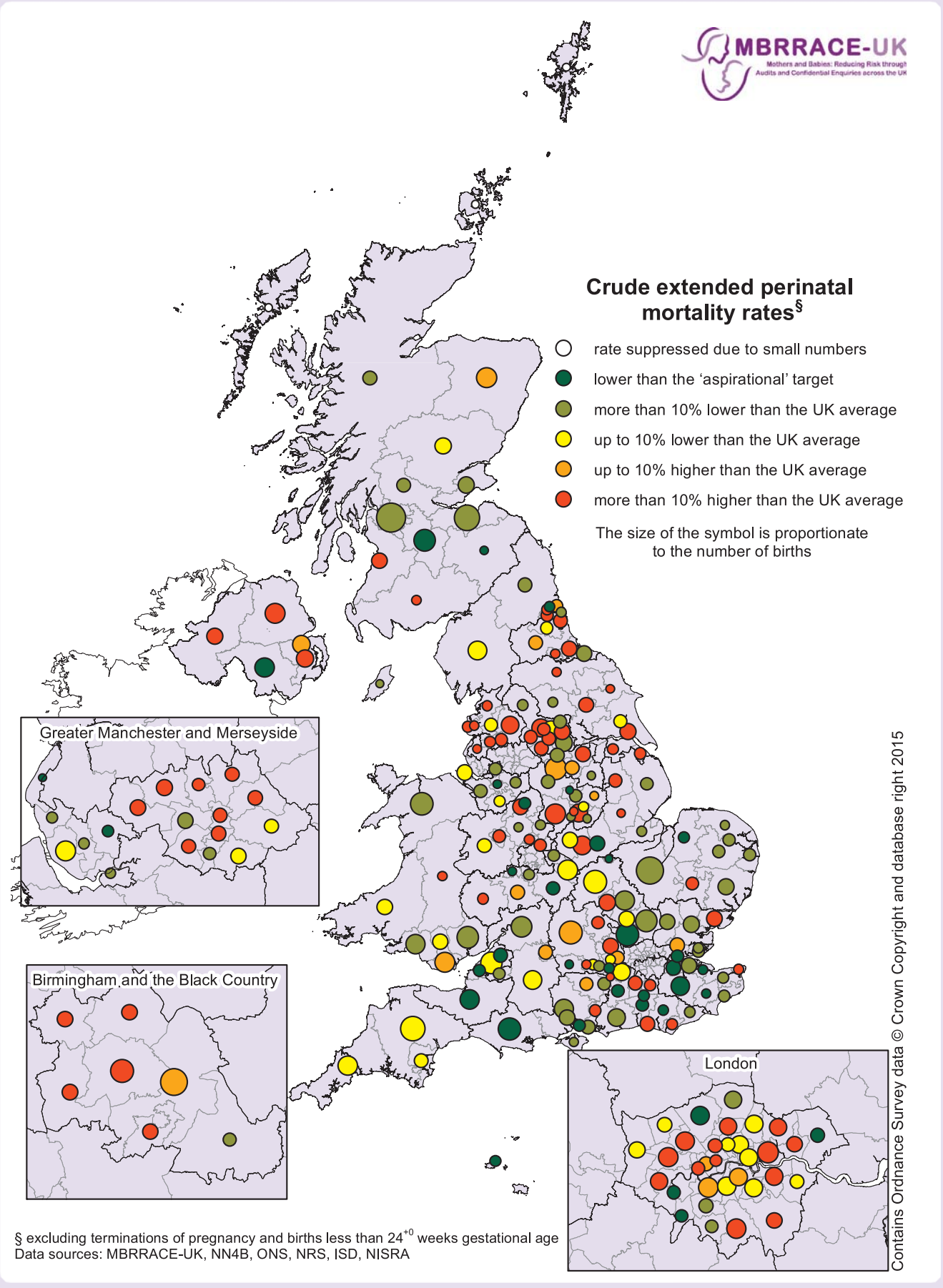


Figure 6: Stabilised & adjusted neonatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Isle of Man, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
◊ excluding Jan 2013 births for England, Wales and IOM due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 7: Crude extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 8: Stabilised & adjusted extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Isle of Man, for births in 2013

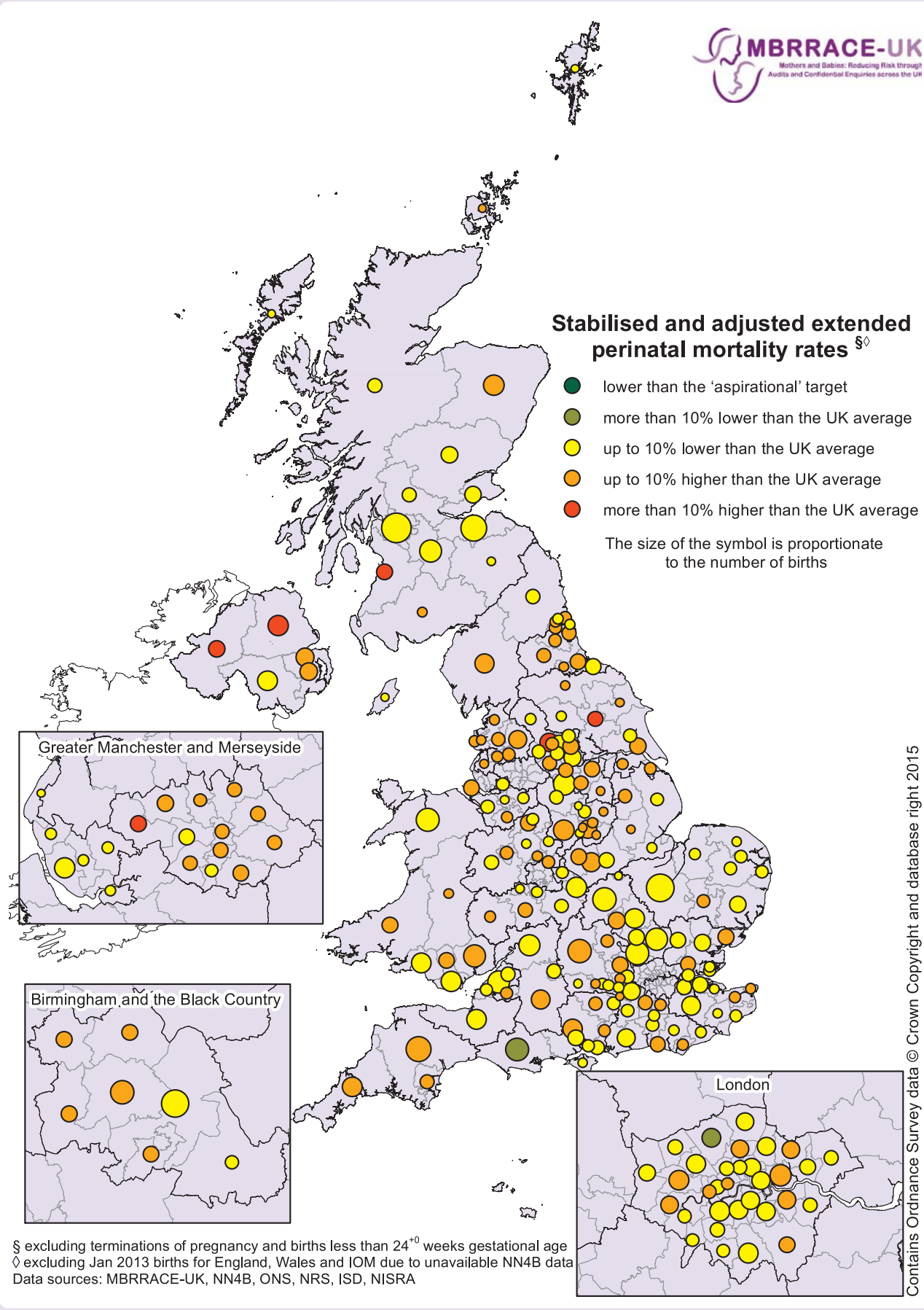


Table 4: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland & Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2013

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
ENGLAND								
Airedale, Wharfedale & Craven	1,735	3.46	4.18 (3.55 to 4.83)	1.74	1.85 (1.23 to 2.76)	5.19	6.00 (4.98 to 7.38)	
Ashford	1,416	*	4.15 (3.47 to 4.90)	*	1.81 (1.17 to 2.67)	3.53	5.88 (4.75 to 7.27)	
Aylesbury Vale	2,209	4.98	4.24 (3.64 to 4.95)	3.64	2.26 (1.52 to 3.61)	8.60	6.44 (5.24 to 8.03)	
Barking & Dagenham	3,635	5.23	4.18 (3.61 to 4.84)	2.21	1.87 (1.32 to 2.69)	7.43	6.01 (5.03 to 7.15)	
Barnet	5,236	*	4.11 (3.43 to 4.70)	*	1.44 (0.91 to 2.13)	3.63	5.41 (4.31 to 6.62)	
Barnsley	2,895	*	4.21 (3.62 to 4.89)	*	1.82 (1.24 to 2.78)	5.18	6.02 (4.98 to 7.29)	
Basildon & Brentwood	3,191	4.39	4.24 (3.62 to 5.05)	1.89	1.89 (1.31 to 2.71)	6.27	6.20 (5.09 to 7.46)	
Bassetlaw	1,174	*	4.19 (3.63 to 4.83)	*	1.85 (1.26 to 2.70)	5.11	6.03 (4.99 to 7.57)	
Bath & North East Somerset	1,954	*	4.26 (3.67 to 5.09)	*	1.64 (1.09 to 2.50)	5.12	6.06 (4.99 to 7.42)	
Bedfordshire	5,308	4.14	4.23 (3.69 to 4.87)	0.76	1.67 (1.12 to 2.46)	4.90	5.88 (4.86 to 7.05)	
Bexley	2,787	4.31	4.19 (3.60 to 4.88)	1.44	1.81 (1.21 to 2.61)	5.74	5.98 (4.95 to 7.16)	
Birmingham CrossCity	10,482	4.58	4.11 (3.54 to 4.67)	1.92	1.88 (1.38 to 2.56)	6.49	5.82 (4.99 to 6.73)	
Birmingham South & Central	3,659	7.65	4.30 (3.73 to 5.09)	1.65	1.78 (1.22 to 2.57)	9.29	6.26 (5.26 to 7.55)	
Blackburn With Darwen	2,341	*	4.17 (3.61 to 4.86)	*	2.03 (1.38 to 2.94)	6.83	6.09 (5.05 to 7.49)	
Blackpool	1,778	5.62	4.22 (3.62 to 4.96)	2.26	1.91 (1.27 to 2.87)	7.87	6.17 (4.99 to 7.59)	
Bolton	3,812	5.77	4.26 (3.72 to 5.09)	1.58	1.75 (1.24 to 2.57)	7.35	6.13 (5.04 to 7.49)	
Bracknell & Ascot	1,476	*	4.13 (3.47 to 4.83)	*	1.72 (1.12 to 2.55)	2.03	5.74 (4.56 to 6.92)	
Bradford City	2,214	8.58	4.33 (3.71 to 5.35)	3.64	1.91 (1.34 to 2.81)	12.20	6.58 (5.37 to 8.11)	
Bradford Districts	4,568	6.79	4.41 (3.67 to 5.56)	1.98	1.93 (1.34 to 2.68)	8.76	6.70 (5.46 to 8.30)	
Brent	5,096	4.12	4.10 (3.46 to 4.73)	2.76	1.96 (1.40 to 2.79)	6.87	5.84 (4.75 to 6.94)	
Brighton & Hove	3,109	4.82	4.26 (3.72 to 5.11)	2.91	2.05 (1.37 to 3.04)	7.72	6.44 (5.28 to 8.12)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Bristol	6,653	4.66	4.20 (3.66 to 4.86)	1.36	1.60 (1.15 to 2.20)	6.01	5.80 (4.83 to 6.81)	
Bromley	3,679	5.44	4.27 (3.73 to 5.02)	1.37	1.80 (1.27 to 2.49)	6.80	6.21 (5.10 to 7.46)	
Bury	2,453	6.11	4.23 (3.64 to 4.94)	1.23	1.74 (1.17 to 2.47)	7.34	6.08 (4.92 to 7.57)	
Calderdale	2,516	3.58	4.16 (3.60 to 4.78)	3.19	2.03 (1.38 to 3.10)	6.76	6.02 (5.04 to 7.42)	
Cambridgeshire & Peterborough	10,692	3.18	4.04 (3.33 to 4.69)	1.69	1.82 (1.33 to 2.49)	4.86	5.58 (4.63 to 6.60)	
Camden	2,783	4.67	4.18 (3.56 to 4.83)	2.17	1.87 (1.30 to 2.70)	6.83	5.96 (4.91 to 7.10)	
Cannock Chase	1,475	4.75	4.21 (3.63 to 4.98)	2.04	1.80 (1.23 to 2.56)	6.78	6.08 (5.04 to 7.55)	
Canterbury & Coastal	1,863	3.22	4.18 (3.53 to 4.80)	2.15	1.94 (1.35 to 2.95)	5.37	6.05 (4.94 to 7.49)	
Castle Point, Rayleigh & Rochford	1,552	2.58	4.17 (3.57 to 4.92)	2.58	1.78 (1.17 to 2.62)	5.15	5.93 (4.66 to 7.19)	
Central London (Westminster)	1,974	7.09	4.26 (3.72 to 5.05)	1.53	1.72 (1.20 to 2.50)	8.61	6.18 (5.10 to 7.58)	
Central Manchester	3,080	5.84	4.22 (3.70 to 4.94)	1.96	1.90 (1.31 to 2.72)	7.79	6.11 (5.13 to 7.42)	
Chiltern	3,486	4.30	4.18 (3.61 to 4.87)	2.59	1.98 (1.36 to 2.97)	6.88	6.06 (5.04 to 7.28)	
Chorley & South Ribble	1,867	4.82	4.25 (3.64 to 5.07)	2.69	1.92 (1.32 to 2.67)	7.50	6.37 (5.31 to 7.93)	
City & Hackney	4,647	4.52	4.12 (3.50 to 4.74)	1.30	1.58 (1.07 to 2.20)	5.81	5.59 (4.61 to 6.68)	
Coastal West Sussex	4,679	3.63	4.22 (3.63 to 4.89)	1.50	1.75 (1.17 to 2.62)	5.13	5.98 (4.95 to 7.13)	
Corby	959	*	4.16 (3.57 to 4.84)	*	1.72 (1.13 to 2.59)	3.13	5.82 (4.73 to 7.08)	
Coventry & Rugby	5,905	4.06	4.17 (3.60 to 4.78)	1.87	1.80 (1.28 to 2.49)	5.93	5.94 (4.95 to 7.13)	
Crawley	1,745	*	4.14 (3.54 to 4.83)	*	1.70 (1.10 to 2.46)	2.87	5.72 (4.63 to 6.90)	
Croydon	5,346	4.86	4.13 (3.51 to 4.72)	2.44	2.05 (1.44 to 2.91)	7.30	5.98 (4.94 to 7.11)	
Cumbria	4,926	3.86	4.24 (3.65 to 4.91)	1.83	1.88 (1.34 to 2.65)	5.68	6.23 (5.17 to 7.53)	
Darlington	1,262	3.17	4.18 (3.54 to 4.87)	3.97	2.00 (1.37 to 3.00)	7.13	6.17 (4.97 to 7.67)	
Dartford, Gravesham & Swanley	3,191	2.51	4.10 (3.35 to 4.64)	0.94	1.65 (1.09 to 2.43)	3.45	5.61 (4.57 to 6.87)	
Doncaster	3,740	4.01	4.20 (3.61 to 4.90)	2.95	2.04 (1.42 to 2.83)	6.95	6.25 (5.17 to 7.49)	
Dorset	7,516	2.13	4.00 (3.18 to 4.71)	1.33	1.60 (1.09 to 2.25)	3.46	5.34 (4.27 to 6.61)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Dudley	3,722	4.84	4.21 (3.61 to 4.94)	1.89	1.87 (1.28 to 2.73)	6.72	6.04 (5.03 to 7.42)	
Durham Dales, Easington & Sedgefield	2,935	4.43	4.22 (3.66 to 4.98)	1.71	1.78 (1.21 to 2.51)	6.13	6.12 (5.07 to 7.45)	
Ealing	5,708	5.61	4.23 (3.65 to 5.00)	2.82	2.09 (1.51 to 2.90)	8.41	6.34 (5.23 to 7.59)	
East & North Hertfordshire	6,664	3.30	4.13 (3.49 to 4.69)	1.66	1.87 (1.34 to 2.64)	4.95	5.83 (4.88 to 6.95)	
East Lancashire	4,632	6.04	4.32 (3.73 to 5.32)	2.17	1.74 (1.21 to 2.40)	8.20	6.40 (5.40 to 7.78)	
East Leicestershire & Rutland	3,097	*	4.12 (3.42 to 4.73)	*	1.85 (1.23 to 2.74)	3.87	5.80 (4.83 to 7.07)	
East Riding Of Yorkshire	2,689	*	4.23 (3.61 to 5.03)	*	1.70 (1.11 to 2.54)	5.58	6.02 (4.95 to 7.34)	
East Staffordshire	1,510	*	4.18 (3.50 to 4.93)	*	1.65 (1.10 to 2.36)	4.64	5.89 (4.73 to 7.23)	
East Surrey	2,137	5.62	4.27 (3.68 to 5.12)	1.41	1.71 (1.14 to 2.63)	7.02	6.11 (5.06 to 7.41)	
Eastbourne, Hailsham & Seaford	1,807	6.09	4.25 (3.67 to 5.18)	2.23	1.89 (1.31 to 2.79)	8.30	6.29 (5.13 to 7.80)	
Eastern Cheshire	1,909	3.14	4.17 (3.60 to 4.86)	1.58	1.80 (1.21 to 2.54)	4.71	5.95 (4.81 to 7.08)	
Enfield	4,470	2.91	4.04 (3.16 to 4.73)	2.02	1.80 (1.29 to 2.58)	4.92	5.58 (4.55 to 6.62)	
Erewash	1,146	*	4.19 (3.57 to 4.94)	*	1.77 (1.15 to 2.62)	4.36	5.97 (4.82 to 7.21)	
Fareham & Gosport	2,034	*	4.20 (3.64 to 4.90)	*	1.68 (1.07 to 2.50)	3.93	5.90 (4.78 to 7.17)	
Fylde & Wyre	1,277	3.92	4.21 (3.59 to 4.94)	3.93	2.01 (1.34 to 3.17)	7.83	6.22 (5.10 to 7.88)	
Gateshead	2,342	4.27	4.20 (3.52 to 4.94)	2.57	2.02 (1.39 to 3.02)	6.83	6.17 (5.03 to 7.62)	
Gloucestershire	6,509	3.84	4.17 (3.52 to 4.74)	0.93	1.50 (1.00 to 2.18)	4.76	5.68 (4.66 to 6.77)	
Great Yarmouth & Waveney	2,369	2.95	4.15 (3.51 to 4.79)	1.69	1.85 (1.24 to 2.76)	4.64	5.83 (4.70 to 7.18)	
Greater Huddersfield	2,860	3.50	4.13 (3.46 to 4.74)	3.16	2.17 (1.47 to 3.24)	6.64	6.03 (5.01 to 7.43)	
Greater Preston	2,499	*	4.25 (3.68 to 4.94)	*	1.65 (1.08 to 2.35)	5.60	6.05 (5.02 to 7.38)	
Greenwich	4,532	9.49	4.48 (3.69 to 5.83)	1.11	1.60 (1.09 to 2.27)	10.59	6.62 (5.48 to 8.17)	
Guildford & Waverley	2,226	*	4.12 (3.44 to 4.76)	*	1.70 (1.10 to 2.57)	3.14	5.67 (4.50 to 7.01)	
Halton	1,553	*	4.16 (3.58 to 4.91)	*	1.74 (1.09 to 2.56)	5.15	5.83 (4.71 to 7.15)	
Hambleton, Richmond & Whitby	1,385	4.33	4.22 (3.64 to 4.91)	2.90	1.93 (1.35 to 2.75)	7.22	6.23 (5.08 to 7.68)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Hammersmith & Fulham	2,541	6.69	4.29 (3.67 to 5.17)	1.98	1.88 (1.37 to 2.72)	8.66	6.36 (5.28 to 7.82)	
Hardwick	1,037	*	4.18 (3.50 to 4.89)	*	1.70 (1.10 to 2.58)	3.86	5.88 (4.74 to 7.13)	
Haringey	4,267	5.39	4.21 (3.65 to 4.88)	2.36	1.92 (1.37 to 2.70)	7.73	6.17 (5.16 to 7.40)	
Harrogate & Rural District	1,478	2.71	4.17 (3.57 to 4.90)	2.04	1.78 (1.18 to 2.61)	4.74	5.93 (4.72 to 7.22)	
Harrow	3,291	3.95	4.14 (3.50 to 4.76)	1.83	1.71 (1.15 to 2.44)	5.77	5.79 (4.71 to 6.95)	
Hartlepool & Stockton-On-Tees	3,436	5.82	4.29 (3.69 to 5.03)	1.46	1.63 (1.09 to 2.32)	7.28	6.12 (5.17 to 7.51)	
Hastings & Rother	1,882	*	4.22 (3.67 to 4.94)	*	1.70 (1.07 to 2.48)	5.31	5.96 (4.79 to 7.27)	
Havering	3,033	2.64	4.10 (3.36 to 4.83)	1.65	1.72 (1.16 to 2.48)	4.29	5.62 (4.58 to 6.83)	
Herefordshire	1,826	7.12	4.32 (3.72 to 5.19)	2.76	1.98 (1.33 to 3.18)	9.86	6.58 (5.30 to 8.61)	
Herts Valleys	7,579	*	4.12 (3.53 to 4.81)	*	1.60 (1.11 to 2.20)	4.22	5.59 (4.66 to 6.69)	
Heywood, Middleton & Rochdale	3,035	4.94	4.22 (3.66 to 4.98)	2.32	1.87 (1.29 to 2.65)	7.25	6.14 (5.13 to 7.47)	
High Weald Lewes Havens	1,480	*	4.15 (3.52 to 4.87)	*	1.65 (1.07 to 2.43)	3.38	5.75 (4.53 to 7.06)	
Hillingdon	3,917	3.32	4.08 (3.38 to 4.72)	2.56	1.87 (1.32 to 2.65)	5.87	5.78 (4.64 to 6.96)	
Horsham & Mid Sussex	2,321	*	4.16 (3.52 to 4.82)	*	1.73 (1.14 to 2.51)	3.45	5.82 (4.80 to 7.02)	
Hounslow	4,473	4.69	4.19 (3.56 to 4.79)	2.70	2.12 (1.49 to 2.98)	7.38	6.16 (5.22 to 7.53)	
Hull	3,839	6.25	4.34 (3.67 to 5.40)	2.36	1.89 (1.32 to 2.69)	8.60	6.49 (5.30 to 8.08)	
Ipswich & East Suffolk	3,887	4.12	4.23 (3.65 to 4.98)	1.03	1.76 (1.17 to 2.54)	5.15	6.01 (4.99 to 7.23)	
Isle Of Wight	1,301	*	4.14 (3.44 to 4.87)	*	1.81 (1.22 to 2.67)	4.61	5.84 (4.66 to 7.22)	
Islington	2,994	4.01	4.16 (3.55 to 4.86)	1.68	1.71 (1.17 to 2.46)	5.68	5.82 (4.76 to 6.95)	
Kernow	5,604	3.39	4.16 (3.59 to 4.75)	2.15	1.97 (1.42 to 2.89)	5.53	6.07 (5.03 to 7.30)	
Kingston	2,338	*	4.18 (3.54 to 4.83)	*	1.67 (1.09 to 2.49)	4.28	5.80 (4.68 to 7.03)	
Knowsley	1,825	2.74	4.15 (3.48 to 4.81)	2.20	1.84 (1.28 to 2.71)	4.93	5.88 (4.80 to 7.09)	
Lambeth	5,171	4.25	4.15 (3.61 to 4.81)	1.36	1.61 (1.11 to 2.29)	5.61	5.70 (4.63 to 6.76)	
Lancashire North	1,582	5.06	4.23 (3.59 to 4.96)	1.91	1.90 (1.23 to 2.92)	6.95	6.17 (5.09 to 7.50)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Leeds North	2,481	4.03	4.17 (3.60 to 4.83)	1.21	1.77 (1.20 to 2.52)	5.24	5.88 (4.90 to 7.20)	
Leeds South & East	3,654	5.47	4.24 (3.67 to 4.99)	3.03	2.13 (1.51 to 3.09)	8.48	6.39 (5.32 to 7.79)	
Leeds West	4,038	4.95	4.24 (3.66 to 4.95)	1.00	1.70 (1.15 to 2.44)	5.94	6.00 (5.03 to 7.26)	
Leicester City	5,109	5.09	4.18 (3.62 to 4.82)	2.75	2.04 (1.47 to 2.90)	7.83	6.15 (5.14 to 7.47)	
Lewisham	4,751	4.00	4.12 (3.49 to 4.68)	1.69	1.73 (1.22 to 2.42)	5.68	5.75 (4.73 to 6.77)	
Lincolnshire East	2,329	*	4.22 (3.56 to 4.97)	*	1.71 (1.08 to 2.53)	5.15	5.99 (4.94 to 7.32)	
Lincolnshire West	2,530	4.74	4.24 (3.70 to 4.94)	3.18	2.17 (1.42 to 3.22)	7.91	6.42 (5.24 to 8.11)	
Liverpool	5,738	3.83	4.15 (3.55 to 4.82)	1.92	1.83 (1.33 to 2.55)	5.75	5.98 (5.01 to 7.10)	
Luton	3,454	4.05	4.13 (3.48 to 4.73)	1.74	1.62 (1.10 to 2.32)	5.79	5.69 (4.62 to 6.81)	
Mansfield & Ashfield	2,293	2.62	4.15 (3.50 to 4.84)	1.75	1.87 (1.23 to 2.76)	4.36	5.91 (4.75 to 7.10)	
Medway	3,632	3.58	4.19 (3.59 to 4.80)	0.83	1.63 (1.08 to 2.38)	4.41	5.84 (4.78 to 7.08)	
Merton	3,073	*	4.22 (3.63 to 4.91)	*	1.66 (1.11 to 2.41)	5.21	5.92 (4.96 to 6.98)	
Mid Essex	4,088	*	4.27 (3.70 to 5.04)	*	1.51 (0.95 to 2.22)	4.65	5.96 (4.83 to 7.22)	
Milton Keynes	3,885	4.63	4.23 (3.64 to 4.93)	3.10	2.13 (1.48 to 3.12)	7.72	6.44 (5.32 to 7.78)	
Nene	7,765	3.73	4.14 (3.55 to 4.73)	1.94	1.80 (1.29 to 2.47)	5.67	5.96 (5.11 to 7.09)	
Newark & Sherwood	1,243	3.22	4.19 (3.58 to 4.88)	3.23	2.01 (1.39 to 3.03)	6.44	6.13 (5.00 to 7.41)	
Newbury & District	1,239	*	4.19 (3.54 to 4.91)	*	1.72 (1.08 to 2.67)	4.04	5.88 (4.71 to 7.40)	
Newcastle North & East	1,541	1.95	4.11 (3.39 to 4.74)	1.95	1.79 (1.21 to 2.56)	3.89	5.71 (4.50 to 6.90)	
Newcastle West	1,811	8.83	4.34 (3.68 to 5.34)	2.23	1.88 (1.27 to 2.73)	11.04	6.56 (5.37 to 8.19)	
Newham	6,319	7.12	4.35 (3.75 to 5.10)	2.23	1.79 (1.27 to 2.49)	9.34	6.35 (5.35 to 7.63)	
North & West Reading	1,339	3.73	4.17 (3.54 to 4.85)	3.75	2.07 (1.44 to 3.20)	7.47	6.15 (4.99 to 7.63)	
North Derbyshire	2,566	3.12	4.18 (3.59 to 4.88)	1.56	1.87 (1.23 to 2.68)	4.68	5.99 (4.95 to 7.30)	
North Durham	2,451	*	4.28 (3.76 to 5.15)	*	1.69 (1.11 to 2.60)	5.71	6.13 (5.09 to 7.45)	
North East Essex	3,485	4.02	4.21 (3.60 to 4.91)	3.75	2.23 (1.57 to 3.34)	7.75	6.45 (5.31 to 8.06)	

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		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
North East Hampshire & Farnham	2,448	3.27	4.14 (3.49 to 4.87)	1.64	1.81 (1.22 to 2.74)	4.90	5.83 (4.72 to 7.15)	
North East Lincolnshire	1,973	6.08	4.27 (3.68 to 5.10)	2.55	1.94 (1.34 to 2.91)	8.62	6.37 (5.28 to 7.82)	
North Hampshire	2,548	3.14	4.13 (3.43 to 4.76)	3.15	2.20 (1.44 to 3.48)	6.28	6.08 (4.90 to 7.39)	
North Kirklees	2,735	4.39	4.15 (3.57 to 4.85)	2.94	1.92 (1.32 to 2.77)	7.31	5.95 (4.87 to 7.25)	
North Lincolnshire	1,842	6.51	4.28 (3.70 to 5.14)	3.83	2.18 (1.46 to 3.45)	10.31	6.59 (5.39 to 8.56)	
North Manchester	3,053	7.53	4.36 (3.71 to 5.38)	1.98	1.75 (1.25 to 2.54)	9.50	6.53 (5.24 to 8.10)	
North Norfolk	1,384	*	4.18 (3.58 to 4.83)	*	1.74 (1.12 to 2.54)	4.34	5.91 (4.72 to 7.22)	
North Somerset	2,176	*	4.13 (3.44 to 4.80)	*	1.94 (1.31 to 3.01)	3.68	5.85 (4.81 to 7.08)	
North Staffordshire	1,929	*	4.12 (3.49 to 4.71)	*	1.69 (1.09 to 2.51)	2.59	5.69 (4.52 to 6.87)	
North Tyneside	2,294	*	4.29 (3.71 to 5.20)	*	1.67 (1.06 to 2.37)	6.54	6.21 (5.07 to 7.57)	
North West Surrey	4,425	4.07	4.21 (3.66 to 4.86)	1.36	1.79 (1.21 to 2.54)	5.42	6.01 (4.99 to 7.20)	
North, East, West Devon	9,047	3.87	4.23 (3.66 to 4.86)	1.66	1.94 (1.41 to 2.66)	5.53	6.17 (5.27 to 7.28)	
Northumberland	2,823	*	4.23 (3.66 to 5.02)	*	1.67 (1.09 to 2.45)	4.96	6.00 (4.99 to 7.21)	
Norwich	2,409	3.74	4.18 (3.55 to 4.85)	1.25	1.80 (1.23 to 2.65)	4.98	5.91 (4.85 to 7.15)	
Nottingham City	4,501	3.78	4.12 (3.50 to 4.78)	3.79	2.37 (1.58 to 3.62)	7.55	6.21 (5.22 to 7.43)	
Nottingham North & East	1,684	*	4.22 (3.62 to 5.05)	*	1.74 (1.18 to 2.55)	5.94	6.06 (4.90 to 7.39)	
Nottingham West	1,079	7.41	4.28 (3.71 to 5.32)	3.73	2.00 (1.39 to 2.99)	11.12	6.48 (5.21 to 8.18)	
Oldham	3,339	5.69	4.26 (3.67 to 5.05)	2.41	1.82 (1.27 to 2.53)	8.09	6.33 (5.24 to 7.81)	
Oxfordshire	7,667	4.70	4.28 (3.76 to 5.00)	1.57	1.72 (1.26 to 2.38)	6.26	6.15 (5.21 to 7.33)	
Portsmouth	2,782	*	4.16 (3.51 to 4.80)	*	1.65 (1.07 to 2.40)	4.31	5.77 (4.71 to 7.07)	
Redbridge	4,361	7.80	4.35 (3.67 to 5.38)	0.69	1.56 (1.05 to 2.25)	8.48	6.14 (5.19 to 7.44)	
Redditch & Bromsgrove	1,894	*	4.20 (3.61 to 4.87)	*	1.76 (1.21 to 2.52)	4.75	5.98 (4.87 to 7.35)	
Richmond	2,669	*	4.14 (3.54 to 4.83)	*	1.66 (1.05 to 2.47)	3.00	5.69 (4.56 to 6.92)	
Rotherham	2,990	4.35	4.21 (3.53 to 4.91)	2.02	1.85 (1.29 to 2.72)	6.35	6.07 (4.97 to 7.37)	

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		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Rushcliffe	1,175	*	4.21 (3.71 to 4.93)	*	1.80 (1.15 to 2.79)	5.11	6.03 (5.03 to 7.40)	
Salford	3,514	*	4.16 (3.55 to 4.75)	*	1.59 (1.04 to 2.28)	5.12	5.69 (4.68 to 6.90)	
Sandwell & West Birmingham	8,045	5.59	4.29 (3.75 to 5.04)	3.00	2.06 (1.54 to 2.81)	8.58	6.49 (5.43 to 7.59)	
Scarborough & Ryedale	1,067	*	4.22 (3.65 to 5.05)	*	1.76 (1.19 to 2.58)	7.50	6.05 (5.03 to 7.42)	
Sheffield	6,634	4.37	4.16 (3.56 to 4.77)	2.12	1.97 (1.42 to 2.71)	6.48	6.01 (4.98 to 7.13)	
Shropshire	2,764	*	4.23 (3.62 to 5.06)	*	1.74 (1.13 to 2.56)	5.43	6.00 (4.94 to 7.31)	
Slough	2,501	4.00	4.15 (3.46 to 4.85)	2.41	1.93 (1.32 to 2.84)	6.40	5.96 (4.90 to 7.14)	
Solihull	2,629	3.04	4.15 (3.53 to 4.79)	1.91	1.82 (1.27 to 2.66)	4.94	5.93 (4.95 to 7.23)	
Somerset	5,455	2.02	4.04 (3.21 to 4.72)	1.65	1.83 (1.32 to 2.58)	3.67	5.58 (4.50 to 6.71)	
South Cheshire	1,727	4.05	4.22 (3.59 to 4.96)	1.74	1.81 (1.23 to 2.63)	5.79	6.11 (5.10 to 7.59)	
South Devon & Torbay	2,773	3.97	4.22 (3.65 to 4.99)	1.81	1.84 (1.24 to 2.77)	5.77	6.09 (4.99 to 7.46)	
South East Staffs & Seisdon & Peninsular	2,226	4.04	4.18 (3.59 to 4.88)	3.61	2.26 (1.45 to 3.63)	7.64	6.27 (5.09 to 7.73)	
South Eastern Hampshire	2,060	5.34	4.25 (3.69 to 5.18)	1.46	1.75 (1.19 to 2.44)	6.80	6.20 (5.20 to 7.64)	
South Gloucestershire	2,940	*	4.16 (3.49 to 4.76)	*	1.68 (1.12 to 2.51)	3.40	5.77 (4.75 to 7.02)	
South Kent Coast	2,036	*	4.09 (3.41 to 4.77)	*	1.75 (1.15 to 2.57)	4.42	5.62 (4.35 to 6.83)	
South Lincolnshire	1,521	3.29	4.17 (3.57 to 4.76)	1.98	1.93 (1.28 to 2.88)	5.26	6.01 (4.94 to 7.26)	
South Manchester	2,240	*	4.17 (3.51 to 4.77)	*	1.60 (1.04 to 2.40)	5.36	5.76 (4.64 to 6.97)	
South Norfolk	2,393	2.93	4.18 (3.60 to 4.87)	1.68	1.79 (1.22 to 2.59)	4.60	5.95 (4.91 to 7.29)	
South Reading	1,901	3.16	4.14 (3.52 to 4.80)	2.64	1.93 (1.30 to 2.84)	5.79	5.88 (4.71 to 7.17)	
South Sefton	1,784	2.80	4.14 (3.48 to 4.82)	1.69	1.83 (1.26 to 2.64)	4.48	5.85 (4.76 to 7.25)	
South Tees	3,515	*	4.13 (3.48 to 4.73)	*	1.78 (1.21 to 2.55)	4.84	5.78 (4.72 to 7.01)	
South Tyneside	1,615	*	4.19 (3.58 to 4.89)	*	1.82 (1.20 to 2.73)	4.95	5.96 (4.80 to 7.20)	
South Warwickshire	2,603	2.31	4.14 (3.49 to 4.87)	1.16	1.72 (1.19 to 2.43)	3.46	5.79 (4.59 to 6.95)	
South West Lincolnshire	1,222	5.73	4.21 (3.64 to 4.95)	4.12	2.11 (1.36 to 3.18)	9.82	6.30 (5.17 to 7.80)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
South Worcestershire	3,032	4.29	4.25 (3.70 to 5.04)	1.99	1.85 (1.30 to 2.70)	6.27	6.22 (5.19 to 7.53)	
Southampton	3,433	3.50	4.13 (3.45 to 4.74)	1.17	1.67 (1.11 to 2.50)	4.66	5.72 (4.62 to 6.83)	
Southend	2,185	3.20	4.13 (3.45 to 4.86)	1.38	1.74 (1.19 to 2.47)	4.58	5.81 (4.66 to 7.05)	
Southern Derbyshire	6,076	4.61	4.26 (3.70 to 4.95)	2.31	2.02 (1.50 to 2.86)	6.91	6.37 (5.33 to 7.65)	
Southport & Formby	1,049	*	4.16 (3.51 to 4.90)	*	1.82 (1.16 to 2.82)	3.81	5.88 (4.79 to 7.16)	
Southwark	4,704	3.61	4.07 (3.41 to 4.68)	2.56	2.05 (1.47 to 2.97)	6.16	5.80 (4.84 to 6.98)	
St Helens	2,132	*	4.14 (3.54 to 4.78)	*	1.69 (1.18 to 2.47)	3.75	5.75 (4.68 to 7.00)	
Stafford & Surrounds	1,350	*	4.17 (3.51 to 4.84)	*	1.76 (1.15 to 2.58)	4.44	5.87 (4.57 to 7.04)	
Stockport	3,444	4.94	4.26 (3.77 to 5.06)	0.88	1.63 (1.06 to 2.35)	5.81	6.03 (4.91 to 7.32)	
Stoke On Trent	3,661	4.37	4.20 (3.60 to 4.88)	3.29	2.10 (1.47 to 3.04)	7.65	6.24 (5.27 to 7.60)	
Sunderland	3,005	5.66	4.28 (3.71 to 5.12)	2.68	2.03 (1.36 to 2.89)	8.32	6.47 (5.28 to 8.01)	
Surrey Downs	3,063	4.90	4.26 (3.67 to 5.02)	1.97	1.94 (1.37 to 2.80)	6.86	6.28 (5.14 to 7.56)	
Surrey Heath	,983	8.14	4.29 (3.73 to 5.25)	3.08	1.99 (1.33 to 3.09)	11.19	6.45 (5.24 to 8.32)	
Sutton	2,384	3.36	4.17 (3.53 to 4.86)	1.68	1.82 (1.25 to 2.70)	5.03	5.95 (4.94 to 7.20)	
Swale	1,354	*	4.17 (3.53 to 4.90)	*	1.73 (1.16 to 2.52)	3.69	5.88 (4.76 to 7.24)	
Swindon	2,960	4.39	4.18 (3.53 to 4.81)	1.70	1.86 (1.31 to 2.67)	6.08	6.00 (4.98 to 7.23)	
Tameside & Glossop	2,965	*	4.25 (3.65 to 5.03)	*	1.63 (1.05 to 2.36)	5.73	6.04 (4.98 to 7.40)	
Telford & Wrekin	2,193	6.38	4.27 (3.68 to 5.15)	1.84	1.88 (1.26 to 2.74)	8.21	6.28 (5.21 to 7.87)	
Thanet	1,610	5.59	4.25 (3.66 to 5.04)	1.87	1.86 (1.28 to 2.86)	7.45	6.23 (5.18 to 7.76)	
Thurrock	2,276	*	4.12 (3.43 to 4.69)	*	1.72 (1.17 to 2.56)	3.51	5.67 (4.55 to 6.85)	
Tower Hamlets	4,618	4.55	4.06 (3.40 to 4.69)	1.31	1.59 (1.08 to 2.28)	5.85	5.49 (4.46 to 6.60)	
Trafford	2,808	3.92	4.20 (3.59 to 4.96)	3.58	2.25 (1.49 to 3.49)	7.48	6.33 (5.24 to 7.75)	
Vale Of York	3,313	5.73	4.31 (3.70 to 5.10)	3.64	2.20 (1.56 to 3.28)	9.36	6.75 (5.37 to 8.52)	
Vale Royal	1,124	*	4.15 (3.44 to 4.95)	*	1.77 (1.13 to 2.57)	3.56	5.84 (4.76 to 7.17)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Wakefield	4,162	3.36	4.16 (3.53 to 4.84)	1.69	1.73 (1.15 to 2.49)	5.05	5.84 (4.68 to 7.03)	
Walsall	3,657	4.92	4.24 (3.70 to 4.99)	3.57	2.08 (1.43 to 2.99)	8.48	6.40 (5.32 to 7.96)	
Waltham Forest	4,771	3.35	4.09 (3.45 to 4.70)	2.52	1.95 (1.38 to 2.75)	5.87	5.77 (4.72 to 6.87)	
Wandsworth	5,464	4.76	4.25 (3.70 to 4.97)	1.29	1.68 (1.14 to 2.37)	6.04	5.94 (4.90 to 7.13)	
Warrington	2,348	3.41	4.19 (3.60 to 4.89)	1.28	1.84 (1.24 to 2.71)	4.68	5.97 (4.86 to 7.31)	
Warwickshire North	2,095	1.43	4.11 (3.43 to 4.72)	3.35	2.02 (1.37 to 3.04)	4.77	5.99 (4.91 to 7.28)	
West Cheshire	2,478	*	4.16 (3.55 to 4.81)	*	1.92 (1.28 to 2.83)	4.44	5.94 (4.76 to 7.15)	
West Essex	3,444	3.48	4.16 (3.58 to 4.86)	1.17	1.70 (1.16 to 2.46)	4.65	5.86 (4.77 to 7.00)	
West Hampshire	5,332	4.13	4.24 (3.61 to 5.05)	1.13	1.78 (1.23 to 2.61)	5.25	6.04 (5.15 to 7.14)	
West Kent	5,258	2.85	4.12 (3.49 to 4.75)	0.76	1.63 (1.09 to 2.34)	3.61	5.60 (4.50 to 6.73)	
West Lancashire	1,117	6.27	4.23 (3.61 to 5.03)	2.70	1.90 (1.32 to 2.83)	8.95	6.24 (5.16 to 7.69)	
West Leicestershire	3,697	3.79	4.20 (3.65 to 4.95)	2.17	1.93 (1.34 to 2.82)	5.95	6.12 (5.08 to 7.42)	
West London	2,892	4.15	4.18 (3.55 to 4.85)	2.08	1.79 (1.24 to 2.63)	6.22	5.87 (4.75 to 7.10)	
West Norfolk	1,759	*	4.15 (3.50 to 4.83)	*	1.77 (1.17 to 2.69)	3.98	5.78 (4.65 to 7.13)	
West Suffolk	2,414	4.97	4.26 (3.68 to 4.96)	1.67	1.85 (1.24 to 2.69)	6.63	6.24 (5.11 to 7.75)	
Wigan Borough	3,673	4.90	4.29 (3.73 to 5.14)	3.83	2.33 (1.59 to 3.66)	8.71	6.77 (5.48 to 8.68)	
Wiltshire	5,089	*	4.13 (3.45 to 4.77)	*	2.26 (1.58 to 3.33)	5.90	6.15 (5.11 to 7.49)	
Windsor, Ascot & Maidenhead	1,672	2.39	4.15 (3.46 to 4.75)	3.60	2.16 (1.48 to 3.43)	5.98	6.08 (4.99 to 7.51)	
Wirral	3,515	3.98	4.21 (3.61 to 4.91)	1.71	1.88 (1.33 to 2.75)	5.69	6.08 (5.03 to 7.36)	
Wokingham	1,698	*	4.22 (3.65 to 4.95)	*	1.69 (1.13 to 2.40)	5.30	6.00 (4.87 to 7.25)	
Wolverhampton	3,449	4.35	4.17 (3.50 to 4.78)	3.49	2.31 (1.57 to 3.47)	7.83	6.27 (5.23 to 7.62)	
Wyre Forest	1,104	*	4.13 (3.45 to 4.86)	*	1.91 (1.31 to 2.76)	3.62	5.90 (4.83 to 7.23)	
SCOTLAND								
Ayrshire & Arran	3,666	7.09	4.43 (3.66 to 5.57)	3.30	2.23 (1.54 to 3.42)	10.37	7.07 (5.70 to 9.58)	
Borders	1,141	*	4.17 (3.55 to 4.80)	*	1.81 (1.21 to 2.78)	3.51	5.91 (4.72 to 7.12)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Dumfries & Galloway	1,333	6.00	4.26 (3.64 to 4.98)	3.02	2.02 (1.33 to 3.20)	9.00	6.35 (5.22 to 7.98)	
Fife	3,852	3.37	4.16 (3.60 to 4.88)	1.82	1.87 (1.31 to 2.71)	5.19	5.95 (4.97 to 7.22)	
Forth Valley	3,032	3.63	4.18 (3.59 to 4.89)	1.32	1.78 (1.13 to 2.55)	4.95	5.93 (4.89 to 7.18)	
Grampian	6,155	4.55	4.30 (3.74 to 5.05)	1.96	1.99 (1.44 to 2.93)	6.50	6.40 (5.35 to 7.69)	
Greater Glasgow & Clyde	12,616	3.41	4.04 (3.46 to 4.67)	1.67	1.82 (1.37 to 2.40)	5.07	5.62 (4.72 to 6.59)	
Highland	2,948	*	4.20 (3.62 to 4.90)	*	1.72 (1.14 to 2.60)	4.41	5.87 (4.85 to 7.12)	
Lanarkshire	7,017	2.85	4.08 (3.43 to 4.67)	1.29	1.76 (1.24 to 2.49)	4.13	5.59 (4.63 to 6.87)	
Lothian	9,605	2.71	4.01 (3.26 to 4.71)	2.09	2.52 (1.71 to 3.86)	4.79	5.73 (4.82 to 6.76)	
Orkney	202	*	4.22 (3.62 to 4.98)	*	1.81 (1.21 to 2.85)	*	6.09 (4.98 to 7.49)	
Shetland	261	*	4.17 (3.49 to 4.88)	*	1.81 (1.17 to 2.72)	*	5.93 (4.74 to 7.20)	
Tayside	4,048	*	4.30 (3.64 to 5.24)	*	1.44 (0.93 to 2.16)	5.43	6.00 (4.91 to 7.20)	
Western Isles	246	*	4.17 (3.55 to 4.84)	*	1.80 (1.20 to 2.67)	*	5.93 (4.84 to 7.17)	
WALES								
Abertawe Bro Morgannwg University	5,559	3.96	4.17 (3.58 to 4.84)	1.44	1.69 (1.19 to 2.32)	5.40	5.90 (4.91 to 7.08)	
Aneurin Bevan	6,704	3.58	4.19 (3.65 to 4.73)	1.80	1.80 (1.29 to 2.47)	5.37	6.06 (5.13 to 7.26)	
Betsi Cadwaladr University	7,445	3.36	4.18 (3.62 to 4.72)	1.35	1.77 (1.26 to 2.50)	4.70	5.90 (4.87 to 7.01)	
Cardiff & Vale University	6,006	4.16	4.12 (3.55 to 4.71)	2.34	1.97 (1.44 to 2.75)	6.49	5.92 (4.84 to 7.03)	
Cwm Taf	3,512	4.27	4.20 (3.63 to 4.88)	1.72	1.76 (1.16 to 2.49)	5.98	6.06 (5.01 to 7.35)	
Hywel Dda	3,602	3.33	4.19 (3.53 to 4.84)	2.51	1.94 (1.39 to 2.81)	5.83	6.15 (5.05 to 7.56)	
Powys Teaching	1,258	3.97	4.21 (3.62 to 4.99)	4.79	1.94 (1.27 to 2.87)	8.74	6.15 (5.03 to 7.49)	
NORTHERN IRELAND								
Belfast	4,740	4.22	4.19 (3.57 to 4.84)	2.12	1.91 (1.37 to 2.62)	6.33	6.07 (5.08 to 7.24)	
Northern	5,836	5.48	4.40 (3.74 to 5.50)	2.24	2.10 (1.46 to 3.02)	7.71	6.77 (5.50 to 8.38)	
South Eastern	4,343	4.37	4.25 (3.67 to 5.05)	2.54	2.18 (1.46 to 3.17)	6.91	6.40 (5.31 to 7.86)	
Southern	5,376	2.60	4.08 (3.40 to 4.66)	1.68	1.86 (1.33 to 2.60)	4.28	5.71 (4.66 to 6.82)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Western	3,956	5.06	4.27 (3.71 to 5.09)	3.56	2.37 (1.61 to 3.80)	8.59	6.68 (5.49 to 8.57)	
CROWN DEPENDENCIES								
Isle Of Man	767	*	4.14 (3.51 to 4.80)	*	1.82 (1.14 to 2.84)	5.22	5.81 (4.56 to 7.14)	
Channel Islands Δ	1,695	*	-	*	-	4.13	-	

† per 1,000 total births
‡ per 1,000 live births
§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
◊ excluding January 2013 births for England, Wales and Isle of Man due to unavailability of NN4B data
Δ stabilised & adjusted rate not calculated due to unavailability of individual level data
* entry suppressed because of small number of deaths
# colours represent variation from UK average extended perinatal mortality rate, see page 19
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

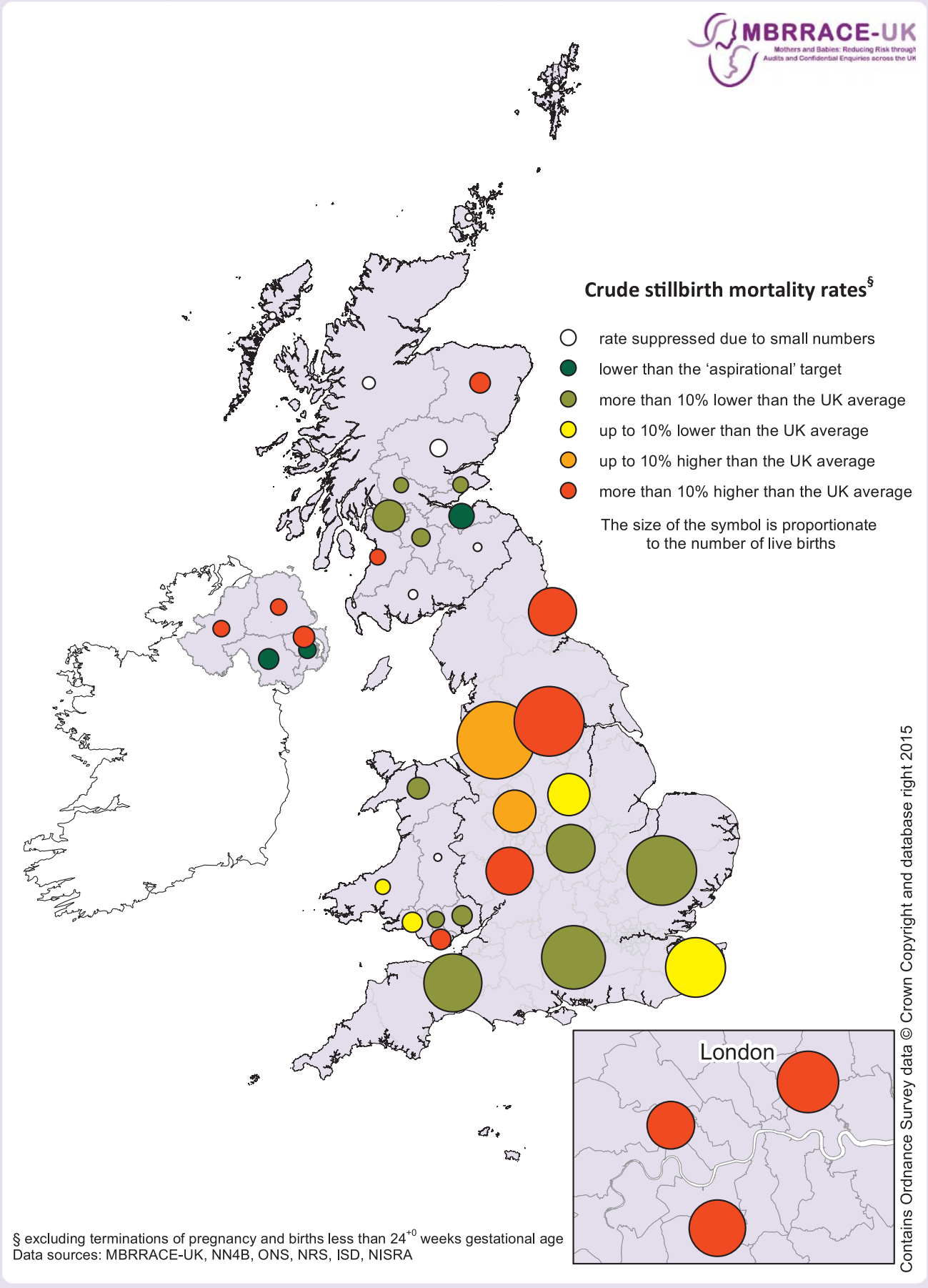
4.2. Rates of mortality by service delivery organisation based on place of birth

The data for the service delivery organisations (ODNs in England, Health Boards in Wales and Scotland and the Health and Social Care Trusts in Northern Ireland) are perhaps the most striking in terms of the widely varying stillbirth and neonatal mortality rates. Within England the relevant birth population sizes are large and provide sufficient statistical power to fully reflect the impact of the stabilisation and adjustment process. The effect is less apparent elsewhere in the UK as the birth populations covered remain relatively modest.

Those responsible for the management of ODNs, Health Boards, and Health and Social Care Trusts with high mortality rates will need to work with their relevant individual care provider organisations to try to understand more fully the reason for their high rates of mortality (see Section 4.3). It is important to remember that, outside of England, transfers between individual care provider organisations might mean that high-risk cases are concentrated in Trusts and Health Boards which provide the highest levels of obstetric and neonatal care.

The current data highlight the importance of Trusts and Health Boards fully engaging with the MBRRACE-UK data collection in terms of data quality and completeness in order that the process of stabilisation and adjustment of mortality rates is as precise and accurate as possible. This applies both to the outcomes for delivery organisations and, when available, information about the performance of individual Trusts and hospitals.

Figure 9: Crude stillbirth mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 10: Stabilised & adjusted stillbirth mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013

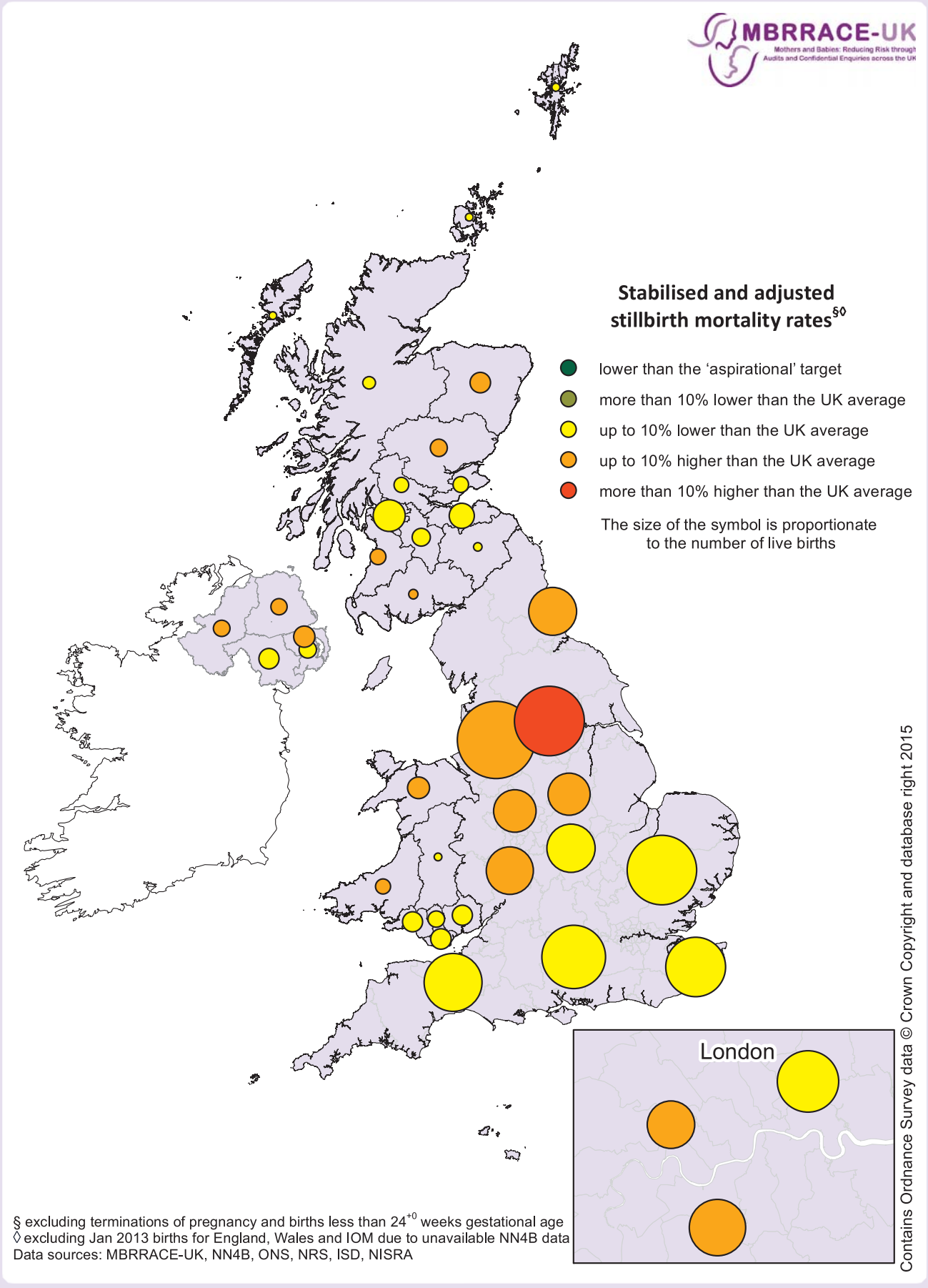
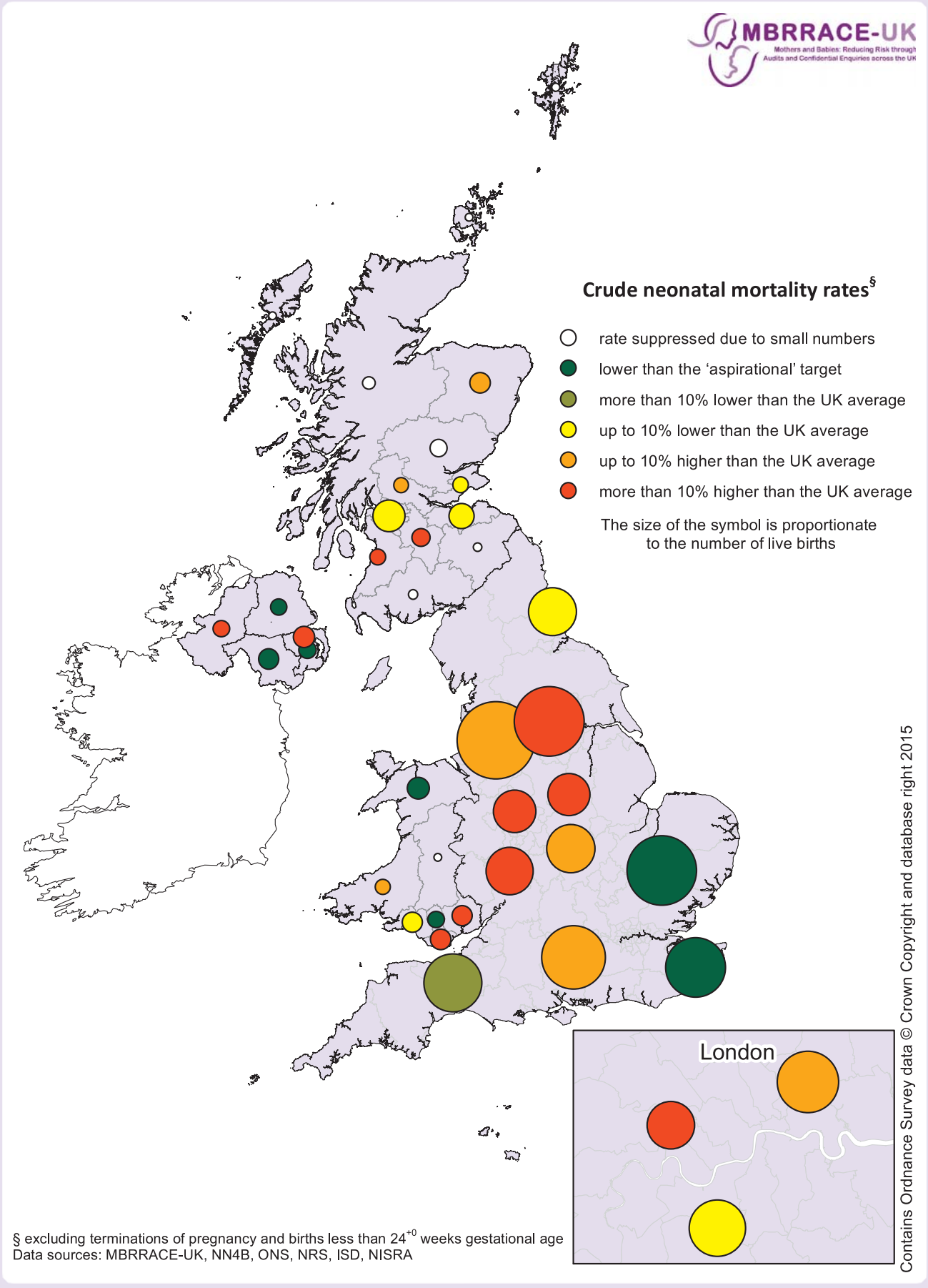


Figure 11: Crude neonatal mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 12: Stabilised & adjusted neonatal mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013

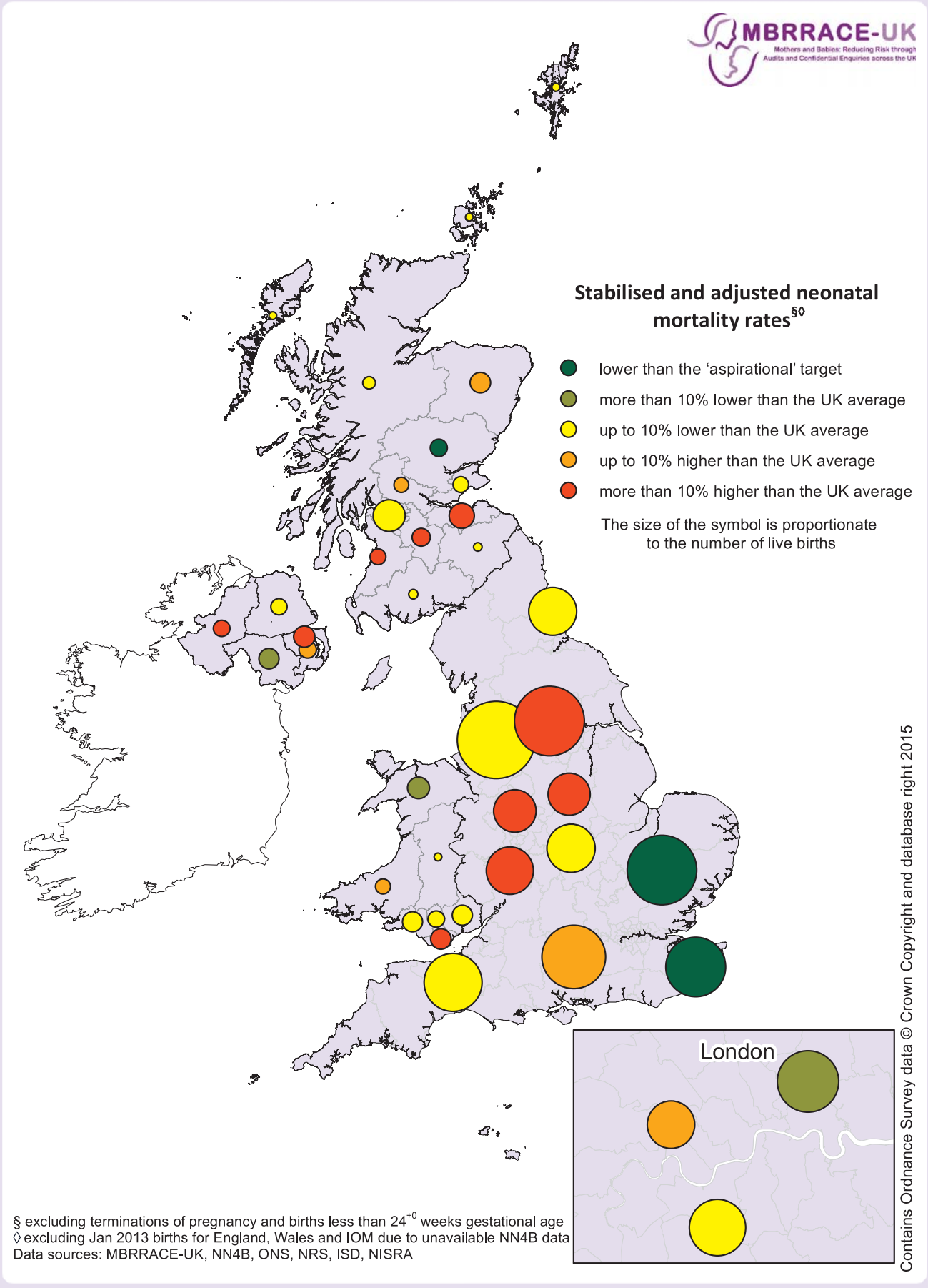
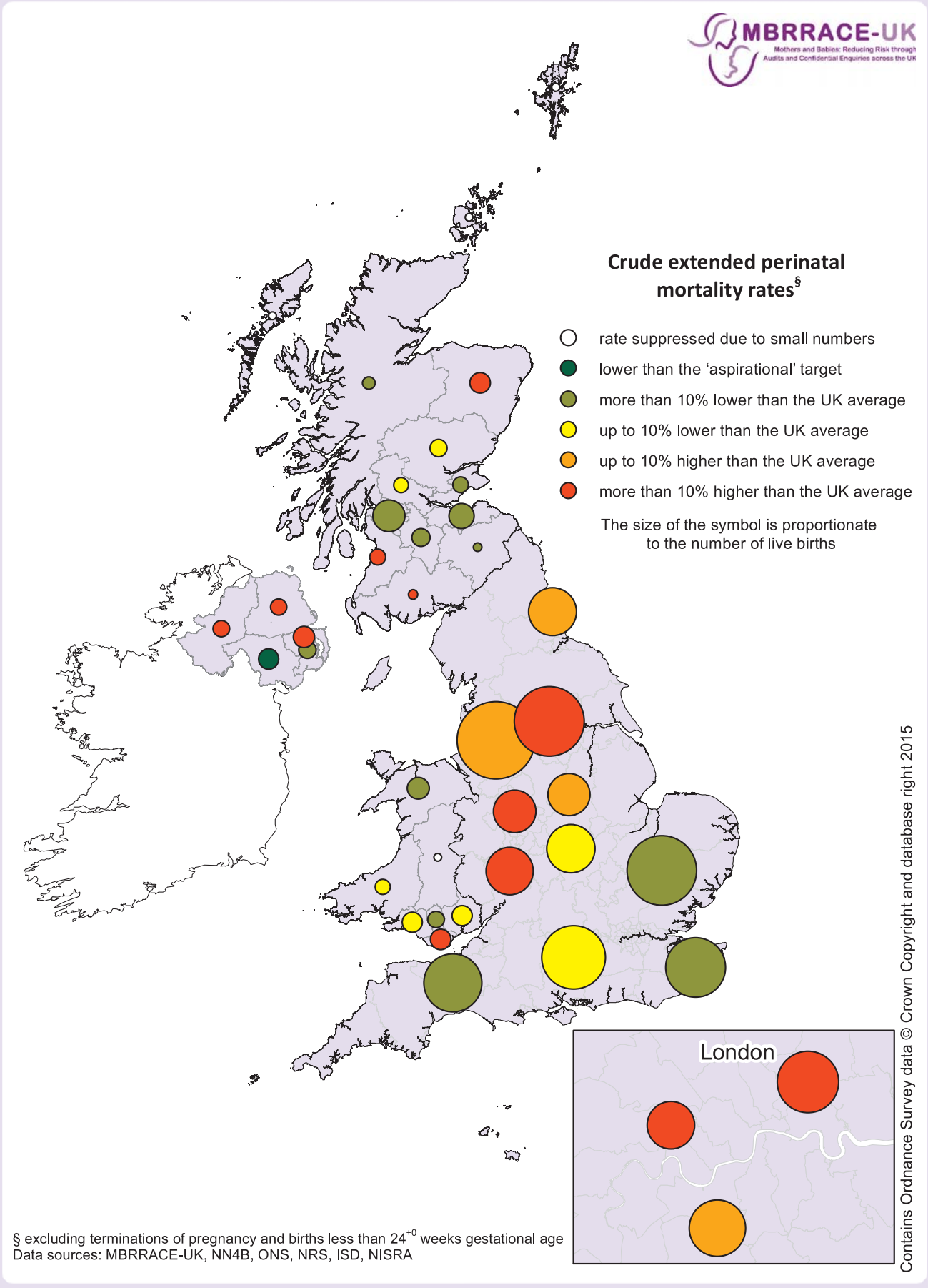


Figure 13: Crude extended perinatal mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 14: Extended perinatal stabilised & adjusted mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013

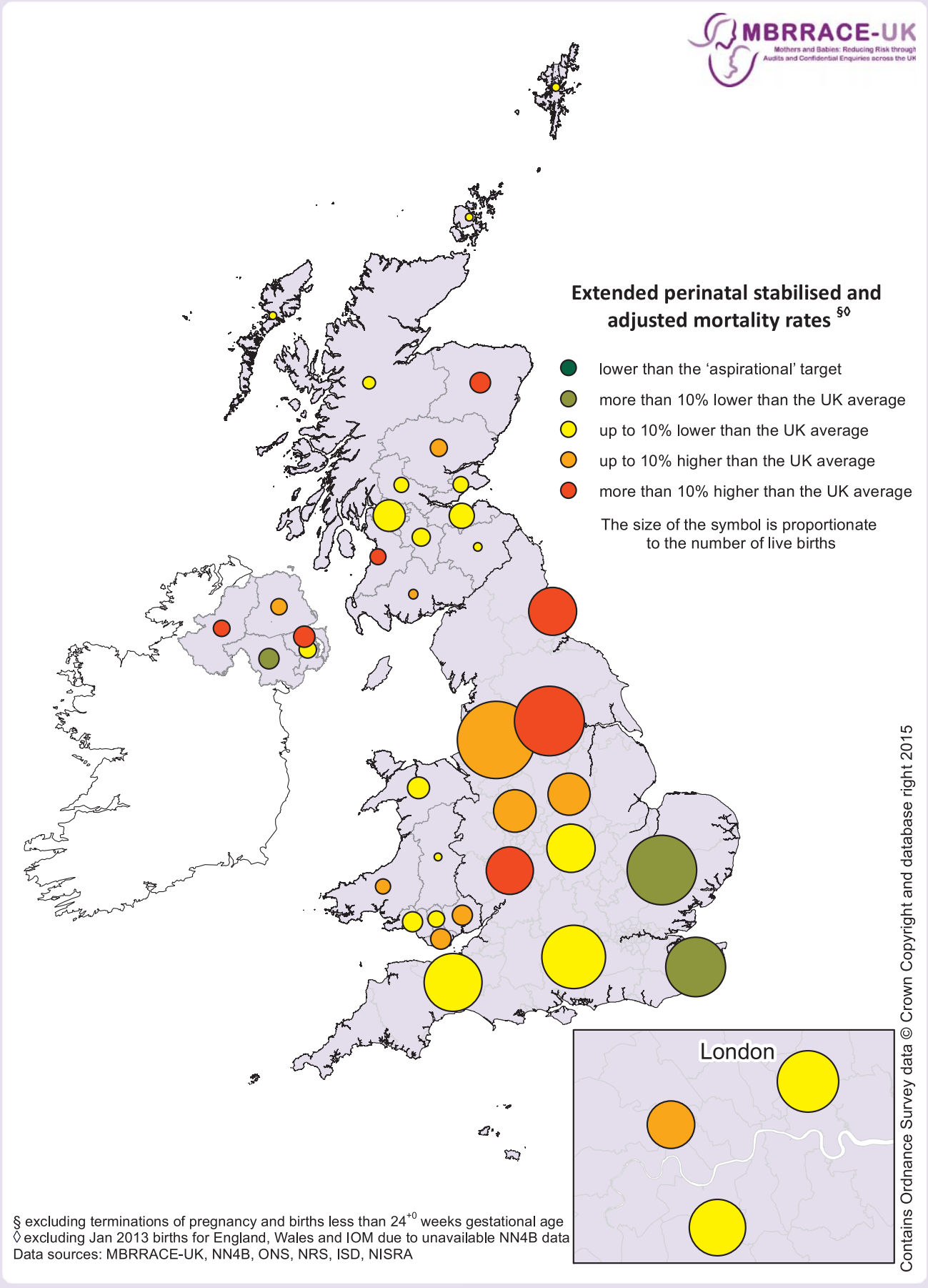


Table 5: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by Operational Delivery Network (England), Health Board (Scotland & Wales), and Health & Social Care Trust (Northern Ireland) based on place of birth: United Kingdom, for births in 2013

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
ENGLAND								
Central	32,188	3.70	3.98 (3.44 to 4.60)	1.90	1.84 (1.49 to 2.36)	5.59	5.66 (4.87 to 6.59)	
East Of England	68,662	3.44	3.88 (3.35 to 4.54)	1.13	1.29 (1.02 to 1.68)	4.56	4.88 (4.23 to 5.60)	
North Central & East London	52,976	4.78	4.03 (3.57 to 4.54)	1.93	1.62 (1.30 to 2.04)	6.70	5.55 (4.82 to 6.37)	
North West	83,664	4.60	4.24 (3.81 to 4.63)	1.91	1.75 (1.48 to 2.12)	6.50	6.09 (5.44 to 6.86)	
North West London	31,767	4.97	4.24 (3.73 to 4.74)	2.53	1.95 (1.53 to 2.37)	7.49	6.28 (5.46 to 7.18)	
Northern	33,091	4.77	4.63 (3.91 to 5.37)	1.85	1.78 (1.39 to 2.25)	6.62	6.77 (5.81 to 7.76)	
South East Coast	49,713	3.82	4.08 (3.58 to 4.54)	1.25	1.43 (1.12 to 1.88)	5.07	5.39 (4.68 to 6.26)	
South London	44,588	4.82	4.23 (3.79 to 4.68)	1.78	1.77 (1.42 to 2.25)	6.59	5.85 (5.12 to 6.59)	
South West	47,802	3.56	4.02 (3.50 to 4.53)	1.64	1.70 (1.38 to 2.17)	5.19	5.55 (4.87 to 6.37)	
Southern West Midlands	31,890	5.14	4.41 (3.86 to 4.98)	2.40	2.15 (1.71 to 2.74)	7.53	6.69 (5.81 to 7.73)	
Staffordshire, Shrops & Black Country	25,773	4.46	4.24 (3.77 to 4.75)	2.42	2.11 (1.66 to 2.69)	6.87	6.38 (5.47 to 7.39)	
Thames Valley & Wessex	56,802	3.77	4.03 (3.48 to 4.54)	2.00	2.03 (1.65 to 2.50)	5.76	5.95 (5.24 to 6.73)	
Trent	24,921	4.21	4.29 (3.76 to 4.86)	2.34	2.33 (1.74 to 3.03)	6.54	6.64 (5.71 to 7.58)	
Yorkshire & Humber	67,690	4.93	4.65 (4.07 to 5.23)	2.23	2.07 (1.72 to 2.51)	7.15	6.89 (6.03 to 7.73)	
SCOTLAND								
Ayrshire & Arran	3,523	7.10	4.50 (3.75 to 5.74)	2.86	2.13 (1.50 to 3.10)	9.93	7.36 (5.66 to 10.09)	
Borders	1,086	*	4.20 (3.54 to 4.86)	*	1.86 (1.26 to 2.81)	3.68	5.91 (4.46 to 7.66)	
Dumfries & Galloway	1,259	*	4.31 (3.66 to 5.10)	*	1.82 (1.20 to 2.78)	7.15	6.29 (4.90 to 7.93)	
Fife	3,408	3.52	4.19 (3.59 to 4.83)	1.77	1.85 (1.28 to 2.61)	5.28	5.96 (4.65 to 7.44)	
Forth Valley	3,092	3.56	4.20 (3.59 to 4.88)	1.95	1.95 (1.37 to 2.88)	5.50	6.05 (4.82 to 7.77)	
Grampian	6,092	4.92	4.39 (3.72 to 5.14)	1.98	2.00 (1.40 to 2.75)	6.89	6.69 (5.38 to 8.29)	
Greater Glasgow & Clyde	14,707	3.40	4.02 (3.41 to 4.62)	1.84	1.84 (1.42 to 2.44)	5.24	5.60 (4.63 to 6.74)	

Organisation	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Highland	2,281	*	4.21 (3.59 to 4.96)	*	1.72 (1.12 to 2.51)	3.95	5.77 (4.36 to 7.39)	
Lanarkshire	4,754	3.16	4.15 (3.50 to 4.77)	2.32	2.05 (1.45 to 3.01)	5.47	6.05 (4.90 to 7.60)	
Lothian	8,890	2.92	4.03 (3.31 to 4.60)	1.81	2.34 (1.58 to 3.57)	4.72	5.58 (4.40 to 6.71)	
Orkney	130	*	4.21 (3.55 to 4.91)	*	1.85 (1.19 to 2.87)	*	6.00 (4.53 to 7.74)	
Shetland	149	*	4.21 (3.56 to 4.92)	*	1.85 (1.21 to 2.90)	*	5.99 (4.33 to 8.01)	
Tayside	4,331	*	4.40 (3.76 to 5.28)	*	1.48 (0.95 to 2.20)	6.00	6.21 (5.03 to 7.72)	
Western Isles	201	*	4.20 (3.60 to 4.94)	*	1.85 (1.15 to 2.88)	*	5.9 (4.57 to 7.72)	
WALES								
Abertawe Bro Morgannwg University	5,773	3.98	4.19 (3.62 to 4.84)	1.74	1.70 (1.18 to 2.30)	5.72	5.91 (4.77 to 7.31)	
Aneurin Bevan	6,019	3.66	4.22 (3.61 to 4.85)	2.17	1.84 (1.35 to 2.54)	5.81	6.13 (4.91 to 7.50)	
Betsi Cadwaladr University	6,930	3.61	4.23 (3.62 to 4.83)	1.01	1.67 (1.13 to 2.33)	4.62	5.82 (4.64 to 7.10)	
Cardiff & Vale University	5,970	4.69	4.20 (3.61 to 4.90)	2.86	2.10 (1.54 to 2.95)	7.54	6.34 (5.22 to 7.87)	
Cwm Taf	4,002	3.50	4.16 (3.50 to 4.88)	1.00	1.69 (1.11 to 2.40)	4.50	5.67 (4.43 to 7.08)	
Hywel Dda	3,228	4.03	4.27 (3.69 to 5.05)	1.87	1.89 (1.31 to 2.65)	5.89	6.32 (5.02 to 7.91)	
Powys Teaching	191	*	4.20 (3.58 to 4.96)	*	1.85 (1.21 to 2.83)	*	5.97 (4.43 to 7.70)	
NORTHERN IRELAND								
Belfast	6,404	5.78	4.45 (3.77 to 5.43)	4.87	2.68 (1.79 to 3.94)	10.62	8.13 (6.27 to 10.94)	
Northern	4,000	5.50	4.40 (3.76 to 5.35)	1.26	1.79 (1.27 to 2.58)	6.75	6.51 (5.22 to 8.48)	
South Eastern	4,328	2.77	4.12 (3.47 to 4.83)	1.39	1.93 (1.27 to 2.89)	4.16	5.65 (4.44 to 7.03)	
Southern	5,777	2.25	4.02 (3.28 to 4.66)	0.87	1.65 (1.07 to 2.36)	3.12	5.14 (3.82 to 6.61)	
Western	3,942	5.33	4.35 (3.73 to 5.13)	2.81	2.17 (1.51 to 3.17)	8.12	6.80 (5.46 to 8.85)	

† per 1,000 total births
‡ per 1,000 live births
§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
◊ excluding January 2013 births for England and Wales due to unavailability of NN4B data
* entry suppressed because of small number of deaths
# colours represent variation from UK average extended perinatal mortality rate, see page 19
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

4.3. How local organisations should respond to these data

These data are intended to give local teams an insight into clinical performance based not just on crude mortality rates but also having taken account of at least some important socio-demographic factors that influence pregnancy outcomes. However, the reported mortality rates have been referenced against the UK average as a benchmark. This was chosen for convenience in this first report. NHS England, NHS Scotland, NHS Wales, Health and Social Care in Northern Ireland, in conjunction with professional bodies responsible for clinical standards in the relevant specialties aspiring to significant improvement in the UK's performance may feel this benchmark is inadequate. For example, if the benchmark used had been the comparable rates in Sweden then virtually the whole of the United Kingdom would have been covered in red dots.

However, in terms of this report and the benchmark employed the following is suggested:

a) For those whose performance falls in the red band ● a more detailed local review is indicated to try and assess the deaths that were potentially avoidable or to investigate local factors that might explain the high rate. For example, data quality might not be sufficiently good to allow for the effect of concentrations of mothers who for legal, cultural or religious reasons choose to carry babies affected by severe congenital anomalies to term. A part of the review process will involve interaction with local clinical teams. In some cases this will be limited to a handful of units but in other parts of the UK it will involve multiple delivery sites. To date we have not had the capacity to support this type of review by providing stabilised & adjusted mortality rates for individual provider organisations. However, we will be able to provide this type of additional insight later in the autumn of 2015.

MBRRACE-UK Recommendation ●

All organisations which have been identified as having a stabilised & adjusted stillbirth, neonatal or extended perinatal mortality rate that fall in the red band should conduct a local review in order to check their data and to identify factors which might be responsible for their reported high stabilised & adjusted mortality rate.

b) For those in the amber band ● reviews should be carried out. However, the decision to carry out more detailed local review should also reflect local aspiration in terms of performance, i.e. whether avoiding being a rate 10% higher than the national average is good enough even when local socio-demographic factors have been taken into account. For those who choose to wait for further data in order to gain a better perspective over time, encouraging local delivery sites to fully engage with MBRRACE-UK data collection will ensure that, going forward, estimates are more precise.

MBRRACE-UK Recommendation ●

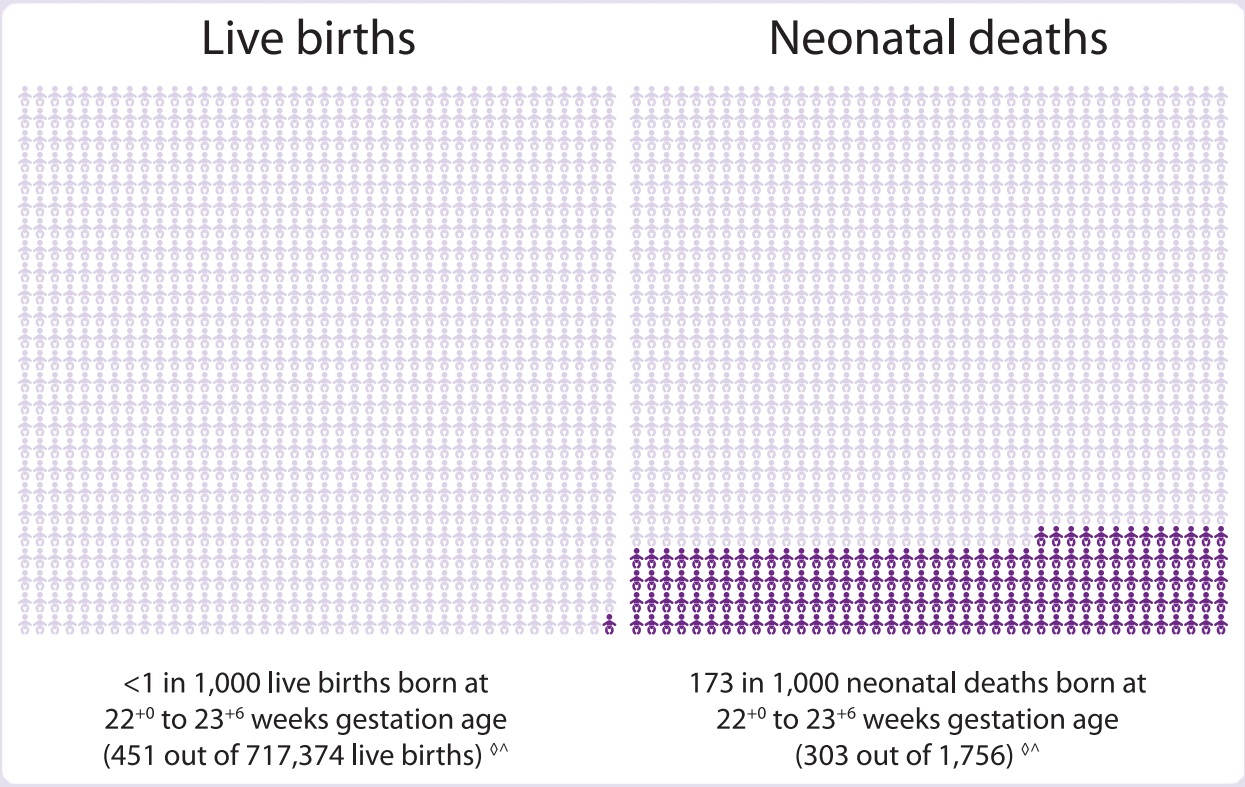
Organisations whose stabilised & adjusted stillbirth, neonatal or extended perinatal mortality rate fall within the amber band should similarly consider carrying out a local review.

c) For those who are in the yellow band ● (and perhaps even green ●) any additional local review would be justified if the local aspiration is not simply to be average for the UK but to seek levels of clinical performance that compare with those achieved in other parts of the developed world, particularly the Nordic countries.

5. Mortality among babies born at less than 24 weeks gestational age

While births at 22^{+0} to 23^{+6} weeks gestational age are extremely rare (less than 1 in a 1,000 babies), nearly 20% of all neonatal deaths (173 out of every 1,000 neonatal deaths) in the UK occur among babies born at this gestational age (Figure 15). The outcomes for these babies are extremely poor with 72% of live births ending in a neonatal death.

Figure 15: Proportion of live births and neonatal deaths occurring from 22^{+0} to 23^{+6} weeks gestational age compared to all gestational ages: United Kingdom, for births in 2013



^ excluding terminations of pregnancy
◊ excluding January 2013 births for England and Wales due to unavailability of NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA
image created by Ferran Brown from the Noun Project

The original intention of MBRRACE-UK was to be able to report all deaths from 22^{+0} weeks gestational age onwards as recommended by the WHO (16), which would allow direct comparison with other European countries and the mortality statistics reported by EUROSTAT. However, unlike many other European countries which have statutory registration of all births from 22^{+0} weeks gestational age, in the UK statutory registration differs between live and stillbirths with no legal requirement to register fetal losses before 24^{+0} weeks gestational age. In the UK there is wide variation in the birth certification practice for babies born before 24^{+0} weeks gestational age: (3) that is, whether a clinician considers a baby born before 24^{+0} weeks as:

- a late fetal loss and, therefore, not statutorily registered as either a birth or death;
- a live birth ending in a neonatal death which is then registered as both a birth and as a death.

These variations in practice are evident within the MBRRACE-UK data and impact on perinatal mortality rates. Table 6 shows the percentage of neonatal deaths which were born at 22^{+0} to 23^{+6} weeks gestational age across the UK by country, and by ODN for England. While the percentages were similar across the four countries, at the ODN level they varied widely from l"… less than 1 in 9 in Trent to over 1 in 4 in South London and the East of England.

The size of this disparity suggests that it is likely to be predominantly due to differences in how babies born between 22^{+0} to 23^{+6} weeks are registered rather than higher rates of deliveries at these gestational ages. Therefore, to reliably report mortality, extended perinatal mortality rates must be calculated using the same gestational age cut-off for both neonatal deaths and late fetal losses.

Table 6: Number and percentage of neonatal deaths of babies born at 22^{+0} to 23^{+6} weeks gestational age compared to babies born at ≥24^{+0} weeks gestational age by country and Operational Delivery Network: United Kingdom, for births in 2013

Place of birth	Neonatal deaths 22^{+0}-23^{+6} weeks gestational age ^	Neonatal deaths ≥24^{+0} weeks gestational age ^	Percentage of neonatal deaths 22^{+0}-23^{+6} weeks gestational age
England	265	1,236	18%
Wales	9	53	15%
Scotland	15	92	14%
Northern Ireland	14	72	16%
Operational Delivery Networks (England)			
Central	16	61	21%
East of England	28	75	27%
North Central and East London	19	99	16%
North West	29	164	15%
North West London	15	72	17%
Northern	10	65	13%
South East Coast	14	69	17%
South London	32	83	28%
South West	16	83	16%
Southern West Midlands	27	91	23%
Staffordshire, Shropshire and Black Country	7	56	11%
Thames Valley and Wessex	20	120	14%
Trent	7	59	11%
Yorkshire and Humber	25	139	15%

^ excluding terminations of pregnancy
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

The MBRRACE-UK data reporting aimed to include fetal losses at 22^{+0} to 23^{+6} weeks gestational age in addition to all officially registered neonatal deaths and stillbirths. It was vital to assess whether Trusts and Health Boards had entered data on all late fetal losses since systematic under-reporting of these deaths would bias the calculated mortality rates. The expected total number of births at this gestational age (i.e. both live births and fetal losses) can be estimated robustly based on a comparison with the number of registered deaths at 24^{+0} to 25^{+6} weeks gestational age. Using data from the EPICURE study, (17) approximately four births at 22^{+0} to 23^{+6} weeks gestational age are expected for every five births at 24^{+0} to 25^{+6} weeks. For 2013 there were 874 births at 22^{+0} to 23^{+6} weeks gestational age reported to MBRRACE-UK compared to 1,477

births at 24^{+0} to 25^{+6} weeks (Table 7). This suggests that late fetal losses are under-reported by between 251 and 388 cases, i.e. between 37% and 48% of late fetal losses at 22^{+0} to 23^{+6} weeks gestational age were not reported to MBRRACE-UK.

Table 7: Reported and expected late fetal losses at 22^{+0} to 23^{+6} weeks and 95% confidence intervals: United Kingdom, for births in 2013

	Reported births ^		Expected births 22^{+0}-23^{+6} weeks gestational age (80% of 24^{+0}-25^{+6} weeks)	Expected unreported late fetal losses
	24^{+0}-25^{+6} weeks gestational age	22^{+0}-23^{+6} weeks gestational age		
Live births	1,081	453		
Stillbirths	396	421		
Total births	1,477	874	1,192 95% CI (1,125 to 1,262)	318 95% CI (251 to 388)

^ excluding terminations of pregnancy
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

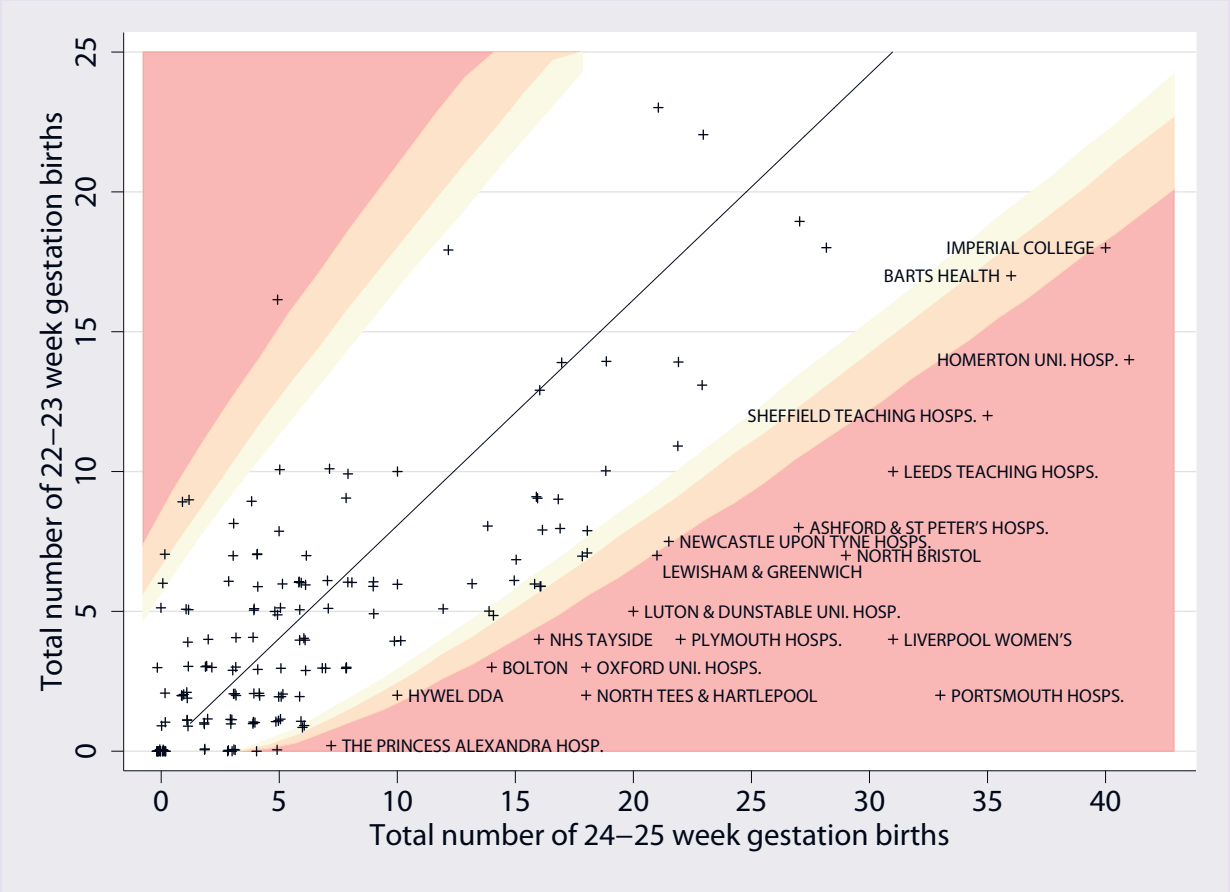
In Figure 16 the number of births between 22^{+0} and 23^{+6} and between 24^{+0} and 25^{+6} weeks gestational age reported for each Trust and Health Board are shown. The majority of Trusts and Health Boards reported a number of births between 22^{+0} and 23^{+6} weeks gestational age similar to that which would be expected (white area of the graph). However, there was a high number of Trusts and Health Boards falling in the lower amber and red areas which have significantly lower rates of births between 22^{+0} and 23^{+6} weeks gestational age than expected; most likely due to the under-reporting of late fetal losses. The Trusts and Health Boards highlighted as having low rates should scrutinise the reporting of babies born at these early gestational ages to MBRRACE-UK and develop strategies to address this problem in the future.

Due to the possible poor reporting of late fetal losses by some Trusts and Health Boards in the first year of data collection, the decision was taken to concentrate on reporting for births from 24^{+0} weeks gestational age onwards in this report to ensure the mortality rates produced are transparent and reflect real differences rather than variations in death registration and reporting practices. By using this gestational age cut-off, the number of neonatal deaths is reduced by over 300 which led to a decrease in the overall neonatal and extended perinatal mortality rates of approximately 0.4 per 1,000 births. This must be borne in mind when interpreting the results presented in this report. The aim of MBRRACE-UK is still to report for all births from 22^{+0} weeks gestational age onwards to allow international comparisons. However, in order to obtain unbiased estimates of mortality rates every fetal death at 22^{+0} to 23^{+6} weeks gestational age must be reported to MBRRACE-UK. The full co-operation of all Trusts and Health Boards is essential to achieving this aim.

MBRRACE-UK Recommendation

All organisations responsible for maternity services should report to MBRRACE-UK all births between 22^{+0} and 23^{+6} weeks gestational age who do not survive the neonatal period.

Figure 16: Number of reported births at 22^{+0} to 23^{+6} weeks and 24^{+0} to 25^{+6} weeks gestation by Trust or Health Board with expected 90%, 95% and 99% confidence intervals: United Kingdom, for births in 2013



Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

6. Factors affecting perinatal mortality

Information concerning the main known risk factors for stillbirth, neonatal death and extended perinatal mortality is reported through the MBRRACE-UK on-line data collection system. In this chapter an analysis of individual mother and baby characteristic is presented. Issues of socio-demographic characteristics or population differences (case-mix) are important when considering the variation in stillbirth, neonatal mortality and extended perinatal mortality rates for different populations. However, due to the limited availability of information about mother and baby characteristics in routine denominator datasets for all births, two sets of tables are presented. First, mother (Table 8 and Table 9) and baby (Table 10 and Table 11) characteristics for which information for 2013 is available for the total population of births are presented as crude population mortality rates and rate ratios. Some of these factors have been used in the stabilised & adjusted rates of stillbirth, neonatal mortality, and extended perinatal mortality rates presented in Chapter 4. Second, the proportion of deaths are shown by individual mother's socio-demographic (Table 12), lifestyle (Table 13) and pregnancy (Table 14) risk factors for which data are available for deaths alone and cannot, therefore, be used in the adjustment for population differences as similar individual based data are not available for all UK births.

6.1. Mortality rates and ratios of mortality rates: mothers' characteristics

Mother's age

Increased rates of stillbirth, neonatal mortality and extended perinatal mortality were seen in both the youngest (<20 years) and the oldest (>40 years) mothers (Table 8). Whilst these mothers only account for a small proportion of the births in the UK (4.2% and 4.8% respectively), compared to mothers aged 30-34 years there was a 40% increased risk for all types of mortality for teenage mothers (ratios of mortality rates: stillbirth 1.40 (95% CI: 1.18 to 1.66); neonatal mortality 1.37 (95% CI: 1.06 to 1.76); extended perinatal mortality 1.39 (95% CI: 1.21 to 1.60)) and a slightly higher risk for the oldest mothers of around 50% (ratios of mortality rates: stillbirth 1.44 (95% CI: 1.21 to 1.70); neonatal mortality 1.55 (95% CI: 1.21 to 1.97); extended perinatal mortality 1.47 (95% CI: 1.28 to 1.69)) (Table 9). The UK is known to have relatively high proportions of both the youngest and oldest mothers (18) which may account for a proportion of the excess mortality seen over recent years when the UK is compared to other Western European populations (19). The decrease in the overall total period fertility rate for England and Wales in 2013 for mothers of all ages (20) showed the largest decreases in the proportion of pregnancies in teenage mothers, which may have played a role in the reduction in stillbirth and neonatal mortality rates seen in 2013.

Socio-economic deprivation

Socio-economic deprivation has a major impact on mortality rates (21, 22). The data in Table 8 and Figure 17 show quintiles of deprivation based on the mother's postcode using the Children in Low-Income Families Local Measure (23). This measure of deprivation was selected as it is available for the whole of the UK, unlike the Indices of Multiple Deprivation which are not directly comparable across the four countries of the UK. The quintiles were obtained by dividing all births into five groups ordered from the least to the most deprived with equal numbers of births in each quintile.

Table 8: Stillbirth, neonatal, and extended perinatal mortality rates by mother's age and socio-economic deprivation quintile of residence: United Kingdom and Isle of Man, for births in 2013

Mother's characteristic	Number (%) [§] [◊]						Mortality rate per 1,000 births [§] [◊]		
	Total births		Stillbirths		Neonatal deaths		Stillbirth[†]	Neonatal[‡]	Extended perinatal [†]
Mother's age (years)									
<20	30,319	(4.2)	160	(5.3)	71	(5.4)	5.28	2.35	7.62
20-24	122,991	(17.0)	505	(16.7)	248	(18.8)	4.11	2.02	6.12
25-29	201,870	(27.9)	794	(26.2)	331	(25.0)	3.93	1.65	5.57
30-34	218,900	(30.3)	825	(27.3)	375	(28.4)	3.77	1.72	5.48
35-39	115,030	(15.9)	539	(17.8)	219	(16.6)	4.69	1.91	6.59
≥40	29,512	(4.1)	160	(5.3)	78	(5.9)	5.42	2.66	8.06
Not known	4,023	(0.6)	45	(1.5)	0	(0.0)	11.19	0.00	11.19
Socio-economic deprivation quintile									
1 - Least deprived	152,051	(19.5)	473	(14.4)	234	(16.3)	3.11	1.54	4.65
2	156,879	(20.1)	580	(17.7)	253	(17.6)	3.70	1.62	5.31
3	153,274	(19.6)	635	(19.3)	294	(20.5)	4.14	1.93	6.06
4	154,375	(19.7)	785	(23.9)	292	(20.3)	5.09	1.90	6.98
5 - Most deprived	155,548	(19.9)	790	(24.1)	348	(24.2)	5.08	2.25	7.32
Not known	9,802	(1.3)	20	(0.6)	15	(1.0)	2.04	1.53	3.57

[†] per 1,000 total births
[‡] per 1,000 live births
[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[◊] excluding January 2013 births for England, Wales and Isle of Man due to unavailability of NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

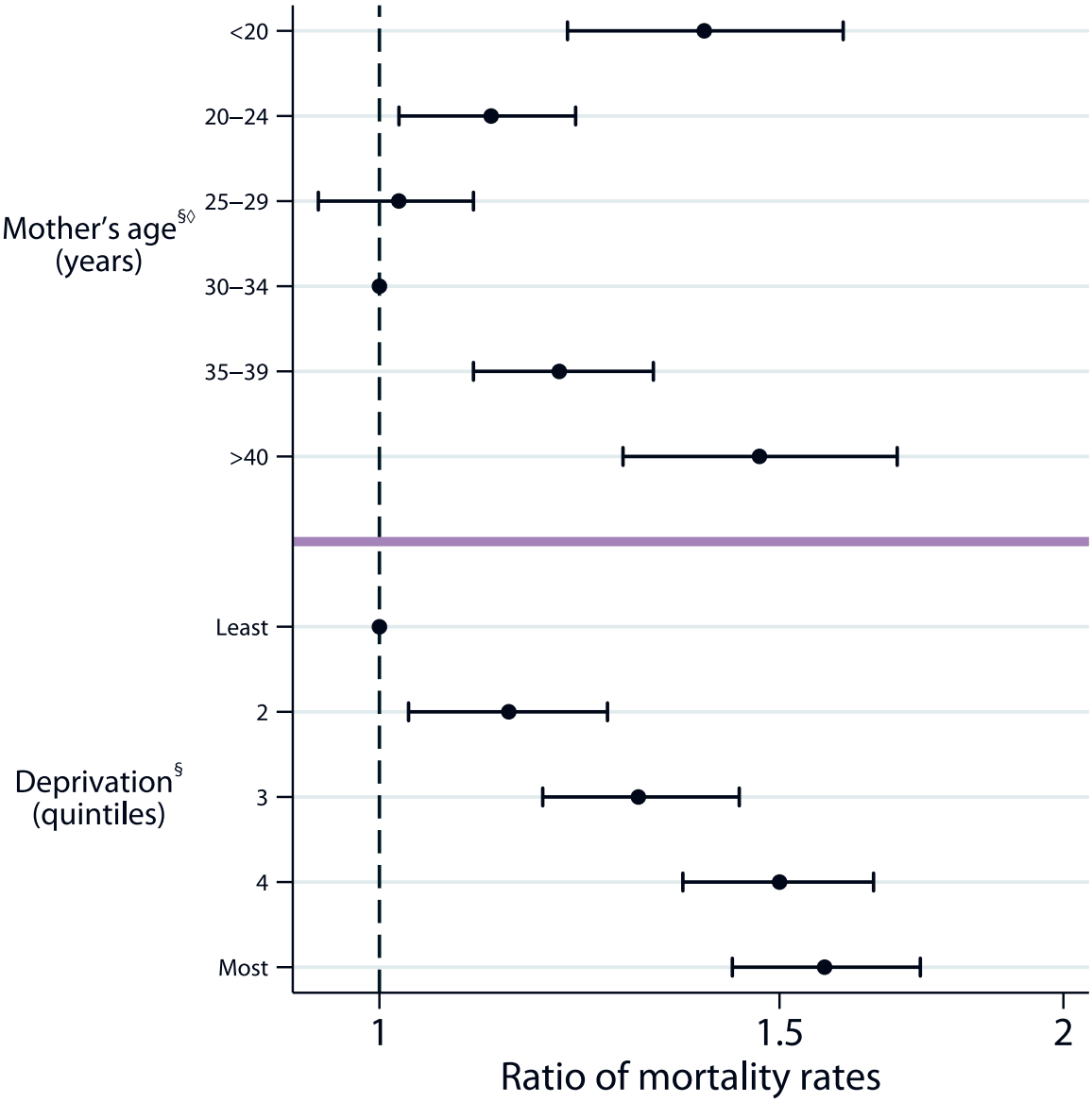
Table 9: Ratios of mortality rates for stillbirth, neonatal death and extended perinatal death by mother's age and socio-economic deprivation quintile of residence: United Kingdom and Isle of Man, for births in 2013

	Ratio of mortality rates (RR) [§] [◊]		
	Stillbirth	Neonatal death	Extended Perinatal death
Mother's age (years)			
<20	1.40 (1.18 to 1.66)	1.37 (1.06 to 1.76)	1.39 (1.21 to 1.60)
20-24	1.09 (0.98 to 1.22)	1.18 (1.00 to 1.38)	1.12 (1.02 to 1.22)
25-29	1.04 (0.95 to 1.15)	0.96 (0.83 to 1.11)	1.02 (0.94 to 1.10)
30-34	referent	referent	referent
35-39	1.24 (1.12 to 1.39)	1.11 (0.94 to 1.31)	1.20 (1.10 to 1.32)
≥40	1.44 (1.21 to 1.70)	1.55 (1.21 to 1.97)	1.47 (1.28 to 1.69)
Socio-economic deprivation quintile			
1 - Least deprived	referent	referent	referent
2	1.19 (1.05 to 1.34)	1.05 (0.88 to 1.25)	1.14 (1.03 to 1.26)
3	1.33 (1.18 to 1.50)	1.25 (1.05 to 1.48)	1.30 (1.18 to 1.44)
4	1.63 (1.46 to 1.83)	1.23 (1.04 to 1.46)	1.50 (1.36 to 1.65)
5 - Most deprived	1.63 (1.46 to 1.83)	1.46 (1.23 to 1.72)	1.57 (1.43 to 1.73)

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[◊] excluding January 2013 births for England, Wales and Isle of Man due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Births to the mothers living in the most deprived areas were at between a 46% and 63% higher risk of poor outcome compared to the mothers in the least deprived areas: (ratios of mortality rates: stillbirth 1.63 (95% CI: 1.46 to 1.83); neonatal mortality 1.46 (95% CI: 1.23 to 1.72); extended perinatal mortality 1.57 (95% CI: 1.43 to 1.73)). There is also strong existing evidence of a link between the highest levels of deprivation and both poorer maternal health (24) and preterm delivery (25) leading to an increased risk of stillbirth, neonatal mortality and extended perinatal mortality.

Figure 17: Ratios of mortality rates with 95% confidence intervals for extended perinatal death by mother's age and socio-economic deprivation quintile of residence: United Kingdom and Crown Dependencies, for births in 2013



§ excluding terminations of pregnancy and births <24+0 weeks gestational age
◊ excluding Jan 2013 births for England and Wales due to unavailability of NN4B data
Data sources: MBRRACE–UK, NN4B, ONS, NRS, ISD, NISRA

6.2. Mortality rates and ratios of mortality rates: babies' characteristics

Sex of baby

As is usually the case, just over half of all births in 2013 were male (51.2%). Compared to female babies significantly higher rates of neonatal mortality and extended perinatal mortality were seen for males: (ratios of mortality rates: neonatal mortality 1.22 (95% CI: 1.09 to 1.35); extended perinatal mortality 1.07 (95% CI: 1.01 to 1.13)). However, for stillbirths the risk for males compared to females showed no difference (ratio of mortality rates: stillbirth 1.01 (95% CI: 0.94 to 1.09)).

Multiple births

Although multiple births only constituted 3% of the total births (twins 2.9%, higher order births 0.1%) they were associated with significantly high rates of mortality, in particular neonatal mortality which showed an almost fivefold increase for twins (ratio of mortality rates: neonatal mortality 4.86 (95% CI: 4.16 to 5.67 and over a twelve fold increase for triplets and higher order births (ratio of mortality rates: neonatal mortality 12.43 (95% CI: 7.19 to 21.46). Preterm delivery is a major factor in multiple birth and thus accounts for much of the excess mortality risk seen (26).

Ethnicity of baby

Whilst nearly three quarters of babies were defined as being of White ethnicity, there were a large number of births to other ethnic groups. It should be noted, however, that 7.0% of data for ethnicity was missing from the routine data for all UK births. Compared to babies of White ethnic origin, babies of Asian or Asian British and Black or Black British ethnic origin are known to be at a significantly increased risk of stillbirth and neonatal mortality (27). In 2013 babies of Black or Black British ethnicity were found to be at highest risk with well over a 50% higher risk of stillbirth or neonatal death compared with babies of White ethnicity: (ratios of mortality rates: stillbirth 1.84 (95% CI: 1.60 to 2.11); neonatal mortality 1.62 (95% CI: 1.30 to 2.01); extended perinatal mortality 1.77 (95% CI: 1.57 to 1.99)). Babies of Asian or Asian British ethnic origin also had significantly increased risks of between 46% and 64% higher: (ratios of mortality rates: stillbirth 1.64 (95% CI: 1.48 to 1.82); neonatal mortality 1.46 (95% CI: 1.25 to 1.72); extended perinatal mortality 1.59 (95% CI: 1.45 to 1.73)). There were no significant differences in the risk of stillbirth, neonatal mortality and extended perinatal mortality in babies described as mixed or multiple ethnicity compared to those of White ethnicity.

Gestational age

The well-established inverse relationship between gestational age and stillbirth, neonatal mortality and extended perinatal mortality rates is clearly demonstrated in Table 10 and Figure 19. While the group of preterm babies at the very highest risk are those born before 24^{+0} weeks gestational age, as discussed in Chapter 5, this group is excluded from these tables due to the variation in reporting of such deaths across the UK. Babies born between 24^{+0} and 27^{+6} weeks gestational age only constituted a very small proportion of all births (0.4%) but were associated with an extremely high risk of mortality compared to babies born at term, in particular neonatal mortality at these gestational ages was associated with a 200 fold increased risk compared to their term counterparts (ratios of mortality rates: stillbirth 118.15 (107.78 to 129.51); neonatal mortality 216.16 (190.43 to 245.36); extended perinatal mortality 133.17 (123.66 to 143.41)). At 28^{+0} to 31^{+6} weeks gestational age the risk of mortality compared to term babies was over 40 fold and similar for all types of mortality (ratios of mortality rates: stillbirth 43.84 (95% CI: 39.54 to 48.59); neonatal mortality 43.70 (95% CI: 37.14 to 51.42); extended perinatal mortality 42.74 (95% CI: 39.17 to 46.62)). The highest risk of mortality for the late and moderate preterm babies, 32^{+0} to 36^{+6} weeks gestational age, was for stillbirths (ratio of mortality rates 9.28 (95% CI: 8.49 to 10.15)). Rates for post term babies were not statistically different to those for term babies (ratios of mortality rates: stillbirth 0.75 (95% CI: 0.53 to 1.06); neonatal mortality 0.81 (95% CI: 0.49 to 1.34); extended perinatal mortality 0.77 (95% CI: 0.58 to 1.02)).

Table 10: Stillbirth, neonatal, and extended perinatal mortality rates by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight: United Kingdom and Crown Dependencies, for births in 2013

Baby's characteristic	Number (%) [§] [◊]						Mortality rate per 1,000 births [§] [◊]		
	Total births		Stillbirths		Neonatal deaths		Stillbirth [†]	Neonatal death [‡]	Extended perinatal death [†]
Sex									
Male	400,535	(51.2)	1,642	(50.0)	795	(55.4)	4.10	1.99	6.08
Female	380,225	(48.6)	1,540	(46.9)	621	(43.3)	4.05	1.64	5.68
Not known	1,169	(0.2)	101	(3.1)	20	(1.4)	86.40	18.73	103.51
Multiplicity									
1	754,519	(96.5)	3,068	(93.4)	1,240	(86.3)	4.07	1.65	5.71
2	22,918	(2.9)	207	(6.3)	182	(12.7)	9.03	8.01	16.97
≥3	642	(0.1)	8	(0.2)	13	(0.9)	12.46	20.50	32.71
Not known	3,850	(0.5)	0	(0.0)	1	(0.1)	0.00	0.26	0.26
Baby's Ethnicity									
White	521,696	(72.2)	1,993	(65.8)	900	(68.1)	3.82	1.73	5.55
Mixed, multiple	33,230	(4.6)	136	(4.5)	45	(3.4)	4.09	1.36	5.45
Asian, Asian British	69,441	(9.6)	436	(14.4)	175	(13.2)	6.28	2.54	8.80
Black, Black British	32,035	(4.4)	225	(7.4)	89	(6.7)	7.02	2.80	9.80
Other	13,812	(1.9)	64	(2.1)	33	(2.5)	4.63	2.40	7.02
Not known	52,431	(7.3)	174	(5.7)	80	(6.1)	3.32	1.53	4.84
Gestational age at birth (weeks)									
24^{+0}-27^{+6}	3,196	(0.4)	680	(22.5)	419	(31.7)	212.77	166.53	343.87
28^{+0}-31^{+6}	6,189	(0.9)	480	(15.9)	186	(14.1)	77.56	32.58	107.61
32^{+0}-36^{+6}	45,074	(6.2)	739	(24.4)	225	(17.0)	16.40	5.07	21.39
37^{+0}-41^{+6}	641,682	(88.8)	1,095	(36.2)	476	(36.0)	1.71	0.74	2.45
≥42^{+0}	26,504	(3.7)	34	(1.1)	16	(1.2)	1.28	0.60	1.89
Birthweight (g)									
<1,,500	7,987	(1.0)	1,307	(39.8)	617	(43.0)	163.64	92.37	240.89
1,500-2,499	42,746	(5.5)	728	(22.2)	272	(18.9)	17.03	6.47	23.39
2,500-3,499	367,373	(47.0)	893	(27.2)	370	(25.8)	2.43	1.01	3.44
3,500-4,499	282,401	(36.1)	295	(9.0)	134	(9.3)	1.04	0.47	1.52
≥4,500	11,737	(1.5)	23	(0.7)	12	(0.8)	1.96	1.02	2.98
Not known	69,685	(8.9)	37	(1.1)	31	(2.2)	0.53	0.45	0.98

[†] per 1,000 total births
[‡] per 1,000 live births
[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[◊] excluding January 2013 births for England, Wales and IOM due to unavailability of NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Birthweight

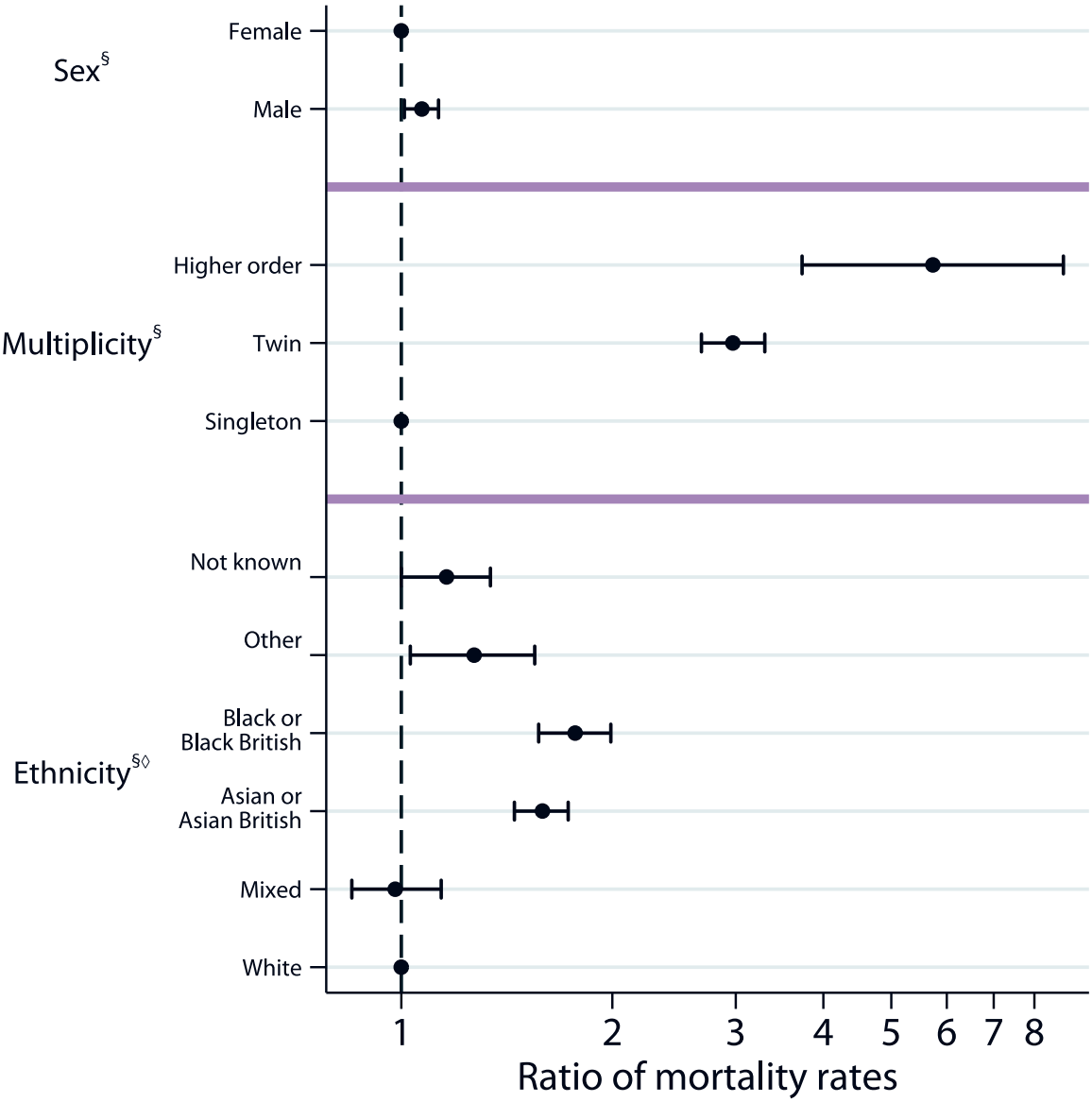
A similar inverse relationship was seen between birthweight and mortality rates. However, the largest babies (≥4,500g) were at a significantly increased risk of mortality compared to those of 3,500g to 4,499g (ratios of mortality rates: stillbirth 1.88 (95% CI: 1.23 to 2.87); neonatal mortality 2.16 (95% CI: 1.19 to 3.89); extended perinatal mortality 1.96 (95% CI: 1.39 to 2.77)).

Table 11: Ratios of mortality rates for stillbirth, neonatal death and extended perinatal death by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight: United Kingdom and Crown Dependencies, for births in 2013

Baby's characteristic	Ratio of mortality rates (RR) [§] [◊]		
	Stillbirth	Neonatal death	Extended Perinatal death
Sex			
Male	1.01 (0.94 to 1.09)	1.22 (1.09 to 1.35)	1.07 (1.01 to 1.13)
Female	referent	referent	referent
Indeterminate/Unknown	21.33 (17.44 to 26.09)	11.42 (7.32 to 17.82)	18.21 (15.16 to 21.87)
Multiplicity			
1	referent	referent	referent
2	2.22 (1.93 to 2.56)	4.86 (4.16 to 5.67)	2.97 (2.68 to 3.3)
≥3	3.06 (1.53 to 6.13)	12.43 (7.19 to 21.46)	5.73 (3.73 to 8.8)
Baby's ethnicity			
White	referent	referent	referent
Mixed, multiple	1.07 (0.90 to 1.27)	0.79 (0.58 to 1.06)	0.98 (0.85 to 1.14)
Asian	1.64 (1.48 to 1.82)	1.46 (1.25 to 1.72)	1.59 (1.45 to 1.73)
Black	1.84 (1.60 to 2.11)	1.62 (1.30 to 2.01)	1.77 (1.57 to 1.99)
Other	1.21 (0.95 to 1.56)	1.39 (0.98 to 1.96)	1.27 (1.03 to 1.55)
Refused/Not Known	1.03 (0.86 to 1.24)	1.43 (1.13 to 1.80)	1.16 (1.00 to 1.34)
Gestational age at birth (weeks)			
24^{+0}-27^{+6}	118.15 (107.78 to 129.51)	216.16 (190.43 to 245.36)	133.17 (123.66 to 143.41)
28^{+0}-31^{+6}	43.84 (39.54 to 48.59)	43.70 (37.14 to 51.42)	42.74 (39.17 to 46.62)
32^{+0}-36^{+6}	9.28 (8.49 to 10.15)	6.73 (5.78 to 7.85)	8.49 (7.86 to 9.17)
37^{+0}-41^{+6}	referent	referent	referent
≥42^{+0}	0.75 (0.53 to 1.06)	0.81 (0.49 to 1.34)	0.77 (0.58 to 1.02)
Birthweight (g)			
<1,500	156.65 (138.06 to 177.75)	194.45 (161.32 to 234.39)	158.57 (142.82 to 176.07)
1,500-2,499	16.30 (14.24 to 18.67)	13.63 (11.08 to 16.76)	15.40 (13.75 to 17.24)
2,500-3,499	2.33 (2.04 to 2.65)	2.13 (1.74 to 2.59)	2.26 (2.03 to 2.53)
3,500-4,499	referent	referent	referent
≥4,500	1.88 (1.23 to 2.87)	2.16 (1.19 to 3.89)	1.96 (1.39 to 2.77)

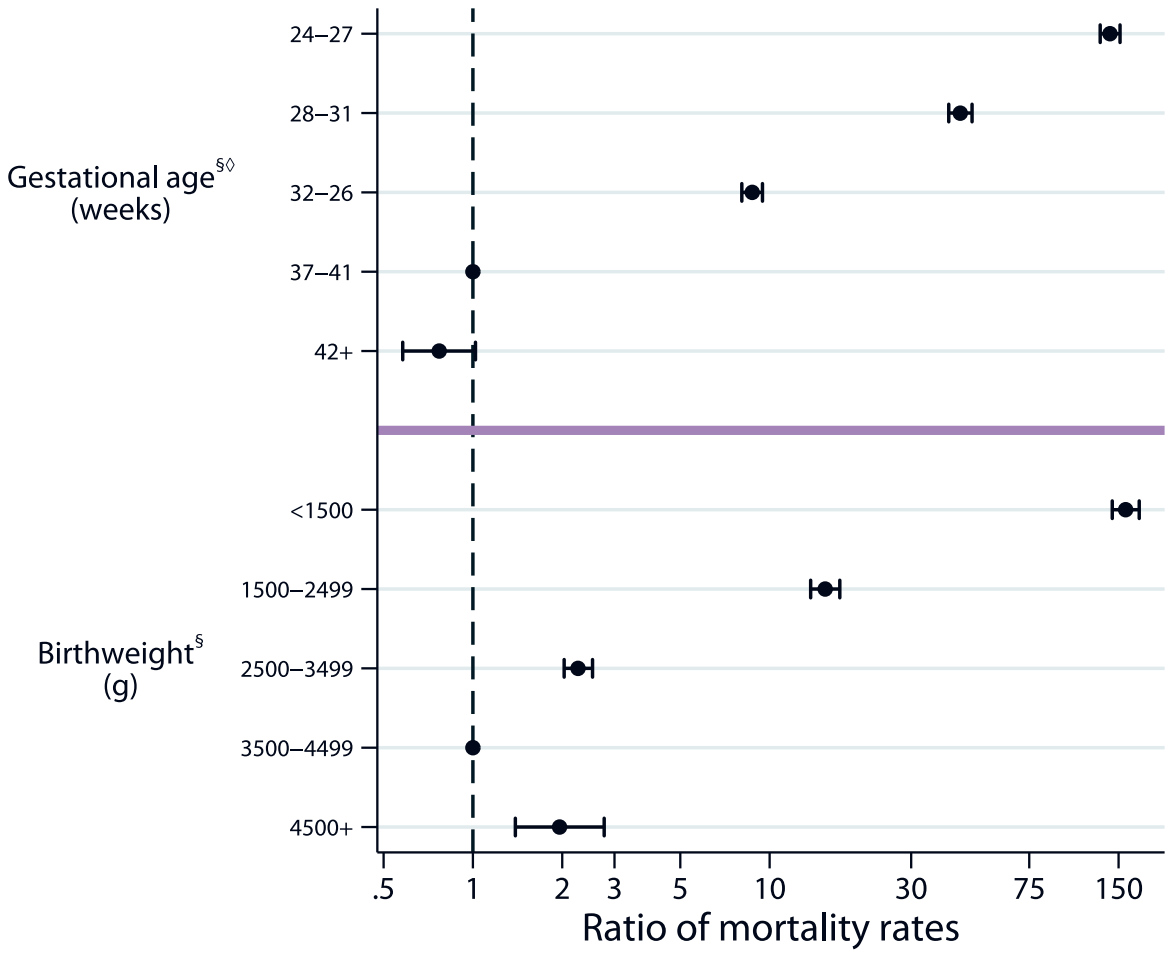
[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[◊] excluding January 2013 births for England, Wales and IOM due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 18: Ratios of mortality rates with 95% confidence intervals for extended perinatal death by baby's sex, ethnicity, and multiplicity of birth: United Kingdom and Crown Dependencies, for births in 2013



§ excluding terminations of pregnancy and births <24+0 weeks gestational age
◊ excluding January 2013 births for England and Wales due to unavailability of NN4B data
Data sources: MBRRACE–UK, NN4B, ONS, NRS, ISD, NISRA

Figure 19: Ratios of mortality rates with 95% confidence intervals of extended perinatal mortality rates by baby's gestational age and birthweight: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births <24+0 weeks gestational age
◊ excluding January 2013 births for England and Wales due to unavailability of NN4B data
Data sources: MBRRACE–UK, NN4B, ONS, NRS, ISD, NISRA

6.3. Mother's demographic, behavioural and pregnancy characteristics of deaths

Data are collected for a number of the mother's characteristics known to be associated with increased perinatal mortality rates but for which denominator data are not available and so these data can only be compared with other published data. However, a major issue for the data collection of these characteristics in this first MBRRACE-UK report is the completeness of the data: for stillbirths between 2% and 13% of these data items were missing and for neonatal deaths between 6% and 43%. The large proportion of missing data for the neonatal deaths seems to be dependent upon whether the data are only available in the maternal notes. If the death occurred in a different Trust or Health Board to the place of birth then the MBRRACE-UK record can be temporarily assigned to the place of birth using the MBRRACE-UK on-line system in order to facilitate data collection from the maternal notes. In this report an overview of mother's characteristics are provided. As the quality of data collection improves, future reports will explore trends in these characteristics over time.

Table 12: Stillbirths, neonatal deaths and extended perinatal deaths by mother's demographic characteristics: United Kingdom and Crown Dependencies, for births in 2013

Mother's characteristic	Stillbirths §		Neonatal deaths §		Extended perinatal deaths §	
	Number	(%)	Number	(%)	Number	(%)
Body Mass Index						
<16.0	4	(0.1)	0	(0.0)	4	(0.1)
16.0 to 18.4	87	(2.7)	24	(1.7)	111	(2.4)
18.5 to 24.9	1,268	(39.0)	341	(24.2)	1,609	(34.5)
25.0 to 29.9	917	(28.2)	233	(16.5)	1,150	(24.6)
30.0 to 34.9	479	(14.7)	132	(9.3)	611	(13.1)
≥35.0	306	(9.4)	76	(5.4)	382	(8.2)
Not known	194	(6.0)	606	(42.9)	800	(17.1)
Previous obstetric history*						
Never pregnant	1,212	(37.3)	544	(38.4)	1,756	(37.6)
Stillbirth or neonatal death	163	(5.0)	79	(5.6)	242	(5.2)
Pre 24 week loss	856	(26.3)	335	(23.7)	1,191	(25.5)
Surviving child	1,558	(47.9)	634	(44.8)	2,192	(46.9)
Not known	68	(2.1)	83	(5.9)	151	(3.2)
Consanguinity						
Unrelated	2,681	(82.4)	983	(69.6)	3,664	(78.5)
First cousins or closer	84	(2.6)	42	(3.0)	126	(2.7)
Other relation	56	(1.7)	20	(1.4)	76	(1.6)
Not known	434	(13.3)	367	(26.0)	801	(17.2)
Born in UK						
Yes	2,125	(65.3)	765	(54.2)	2,890	(61.9)
No	779	(23.9)	223	(15.8)	1,002	(21.5)
Not known	351	(10.8)	424	(30.0)	775	(16.6)
Time resident in the UK						
Less than 1 year	93	(2.9)	22	(1.6)	115	(2.5)
More than 1 year	2,792	(85.8)	948	(67.1)	3,740	(80.1)
Not known	370	(11.4)	442	(31.3)	812	(17.4)
Support during pregnancy						
Partner, cohabiting	2,650	(81.4)	1,053	(74.6)	3,703	(79.3)
Partner, not cohabiting	180	(5.5)	70	(5.0)	250	(5.4)
Family/friend	227	(7.0)	63	(4.5)	290	(6.2)
None	37	(1.1)	3	(0.2)	40	(0.9)
Not known	161	(4.9)	223	(15.8)	384	(8.2)
Employment status						
Employed or self-employed	1,756	(53.9)	629	(44.5)	2,385	(51.1)
Unemployed (looking for work)	455	(14.0)	144	(10.2)	599	(12.8)
Student	103	(3.2)	41	(2.9)	144	(3.1)
Looking after home/family	585	(18.0)	205	(14.5)	790	(16.9)
Permanently sick/disabled	11	(0.3)	6	(0.4)	17	(0.4)
Other	36	(1.1)	12	(0.8)	48	(1.0)
Not known	309	(9.5)	375	(26.6)	684	(14.7)

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
* multiparous mothers can be included in more than one category
Data sources: MBRRACE-UK

Maternal body mass index

Increased BMI is known to be associated with increased rates of stillbirth (27, 28). In 2013 nearly one quarter of all UK stillbirths were associated with a maternal body mass index of 30 or greater (Table 12). However, information for this data item in relation to neonatal death was incomplete, with 43% missing.

Previous obstetric history

Information on the mother's previous obstetric history was relatively complete with only 2% and 6% missing data items for stillbirths and neonatal deaths respectively. Over one third of both stillbirths and neonatal deaths were to primiparous women and 5.0% and 5.6% of women had a history of previous stillbirth or neonatal death respectively.

Consanguinity

Consanguinity in terms of first cousin marriages was reported for around 3% of deaths. However, this data item was incomplete for 13% stillbirths and 26% neonatal deaths.

Maternal country of birth, residency, support, and employment status

The number and proportion of deaths by whether mothers were born in the UK, how long they have been resident in the UK, whether they were supported during pregnancy and their employment status are presented in Table 12. Up to one third of the information relating to these data items was missing for the neonatal deaths, reducing the value of this information. However, only between 5% and 11% of these data items were missing for stillbirths; this suggests that information about these factors is readily available in the mother's notes. MBRRACE-UK data reporters are encouraged to provide complete data for all deaths.

Smoking during pregnancy

Around one fifth of the mothers of stillbirths (20%) and neonatal deaths (18%) smoked throughout pregnancy (Table 13), with a further 4% and 3% respectively of mothers having given up smoking during pregnancy. However, maternal smoking data were not available for 20% of neonatal deaths and 4% of stillbirths. Comparative data for the UK indicate that the prevalence of smoking during pregnancy reduced from 17% in 2005 to 12% in 2010 (29).

Alcohol consumption

Information concerning alcohol consumption both pre pregnancy and at booking was very poorly reported. For neonatal deaths alcohol consumption both pre pregnancy and at booking was only reported for just over half of the deaths. Rates of missing data for stillbirths were also high at 28% and 22% respectively. Midwifery staff are encouraged to ensure that this information is collected at booking and is available in the maternal notes.

Substance abuse

Data concerning substance misuse is difficult to collect due to the problem of mothers being unlikely to report the use of an illegal substance. It is estimated that approximately 1% of pregnant women are substance abusers (30). This compares to 2.4% of the mothers of stillbirths and 1.8% of the mothers of neonatal deaths reported to MBRRACE-UK for 2013. However, once again a sizeable proportion of the cases of neonatal death (16%) had this information missing.

Table 13: Stillbirths, neonatal deaths and extended perinatal deaths by mother's behavioural characteristics: United Kingdom and Crown Dependencies, for births in 2013

Mother's behavioural characteristic	Stillbirths §		Neonatal Deaths §		Extended perinatal deaths §	
	Number	(%)	Number	(%)	Number	(%)
Smoking status						
Never smoked	2,043	(62.8)	758	(53.7)	2,801	(60.0)
Gave up before pregnancy	285	(8.8)	67	(4.7)	352	(7.5)
Gave up during pregnancy	140	(4.3)	37	(2.6)	177	(3.8)
Smoker	658	(20.2)	256	(18.1)	914	(19.6)
Not known	129	(4.0)	294	(20.8)	423	(9.1)
Alcohol consumption pre pregnancy (weekly)						
0 units	1,863	(57.2)	607	(43.0)	2,470	(52.9)
1-2	177	(5.4)	33	(2.3)	210	(4.5)
3-5	128	(3.9)	22	(1.6)	150	(3.2)
6-14	146	(4.5)	39	(2.8)	185	(4.0)
≥15	40	(1.2)	14	(1.0)	54	(1.2)
Not known	901	(27.7)	697	(49.4)	1,598	(34.2)
Alcohol consumption at booking (weekly)						
0 units	2,446	(75.1)	752	(53.3)	3,198	(68.5)
1-2	43	(1.3)	13	(0.9)	56	(1.2)
3-5	19	(0.6)	6	(0.4)	25	(0.5)
6-14	12	(0.4)	2	(0.1)	14	(0.3)
≥15	7	(0.2)	2	(0.1)	9	(0.2)
Not known	728	(22.4)	637	(45.1)	1,365	(29.2)
Substance abuse						
No	3,049	(93.7)	1,157	(81.9)	4,206	(90.1)
Yes	77	(2. 4)	26	(1.8)	103	(2.2)
Not known	129	(4.0)	229	(16.2)	358	(7.7)

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK

Antenatal care

Table 14 provides information about the pregnancy characteristics for the mothers of stillbirths and neonatal deaths. Although almost two thirds of the mothers of stillborn babies were booked for their antenatal care by 12 weeks gestational age, the antenatal care provision for the remaining mothers definitely failed to meet the guidance from the National Institute for Health and Care Excellence (NICE) (antenatal clinical guideline CG62) that women should ideally attend a booking appointment by 10 weeks gestation (31). Once again over 40% of these data were missing for the mothers of neonatal deaths and data reporters are strongly encouraged to use the MBRRACE-UK system to temporarily assign the MBRRACE-UK record for these deaths to the place of delivery in order to obtain details about the mother and her care.

A small proportion of mothers of stillbirths and neonatal deaths were reported to be poor attenders for antenatal care in their notes: 3% and 2%, respectively. However, this information was missing for a large proportion of neonatal deaths (29%).

Improvements are also required in the data reporting concerning assisted conception, particularly for the neonatal deaths.

Table 14: Stillbirths, neonatal deaths and extended perinatal deaths by mother's pregnancy characteristics: United Kingdom and Crown Dependencies, for births in 2013

Pregnancy risk characteristic	Stillbirths §		Neonatal deaths §		Extended perinatal deaths §	
	Number	(%)	Number	(%)	Number	(%)
Booking						
Less than 12^{+0} weeks gestational age	2,138	(65.7)	590	(41.8)	2,728	(58.5)
12^{+0} to 17^{+6} weeks gestational age	642	(19.7)	157	(11.1)	799	(17.1)
18^{+0} or more weeks gestational age	270	(8.3)	79	(5.6)	349	(7.5)
Not known	205	(6.3)	586	(41.5)	791	(16.9)
Documented poor antenatal care attender						
No	2,913	(89.5)	981	(69.5)	3,894	(83.4)
Yes	106	(3.3)	23	(1.6)	129	(2.8)
Not known	236	(7.3)	408	(28.9)	644	(13.8)
Assisted conception						
Not assisted	2,952	(90.7)	1,002	(71.0)	3,954	(84.7)
Ovulation induction only	36	(1.1)	6	(0.4)	42	(0.9)
IVF ◦	89	(2.7)	75	(5.3)	164	(3.5)
Artificial insemination ▫	3	(0.1)	2	(0.1)	5	(0.1)
Not known	175	(5.4)	327	(23.2)	502	(10.8)

§ excluding terminations of pregnancy and births $<24^{+0}$ weeks gestational age
◦ including egg donation and intra-cytoplasmic sperm injection
▫ with or without ovulation induction
Data sources: MBRRACE-UK

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7. Causes of death

7.1. Classification of deaths

The relatively high rate of stillbirth in the UK has been the subject of significant concern in recent years. Trying to gain a greater understanding of the types of underlying problems associated with this high rate has proved difficult not least because of the nature of the classification systems employed previously. The Extended Wigglesworth (32) and Aberdeen (33) classifications tended to group the causes of death into large heterogeneous groups, the largest of which was that where the cause of death was defined as unknown (over one quarter of deaths). Thus, there was a clear need for a new classification system that would provide greater differentiation of the cause of death, particularly in relation to antepartum stillbirths where previously the majority remained unexplained.

7.2. CODAC system of death classification

MBRRACE-UK convened a Death Classification Expert Group to advise on this issue, following which the CODAC classification system was adopted (34). The CODAC system uses a three level hierarchical tree of coded causes of death: a full description of which can be found at http://codac-classification.org/. The CODAC level 1 classification of death for all stillbirths and neonatal deaths is presented in Table 15. One of the main uses of a classification of death is to direct the targeting of interventions to reduce specific types of death. In 2013 just under 9% of stillbirths and 7% neonatal deaths were attributed to an intrapartum cause highlighting one particular group of deaths where perinatal care provision could be targeted for improvement. CODAC does offer the potential to give far wider insight into where different management of the mother or baby may have led to a different outcome.

Table 15: Stillbirths, neonatal deaths and extended perinatal deaths by CODAC level 1 cause of death: United Kingdom and Crown Dependencies, for births in 2013

	Stillbirths §		Neonatal deaths §		Extended perinatal deaths §	
CODAC cause of death: level 1	Number	(%)	Number	(%)	Number	(%)
Infection	86	(2.6)	84	(5.8)	170	(3.6)
Neonatal	32	(1.0)	662	(46.1)	694	(14.7)
Intrapartum	289	(8.8)	93	(6.5)	382	(8.1)
Congenital anomaly	193	(5.9)	321	(22.4)	514	(10.9)
Fetal	100	(3.0)	78	(5.4)	178	(3.8)
Cord	129	(3.9)	1	(0.1)	130	(2.8)
Placenta	629	(19.1)	20	(1.4)	649	(13.7)
Maternal	112	(3.4)	9	(0.6)	121	(2.6)
Unknown	1,551	(47.2)	65	(4.5)	1,616	(34.2)
Missing	165	(5.0)	103	(7.2)	268	(5.7)

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK

Following the launch of the MBRRACE-UK on-line reporting system it was noted that there were problems with the reporting of the CODAC classification of death data. One example from Table 15 is that 32 stillbirths were recorded as having a neonatal cause of death: these deaths were clearly incorrectly coded.

For 2013 a large proportion of stillbirths were classified as due to unknown causes (47%) but by use of the CODAC classification and close working between MBRRACE-UK and Trusts and Health Boards more detailed information will be available to help in the understanding of this type of death. Additional guidance in the use of CODAC has been provided since the collection of the 2013 data and further assistance will be provided by MBRRACE-UK to facilitate cause of death coding using CODAC. As part of this, an MBRRACE-UK Classification of Death Interest Group has been established and new frequently asked questions (FAQs) have been added to the MBRRACE-UK website.

MBRRACE-UK Recommendation

It is essential that all Trusts and Health Boards provide data which are complete, accurate and reported in a timely manner in order that the most accurate comparative estimates can be calculated and used for quality assurance. In particular by:

a) Improving the provision of maternal data for neonatal deaths;
b) Working closely with MBRRACE-UK to improve the classification of cause of death.

Table 16: Neonatal deaths by CODAC level 1 and level 2 cause of death: United Kingdom and Crown Dependencies, for births in 2013

CODAC cause of death	Neonatal deaths §	
	Number	(%)
Infection	84	(5.8)
Neonatal	662	(46.1)
Unspecified or other	12	(0.8)
Extreme prematurity	190	(13.2)
Neurological	202	(14.1)
Cardio-respiratory	158	(11.0)
Gastrointestinal	68	(4.7)
Multi-organ failure	29	(2.0)
Trauma or suffocation	3	(0.2)
Intrapartum	93	(6.5)
Congenital anomaly	321	(22.4)
Fetal	78	(5.4)
Cord	1	(0.1)
Placenta	20	(1.4)
Maternal	9	(0.6)
Unknown	65	(4.5)
Missing	103	(7.2)

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK

Although CODAC was developed for use primarily with stillbirth, it was considered to be an appropriate starting point for the classification of neonatal deaths by the MBRRACE-UK Death Classification Expert Group. This is illustrated in Table 16 where level 2 of the CODAC tree for neonatal causes of death is presented. For neonatal deaths defined as having a neonatal cause (46%) nearly all were categorised to

clearly defined level 2 categories. All CODAC coded deaths are currently being compared with the ICD-10 coded causes of death available from routine mortality data sources in order to inform the MBRRACE-UK FAQs and as an early step in the development of potential new neonatal classification categories.

7.3. Congenital anomalies

Although for most of the UK there was clear evidence of inconsistency in the way in which CODAC was used, in Northern Ireland the organisational and legal framework relating to the collection of MBRRACE-UK data means that there is greater local oversight of data quality by NIMACH staff. The classification of deaths using CODAC was carried out by NIMACH staff following group discussions which included the involvement of a perinatal pathologist. The CODAC classification system could, therefore, be used to provide much greater insight into the particular causes of death for Northern Ireland. For example, Table 17 shows the effect of removing lethal congenital anomalies on the crude extended perinatal mortality rate in Northern Ireland. In this setting they accounted for around 30% of all deaths. Being able to adjust the data for the whole of the UK in this way would provide much greater insight into the true variations in outcome that are related to different care practices rather than focussing on differences in the approach to dealing with congenital anomalies. Importantly, as the data presented here are crude rates for illustrative purposes only they cannot be directly compared with the previous tables presenting the stabilised & adjusted extended perinatal mortality rates.

Table 17: Crude extended perinatal mortality rates including and excluding deaths with a primary cause of congenital abormality: Northern Ireland, for births in 2013

NORTHERN IRELAND – Health and Social Care Trust of mother's residence	Extended perinatal crude mortality rate per 1,000 total births §	
	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly
Belfast Health And Social Care Trust	6.33	4.86
Northern Health And Social Care Trust	7.71	4.98
South Eastern Health And Social Care Trust	6.91	4.85
Southern Health And Social Care Trust	4.28	3.17
Western Health And Social Care Trust	8.59	5.07
Northern Ireland overall	6.68	4.54

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK

7.4. Post-mortem examination

Rates of post-mortem examination have been low since the Alder Hey retention of organs report (35) and 2013 was no exception. Fewer than half of the stillbirths and only a quarter of the neonatal deaths were consented for full post-mortem (Table 18). Whilst a post-mortem following stillbirth may not provide a definitive diagnosis of the cause of death, the process can exclude some of the potential causes and provide valuable information for the counselling of parents for future pregnancies. Similarly, for neonatal deaths where the cause is felt to be known by the clinical team, a post-mortem may identify conditions or congenital anomalies that would contribute important information for parental counselling.

Data concerning the consenting process for post-mortem should be readily available in the medical notes for all deaths (36); however the data were missing for 6% stillbirths and 15% neonatal deaths.

MBRRACE-UK Recommendation

Units should ensure that a post-mortem examination should be offered in all cases of stillbirth and neonatal death in order to improve future pregnancy counselling of parents.

Table 18: Number and percentage of post-mortems undertaken by type of death (stillbirth, neonatal death, extended perinatal death): United Kingdom and Crown Dependencies, for births in 2013

	Stillbirths §		Neonatal deaths §		Extended perinatal deaths §	
Consent for post-mortem	n	(%)	n	(%)	n	(%)
Full	1,383	(42.1)	362	(25.2)	1,745	(37.0)
Limited	98	(3.0)	37	(2.6)	135	(2.9)
None	1,616	(49.2)	826	(57.5)	2,442	(51.7)
Not known	189	(5.8)	211	(14.7)	400	(8.5)
Placental histology	2,864	(87.2)				

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK

Appendix

A1 MBRRACE-UK Lead Reporters

Joanna Webb	Consultant Neonatologist	Abertawe Bro Morgannwg University Health Board
Beverley Beaumont	Labour Ward Coordinator	Airedale NHS Foundation Trust
Kathleen Graham	Consultant Obstetrician	Airedale NHS Foundation Trust
Clare Payne	Neonatal Lead Nurse	Aneurin Bevan Health Board
Deb Jackson	Head of Midwifery	Aneurin Bevan Health Board
Louise Taylor	Senior Midwifery Manager	Aneurin Bevan Health Board
Jacqui Rees	Clinical Quality Lead	Ashford and St Peter's Hospital NHS Foundation Trust
Lianne Joyce	Bereavement Support Midwife	Ashford and St Peter's Hospital NHS Foundation Trust
Sandra Newbold	Consultant Obstetrician and Gynaecologist	Ashford and St Peter's Hospital NHS Foundation Trust
Claire Waters	Bereavement Midwife	Barking Havering and Redbridge University Hospitals NHS Trust
Elizabeth Dorey	Bereavement Midwife	Barking Havering and Redbridge University Hospitals NHS Trust
Jenny Harper	Family Care Coordinator	Barking Havering and Redbridge University Hospitals NHS Trust
Angela Hawes	Bereavement Midwife	Barnet and Chase Farm Hospitals NHS Trust
Miranda Ryan	Staff Nurse	Barnet and Chase Farm Hospitals NHS Trust
Seeking Lee	Ward Lead - Neonatal ICU	Barnet and Chase Farm Hospitals NHS Trust
Cath Jones	Bereavement Midwife	Barnsley Hospital NHS Foundation Trust
Sue Gibson	Head of Midwifery	Barnsley Hospital NHS Foundation Trust
Beena Saji	Labour Ward Coordinator	Barts Health NHS Trust
Chinwe Ejiofor	Bereavement Support Midwife	Barts Health NHS Trust
Imdad Ali	Consultant Neonatologist	Barts Health NHS Trust
Mun-Leng Lim	Women's Health Governance Lead	Barts Health NHS Trust
Debbie Olajugbagbe	Risk Manager	Basildon and Thurrock University Hospitals NHS Foundation Trust
Tracey Glester	Matron/Manager – Neonatal Intensive Care Unit	Basildon and Thurrock University Hospitals NHS Foundation Trust
Carol Warden	Ward Manager	Bedford Hospital NHS Trust
Samantha Hunt	Midwifery Team Manager	Bedford Hospital NHS Trust
Thangamma Katimada-Annaiah	Consultant Obstetrician and Gynaecologist	Bedford Hospital NHS Trust
Catherine Beaumont	Midwifery Sister	Betsi Cadwaladr University Health Board
Fiona Giraud	Associate Chief of Staff - Nursing and Midwifery	Betsi Cadwaladr University Health Board
Hazel Rawson-Williams	Clinical Audit and Effectiveness Facilitator	Betsi Cadwaladr University Health Board
Lucy Dobbins	Labour Ward Shift Leader	Betsi Cadwaladr University Health Board
Lynne Clayton	Labour Ward Shift Leader	Betsi Cadwaladr University Health Board
Melissa Keeble	Labour Ward Shift Leader	Betsi Cadwaladr University Health Board
Janette Vyse	Lead For Patient Experience and Lead For Bereavement Care Services	Birmingham Children's Hospital NHS Foundation Trust
Javier Gonzalez-Fritz	Bereavement Care Services Co-Ordinator	Birmingham Children's Hospital NHS Foundation Trust
Joyce O'Neill	PA To Bereavement and Spiritual Care Services	Birmingham Women's NHS Foundation Trust
Karen Henson	Bereavement Manager	Birmingham Women's NHS Foundation Trust
Christopher Rawlingson	Consultant Paediatrician	Blackpool Teaching Hospitals NHS Foundation Trust
Elizabeth Haslett	Consultant Obstetrician	Blackpool Teaching Hospitals NHS Foundation Trust
Karen Hurst	Midwife	Blackpool Teaching Hospitals NHS Foundation Trust
Janet Cooper	IT Midwife	Bolton NHS Foundation Trust
Neeraja Singh	Consultant Obstetrician and Gynaecologist	Bolton NHS Foundation Trust
Julie Key	Bereavement Support Midwife	Bradford Teaching Hospitals NHS Foundation Trust
Sunita Seal	Consultant Neonatologist	Bradford Teaching Hospitals NHS Foundation Trust
Dionne Robins	Bereavement Midwife	Brighton and Sussex University Hospitals NHS Trust
Patricia Walker	Medical Secretary	Brighton and Sussex University Hospitals NHS Trust
Phil Amess	Consultant Neonatologist	Brighton and Sussex University Hospitals NHS Trust
Heather Brown	Consultant Obstetrician	Brighton and Sussex University Hospitals NHS Trust
Charlotte Allen	Midwife	Buckinghamshire Healthcare NHS Trust

Angela Edwards	Staff Nurse Neonatal Unit	Burton Hospitals NHS Foundation Trust
Caroline Dodd	Senior Sister - Paediatrics	Burton Hospitals NHS Foundation Trust
Cath Askey	Clinical Governance Midwife	Burton Hospitals NHS Foundation Trust
Ellen Deane	Senior Sister - Paediatrics	Burton Hospitals NHS Foundation Trust
Eilean Crosbie	Consultant Paediatrician	Calderdale and Huddersfield NHS Foundation Trust
Lindsay Chandler	Midwife	Calderdale and Huddersfield NHS Foundation Trust
Liz Hopkin	Neonatal Clinical Risk Manager	Cambridge University Hospitals NHS Foundation Trust
Susan Woolley	Maternity Services Risk Manager	Cambridge University Hospitals NHS Foundation Trust
Karen Jewell	Consultant Midwife	Cardiff and Vale University Health Board
Roshan Adappa	Consultant in Neonatal Medicine	Cardiff and Vale University Health Board
Emma Lane	Bereavement Midwife	Central Manchester University Hospitals NHS Foundation Trust
Heather Massey	Midwife	Central Manchester University Hospitals NHS Foundation Trust
Ngozi Edi-Osagie	Consultant Neonatologist	Central Manchester University Hospitals NHS Foundation Trust
Victoria Holmes	Midwife and Bereavement Midwife	Central Manchester University Hospitals NHS Foundation Trust
Alexandra Mancini	Neonatal Matron	Chelsea and Westminster Hospital NHS Foundation Trust
Anna Hanley	Midwife	Chelsea and Westminster Hospital NHS Foundation Trust
Heather Durward	Associate Specialist In Paediatrics	Chesterfield Royal Hospital NHS Foundation Trust
Julie Clark	Matron	Chesterfield Royal Hospital NHS Foundation Trust
Lyn Guerriero	Birth Centre Coordinator	Chesterfield Royal Hospital NHS Foundation Trust
Deborah Wade	Research Midwife	City Hospitals Sunderland NHS Foundation Trust
Paula Berry	Senior Secretary for Paediatrics	City Hospitals Sunderland NHS Foundation Trust
Aravind Shastri	Consultant Paediatrician	Colchester Hospital University NHS Foundation Trust
Fiona Binnie	IT Lead Midwife	Colchester Hospital University NHS Foundation Trust
Catherine Sales	Supervisor of Midwives	Countess of Chester Hospital NHS Foundation Trust
Eirian Powell	Neonatal Nurse Specialist	Countess of Chester Hospital NHS Foundation Trust
Usha Roa	Consultant Obstetrician	Countess of Chester Hospital NHS Foundation Trust
Anita Goel	Consultant Locum	County Durham and Darlington NHS Foundation Trust
Emma Bouic	Midwife	County Durham and Darlington NHS Foundation Trust
Linda MacKinnon	Midwife	County Durham and Darlington NHS Foundation Trust
Lisa Russell	Staff Midwife	County Durham and Darlington NHS Foundation Trust
Sharon Stephenson	Midwife	County Durham and Darlington NHS Foundation Trust
Arun Kumar	Consultant Paediatrician	Croydon Health Services NHS Trust
Julie Tucker	Bereavement Midwife	Croydon Health Services NHS Trust
Myfanwy Ellis	Risk Manager For Obstetrics	Gynaecology and Sexual Health Cwm Taf Health Board
Deborah Mcallion	Head of Midwifery	Dartford and Gravesham NHS Trust
Joanne Seymour	Clinical Governance Midwifery Manager	Dartford and Gravesham NHS Trust
Lynn Brooks	Matron Paediatrics	Dartford and Gravesham NHS Trust
Jeanette Steward	Audit Midwife	Derby Hospitals NHS Foundation Trust
John McIntyre	Consultant Paediatrician	Derby Hospitals NHS Foundation Trust
Sue Rucklidge	Bereavement Midwife	Derby Hospitals NHS Foundation Trust
Carol Lee	Bereavement Support Midwife	Doncaster and Bassetlaw Hospitals NHS Foundation Trust
Sophie Wilson	Midwife	Dorset County Hospital NHS Foundation Trust
Tara Putt	Midwife	Dorset County Hospital NHS Foundation Trust
Jonathan Kefas	Consultant Neonatologist	East and North Hertfordshire NHS Trust
Jakub Kaczmarek	Senior Clinical Audit Facilitator	East and North Hertfordshire NHS Trust
Veda Ryan	Practice Standards Matron	East and North Hertfordshire NHS Trust
Bev Morrison	Paediatric Liaison Health Visitor	East and North Hertfordshire NHS Trust
Heather Millward	Safeguarding Midwife	East Cheshire NHS Trust
Michelle Moran	Clinical Governance Midwife	East Cheshire NHS Trust
Jo Olagboyega	Clinical Governance Midwife	East Kent Hospitals University NHS Foundation Trust

Kathryn Mears	Advanced Neonatal Nurse Practitioner	East Lancashire Hospitals NHS Trust
Liz Matindale	Consultant Obstetrician	East Lancashire Hospitals NHS Trust
Paula Boswell	Midwife Co-Ordinator	East Lancashire Hospitals NHS Trust
Alison Newby	CNST Midwife	East Sussex Healthcare NHS Trust
Anne Watt	Clinical Governance Manager	East Sussex Healthcare NHS Trust
Catherine Swanson	Matron Neonatal Service	Epsom and St Helier University Hospitals NHS Trust
Claire Hill	IT Midwife	Epsom and St Helier University Hospitals NHS Trust
Helen Whapshott	Labour Ward Manager	Frimley Park Hospital NHS Foundation Trust
Jennifer Lomas	Neonatal Ward Manager	Frimley Park Hospital NHS Foundation Trust
Andrea Tweddell	Risk Management Midwife	Gateshead Health NHS Foundation Trust
Dennis Bosman	Consultant Paediatrician	Gateshead Health NHS Foundation Trust
Rob Walker	Consultant Obstetrician and Gynaecologist	Gateshead Health NHS Foundation Trust
Caroline Wood	Sister – Neonatal Unit	George Eliot Hospital NHS Trust
Suet Wong	Sister - Special Care Baby Unit	George Eliot Hospital NHS Trust
Bobbie Cullimore	Clinical Risk Manager Women's Health	Gloucestershire Hospitals NHS Foundation Trust
Donna Lloyd	Bereavement Support Midwife	Gloucestershire Hospitals NHS Foundation Trust
Jennifer Holman	Consultant Paediatrician	Gloucestershire Hospitals NHS Foundation Trust
Miles Wagstaff	Consultant Paediatrician	Gloucestershire Hospitals NHS Foundation Trust
Russell Peek	Consultant Paediatrician	Gloucestershire Hospitals NHS Foundation Trust
Shyam Bhakthavalsala	Consultant Neonatologist	Gloucestershire Hospitals NHS Foundation Trust
Simon Pirie	Consultant Paediatrician	Gloucestershire Hospitals NHS Foundation Trust
Andrew Pearson	Clinical Audit Manager	Great Ormond Street Hospital for Children NHS Foundation Trust
Helen Pepler	Practice Development Midwife	Great Western Hospitals NHS Foundation Trust
Gemma Westcott	Deputy Clinical Governance Facilitator	Guy's and St Thomas' NHS Foundation Trust
Karen Turnock	Consultant Neonatologist	Guy's and St Thomas' NHS Foundation Trust
Mitra Bakhtiari	Maternity Matron	Guy's and St Thomas' NHS Foundation Trust
Samantha Green	Deputy Clinical Governance Facilitator	Guy's and St Thomas' NHS Foundation Trust
Moona Malik	Quality Improvement and Patient Safety (QIPS) Coordinator	Guy's and St Thomas' NHS Foundation Trust
Ruth Wigfield	Consultant Paediatrician	Hampshire Hospitals NHS Foundation Trust
Sandie Skinner	Consultant Nurse In Neonatal Care	Hampshire Hospitals NHS Foundation Trust
Stephanie Goodwin	Maternity Risk and Governance Manager	Hampshire Hospitals NHS Foundation Trust
Kim Pitt	Senior Sister - Special Care Baby Unit	Harrogate and District NHS Foundation Trust
Jaideep Singh	Consultant Neonatologist	Heart of England NHS Foundation Trust
Maria Stewart	Matron Clinical Quality and Safety	Heart of England NHS Foundation Trust
Caroline Duncombe	Quality and Assurance Midwife	Heatherwood and Wexham Park Hospitals NHS Foundation Trust
Rekha Sanghavi	Consultant Paediatrician	Heatherwood and Wexham Park Hospitals NHS Foundation Trust
Sarah Kitchen	Deputy Head of Midwifery Lead Midwife	Hinchingbrooke Health Care NHS Trust
Hilary Dixon	Consultant Paediatrician	Hinchingbrooke Health Care NHS Trust
Anne McKenna	Bereavement Midwife	Homerton University Hospital NHS Foundation Trust
Tracy Hodgkinson	Bereavement Midwife	Homerton University Hospital NHS Foundation Trust
Zoe Smith	Consultant Neonatologist	Homerton University Hospital NHS Foundation Trust
Christopher Wood	Consultant Neonatologist	Hull and East Yorkshire Hospitals NHS Trust
Jean Rennison	Midwife	Hull and East Yorkshire Hospitals NHS Trust
Prem Pitchaikani	Consultant Paediatrician	Hywel Dda Health Board
Jacqui Mallard	Risk Management Midwife	Imperial College Healthcare NHS Trust
Jane Scott	Bereavement Midwife	Imperial College Healthcare NHS Trust
Sarah Beake	Risk Management Midwife	Imperial College Healthcare NHS Trust
Beverley Gordon	Clinical Governance Lead	Ipswich Hospital NHS Trust
Emma Hearnden	Midwife	Isle of Man Department of Health
Paul McCann	Neonatal Lead Nurse	Isle of Man Department of Health
Prakash Thiagarajan	Consultant Paediatrician	Isle of Man Department of Health
Tarun Ghosh	Consultant Obstetrician and Gynaecologist	Isle of Man Department of Health

Amanda Pearson	Risk Lead	Isle of Wight NHS Trust
Yvonne Harris	Clinical Lead	Isle of Wight NHS Trust
Priyadarshan Ambadkar	Consultant Paediatrician	James Paget University Hospitals NHS Foundation Trust
Lynn Garratt	Bereavement Support / Senior Midwife	Kettering General Hospital NHS Foundation Trust
Ravindra Bhat	Consultant Neonatalogist	King's College Hospital NHS Foundation Trust
Susan Mash	IT and Audit Midwife	King's College Hospital NHS Foundation Trust
Hannah Smith	Maternity Risk and Standards Manager	Kingston Hospital NHS Trust
Ruth Kirby	Specialist Bereavement Midwife/Counsellor	Lancashire Teaching Hospitals NHS Foundation Trust
Sandeep Dharmaraj	Consultant Neonatologist	Lancashire Teaching Hospitals NHS Foundation Trust
Diane Garner	Risk Midwife	Lewisham and Greenwich NHS trust
Emma Kenny	Clinical Governance Manager	Lewisham and Greenwich NHS trust
Jauro Kuna	Clinical Director For Neonatal Services	Lewisham and Greenwich NHS trust
Sue Percival	Specialist Midwife - Fetal Medicine	Lewisham and Greenwich NHS trust
Teresa Stimson	Sister – Neonatal Unit	Lewisham and Greenwich NHS trust
Clare Larkin	Neonatal Nurse For IT Systems	Liverpool Women's NHS Foundation Trust
Jane Saltmarsh	IT Nurse Specialist	Liverpool Women's NHS Foundation Trust
Jennifer Robinson	Midwife	Liverpool Women's NHS Foundation Trust
Carlene Lewis	Acting Maternity Clinical Risk Manager	London North West Healthcare NHS Trust
Christine Pace	Clinical Audit and Effectiveness Team	London North West Healthcare NHS Trust
Joanne Dunckley	Labour Ward Manager	London North West Healthcare NHS Trust
Meena Down	Maternity Clinical Risk Manager	London North West Healthcare NHS Trust
Richard Nicholl	Consultant Neonatal Paediatrician	London North West Healthcare NHS Trust
Hiran Samarage	Consultant Obstetrician and Gynaecologist	London North West Healthcare NHS Trust
Anne-Marie Mead	Neonatal Nurse	Luton and Dunstable Hospital NHS Foundation Trust
Catherine Hudson	Midwife	Luton and Dunstable Hospital NHS Foundation Trust
Elizabeth Langham	Neonatal Lead Nurse	Luton and Dunstable Hospital NHS Foundation Trust
Jennifer Head	Matron	Maidstone and Tunbridge Wells NHS Trust
Julie Coppin	Maternity Risk Manager	Maidstone and Tunbridge Wells NHS Trust
Helen McElroy	Consultant Neonatologist	Medway NHS Foundation Trust
Julie Spencer	Lead Midwife Delivery Suite	Medway NHS Foundation Trust
Sarah Jones	Advanced Neonatal Nurse Practitioner	Medway NHS Foundation Trust
Yvonne Morrison	Bereavement Midwife	Medway NHS Foundation Trust
Suzanne Turner	Labour Ward Coordinator	Mid Cheshire Hospitals NHS Foundation Trust
Tracy Sellors	Senior Clinical Audit Facilitator	Mid Cheshire Hospitals NHS Foundation Trust
Alison Cuthbertson	Head of Midwifery	Mid Essex Hospital Services NHS Trust
Janet Herrod	Clinical Governance Lead For Obstetrics and Gynaecology	Mid Staffordshire NHS Foundation Trust
Indranil Misra	Consultant Paediatrician	Milton Keynes Hospital NHS Foundation Trust
Tracy Rea	Bereavement Midwife and Supervisor of Midwives	Milton Keynes Hospital NHS Foundation Trust
Inass Osman	Consultant Obstetrician and Gynaecologist	NHS Ayrshire and Arran
Jane Ramsay	Clinical Director of Obstetrics	NHS Ayrshire and Arran
Sheena Kinmond	Consultant Paediatrician	NHS Ayrshire and Arran
Andrew Duncan	Consultant Paediatrician	NHS Borders
Brian Magowan	Consultant Obstetrician and Gynaecologist	NHS Borders
Heather Armstrong	Associate Specialist In Paediatrics	NHS Dumfries and Galloway
Stephen Wisdom	Consultant Obstetrician	NHS Dumfries and Galloway
Annette Lobo	Consultant Midwife/Supervisor of Midwives	NHS Fife
Sean Ainsworth	Consultant Neonatologist	NHS Fife
Gail Bell	Department Manager – Women and Children's Unit	NHS Forth Valley
Gillian McMillan	Clinical Coordinator	NHS Forth Valley
Lynette Mackenzie	Department Manager	NHS Forth Valley
Lena Crichton	Consultant Obstetrician	NHS Grampian
Mike Munro	Consultant Neonatologist	NHS Grampian
Neil Maclean	Consultant Obstetrician and Gynaecologist	NHS Grampian
Slawomir Wojcik	Consultant Paediatrician	NHS Grampian

Allan Jackson	Consultant Neonatologist	NHS Greater Glasgow and Clyde
Dawn Kernaghan	Consultant Obstetrician	NHS Greater Glasgow and Clyde
Janice Gibson	Consultant Obstetrician	NHS Greater Glasgow and Clyde
Kathleen O'Reilly	Consultant Neonatologist	NHS Greater Glasgow and Clyde
Mandy Reid	Consultant Obstetrician	NHS Greater Glasgow and Clyde
Caron Cruickshank	Maternity Quality and Safety Coordinator	NHS Highland
Dina Mclellan	Consultant Obstetrician	NHS Lanarkshire
Geraldine Morgan	Maternity Management Secondment	NHS Lanarkshire
Samuel Ibhanesebhor	Consultant Neonatologist	NHS Lanarkshire
Mary Moffat	Management Secondment Maternity	NHS Lanarkshire
Ewen Johnston	Consultant Neonatologist	NHS Lothian
Nayani Berugoda	Obstetrician	NHS Lothian
Nithiya Palaniappan	Consultant Obstetrician	NHS Lothian
Sangeetha Nagabushanam	Senior Registrar - Obstetrics and Gynaecology	NHS Lothian
Kate Kenmure	Consultant Midwife/Child Health Manager	NHS Shetland
Margaret Mouat	Senior Midwife and Risk Manager	NHS Shetland
Jennifer Scotland	Consultant Neonatologist	NHS Tayside
Pauline Lynch	Clinical Lead	NHS Tayside
Roselyn Mudenha	Consultant Obstetrician	NHS Tayside
Birgit Wefers	Consultant Neonatologist	NHS Tayside
Jill Tinsey	IT Midwife	Norfolk and Norwich University Hospitals NHS Foundation Trust
Mark Dyke	Consultant Neonatologist	Norfolk and Norwich University Hospitals NHS Foundation Trust
Jacqui Lewis	Midwife	North Bristol NHS Trust
Paul Mannix	Consultant Neonatologist	North Bristol NHS Trust
Andrea Ewing	Pregnancy Loss Midwife	North Cumbria University Hospitals NHS Trust
Anne Musgrave	Head of Midwifery	North Cumbria University Hospitals NHS Trust
Bernadette Bowness	Bereavement Specialist Midwife	North Cumbria University Hospitals NHS Trust
Glyn Jones	Consultant Paediatrician	North Cumbria University Hospitals NHS Trust
Vicky McLaughlin	Clinical Audit Facilitator	North Cumbria University Hospitals NHS Trust
Alison Oldfield	Governance Midwife	North Middlesex University Hospital NHS Trust
Chidambara Harikumar	Consultant Paediatrician	North Tees and Hartlepool NHS Foundation Trust
Debbie Bryan	Ward Manager - Neonatal Unit	North Tees and Hartlepool NHS Foundation Trust
Iona MacLeod	Consultant Obstetrician	North Tees and Hartlepool NHS Foundation Trust
Jane Malcolm	Ward Manager - Neonatal Unit	North Tees and Hartlepool NHS Foundation Trust
Jane Percival	Bereavement Midwife	Northampton General Hospital NHS Trust
Rachael Moss	Pre-Natal Diagnosis Midwife	Northampton General Hospital NHS Trust
Sathyaseelan Jayaseelan	Consultant Paediatrician	Northampton General Hospital NHS Trust
Caroline Hide	Labour Ward Coordinator	Northern Devon Healthcare NHS Trust
Elizabeth Mills	Lead Nurse For Paediatrics/Neonatal Services	Northern Devon Healthcare NHS Trust
Michael Selter	Consultant Paediatrician	Northern Devon Healthcare NHS Trust
Dianne Bradley	Senior Staff Midwife	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Gill Ibbotson	Coordinator On Central Delivery Suite	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Jason Baker	Quality and Audit Department	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Lisa Pennington	Clinical Audit Officer	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Nicola Atter	Staff Nurse	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Pauline Adiotomre	Consultant Paediatrician	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Shonag Mackenzie	Consultant Obstetrician and Gynaecologist	Northumbria Healthcare NHS Foundation Trust
Jennifer O'Brien	Registrar – Obstetrics and Gynaecology	Northumbria Healthcare NHS Foundation Trust
Pauline McKinney	Clinical Audit Supervisor	Northumbria Healthcare NHS Foundation Trust

Vivienne Brady	Governance Lead For Obstetrics and Gynaecology	Northumbria Healthcare NHS Foundation Trust
Amy Brears	Neonatal Bereavement Support Facilitator	Nottingham University Hospitals NHS Trust
Heather McEwen	Bereavement Care Link Midwife	Nottingham University Hospitals NHS Trust
Jane Pidgeon	Midwife	Nottingham University Hospitals NHS Trust
Joy Moran	Lead Nurse Child Death Review Team	Nottingham University Hospitals NHS Trust
Louise Crabtree	Antenatal Nurse Practitioner	Nottingham University Hospitals NHS Trust
Mandy Dann	Bereavement Midwife	Nottingham University Hospitals NHS Trust
Catherine Bartlett	Midwife	Oxford University Hospitals NHS Trust
Laura Stewart-Maunder	Women's Clinical Governance Manager	Oxford University Hospitals NHS Trust
Shirley Steel	Consultant Obstetrician and Gynaecologist	Peterborough and Stamford Hospitals NHS Foundation Trust
Lesley Carline	Bereavement Specialist Midwife	Peterborough and Stamford Hospitals NHS Foundation Trust
Seif Babiker	Consultant Paediatrician	Peterborough and Stamford Hospitals NHS Foundation Trust
Nicola Maxwell	Consultant Neonatologist	Plymouth Hospitals NHS Trust
Pauline Claridge	Audit Midwife	Plymouth Hospitals NHS Trust
Sue Stock	Head of Midwifery/Associate Director of Nursing	Plymouth Hospitals NHS Trust
Daniel Webster	Consultant Obstetrician	Poole Hospital NHS Foundation Trust
Alison McGuinness	Bereavement Support Midwife	Poole Hospital NHS Foundation Trust
Jill Chatten	Acting Risk Manager	Poole Hospital NHS Foundation Trust
Charlotte Groves	Consultant Neonatologist	Portsmouth Hospitals NHS Trust
Sharon Hackett	Senior Midwifery Manager - Clinical Governance	Portsmouth Hospitals NHS Trust
Cate Langley	Head of Midwifery	Powys Teaching Health Board
Donna Owen	Lead Midwife (Risk)	Powys Teaching Health Board
Kate Flack	Bereavement Midwife	Royal Berkshire NHS Foundation Trust
Pat Street	Consultant in Feto-Maternal Medicine	Royal Berkshire NHS Foundation Trust
Val Hedley	Sister - Paediatric ICU	Royal Brompton and Harefield NHS Foundation Trust
Karen Stoyles	Antenatal Ward Manager/Bereavement Midwife	Royal Cornwall Hospitals NHS Trust
Paul Munyard	Consultant Paediatrician	Royal Cornwall Hospitals NHS Trust
Deborah Smith-Ringer	Perinatal and Child Death Coordinator	Royal Devon and Exeter NHS Foundation Trust
Carla Long	Audit Midwife	Royal Free London NHS Foundation Trust
Lindsay Frank	Advanced Neonatal Nurse Practitioner	Royal Free London NHS Foundation Trust
Meg Wilkinson	Labour Ward Matron	Royal Free London NHS Foundation Trust
Sairatha Nimalathevan	Clinical Quality Standards Manager	Royal Free London NHS Foundation Trust
Helen Bolarinwa	Senior Midwife and Labour Ward Co-Ordinator	Royal Free London NHS Foundation Trust
Sheryl Roy	Bereavement Midwife	Royal Surrey County Hospital NHS Foundation Trust
Annette Moreton	Patient Safety Midwife	Royal United Hospital Bath NHS Trust
Stephen Jones	Consultant Paediatrician	Royal United Hospital Bath NHS Trust
Clare Baggot	Midwife	Salisbury NHS Foundation Trust
Louise Jones	Risk Manager	Salisbury NHS Foundation Trust
Philippa Ridley	Consultant Paediatrician	Salisbury NHS Foundation Trust
Lindsay Halpern	Neonatal Consultant	Sandwell and West Birmingham Hospitals NHS Trust
Mary Molloy	Bereavement Midwife	Sandwell and West Birmingham Hospitals NHS Trust
Neil Shah	Consultant Obstetrician	Sandwell and West Birmingham Hospitals NHS Trust
Nicola Robinson	Risk and Governance Lead - Maternity and Neonates	Sandwell and West Birmingham Hospitals NHS Trust
Anton Mayer	Consultant Paediatrician	Sheffield Children's NHS Foundation Trust
Lilias Alison	Consultant Paediatrician	Sheffield Children's NHS Foundation Trust
Sue Cross	Quality Assurance Manager	Sheffield Children's NHS Foundation Trust
Alan Gibson	Director of Neonatal Services	Sheffield Teaching Hospitals NHS Foundation Trust
Eleanor Clewes	Clinical Audit Midwife	Sheffield Teaching Hospitals NHS Foundation Trust
Helen Woodruff	Clinical Risk Coordinator	Sherwood Forest Hospitals NHS Foundation Trust
Kate Draper	Clinical Lead Neonatal Unit	Sherwood Forest Hospitals NHS Foundation Trust
Flo McGrattan	Delivery Suit Co-Ordinator	South Devon Healthcare NHS Foundation Trust
Alison Russell	Central Delivery Suite Manager	South Tees Hospitals NHS Foundation Trust

Caroline Marshall	Research/Audit Co-Ordinator	South Tees Hospitals NHS Foundation Trust
Maria Taylor	Clinical Audit Deputy Manager	South Tees Hospitals NHS Foundation Trust
Vedrana Caric	Consultant In Fetal Medicine	South Tees Hospitals NHS Foundation Trust
Umo Esen	Consultant Obstetrician and Gynaecologist	South Tyneside NHS Foundation Trust
Yvonne Hood	Bereavement Midwife	South Warwickshire NHS Foundation Trust
Laura Wilks	Clinical Risk Manager For Obstetrics and Gynaecology	Southend University Hospital NHS Foundation Trust
Karen Wareing	Neonatal Unit Manager	Southport and Ormskirk Hospital NHS Trust
Janice Beattie	Senior Midwife - Risk	St George's Healthcare NHS Trust
Nasreen Aziz	Consultant Neonatologist	St George's Healthcare NHS Trust
Caroline Deveney	Ward Manager – Special Care Baby Unit	St Helens and Knowsley Teaching Hospitals NHS Trust
Jacqui Kourellias	Delivery Suite Manager	St Helens and Knowsley Teaching Hospitals NHS Trust
Lisa Granville	Risk Management Midwife	States of Guernsey Health and Social Services
Lisa Stephens	Risk Management Midwife	States of Guernsey Health and Social Services
Julie Mycock	Lead Midwife	States of Jersey Health and Social Services
Carole Beales	Bereavement Midwife	Stockport NHS Foundation Trust
Julie Estcourt	Head of Midwifery/Nursing	Stockport NHS Foundation Trust
Marie Dooley	Governance and Quality Manager	Stockport NHS Foundation Trust
Sharmila Sivarajan	Consultant Obstetrician and Gynaecologist	Surrey and Sussex Healthcare NHS Trust
Abdul Khader	Consultant Paediatrician	Surrey and Sussex Healthcare NHS Trust
Anne Haggerty	Matron For Women's Services	Tameside Hospital NHS Foundation Trust
Sue Moore	Clinical Nurse Manager	Tameside Hospital NHS Foundation Trust
Julie Harland	Risk Manager	Taunton and Somerset NHS Foundation Trust
Sue Spooner	Neonatal Unit Manager	Taunton and Somerset NHS Foundation Trust
Justine Edwards	Specialist Midwife Clinical Governance and Risk	The Dudley Group of Hospitals NHS Foundation Trust
Anita Hutchins	Acting Head of Midwifery	The Hillingdon Hospitals NHS Foundation Trust
Ann Palmer	Bereavement Midwife	The Hillingdon Hospitals NHS Foundation Trust
Eithne Harte	Senior Midwife	The Hillingdon Hospitals NHS Foundation Trust
Jide Menakaya	Consultant Neonatologist	The Hillingdon Hospitals NHS Foundation Trust
Lawrence Miall	Consultant Neonatologist	The Leeds Teaching Hospitals NHS Trust
Medha Rathod	Consultant Obstetrician	The Leeds Teaching Hospitals NHS Trust
Sharon Beanland	Sister - Paediatric ICU	The Leeds Teaching Hospitals NHS Trust
Stuart Nicholson	Deputy Quality Governance Manager	The Leeds Teaching Hospitals NHS Trust
Tracey Glanville	Consultant in Fetal Maternal Medicine	The Leeds Teaching Hospitals NHS Trust
Chitra Rajagopalan	Consultant Obstetrician and Gynaecologist	The Mid Yorkshire Hospitals NHS Trust
David Gibson	Lead Neonatologist	The Mid Yorkshire Hospitals NHS Trust
Katy Harrison	Consultant Obstetrician and Gynaecologist	The Mid Yorkshire Hospitals NHS Trust
Sarah Hall	Bereavement Midwife	The Mid Yorkshire Hospitals NHS Trust
Michaela Higson	Risk Management Midwife	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Rhona Collis	Senior Midwife - Risk Management	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Richard Hearn	Consultant Paediatrician	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Caroline Rice	Consultant Obstetrician	The Pennine Acute Hospitals NHS Trust
Dawn Littler	Bereavement Midwife	The Pennine Acute Hospitals NHS Trust
Lydia Bowden	Consultant Neonatologist	The Pennine Acute Hospitals NHS Trust
Victoria Hall	Consultant Obstetrician	The Pennine Acute Hospitals NHS Trust
Jacqui Featherstone	Head of Midwifery	The Princess Alexandra Hospital NHS Trust
Jodie Cully	Quality and Safety Specialist Midwife/CDS Coordinator	The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust
Kevin Bowman	Risk and Governance Midwife	The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust
Clare Jenkins	Clinical Audit Manager	The Queen Victoria Hospital NHS Foundation Trust
Clare Storer	Bereavement Midwife	The Rotherham NHS Foundation Trust
Kathryn Parke	Senior Nurse/Service Manager	The Rotherham NHS Foundation Trust

Pauline Hawkes	Head of Midwifery	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust
Carole Sadler	Specialist Midwife For Bereavement Services	The Royal Wolverhampton Hospitals NHS Trust
Jan Latham	Bereavement Midwife	The Shrewsbury and Telford Hospital NHS Trust
Margaret Crawford	Consultant Paediatrician	United Lincolnshire Hospitals NHS Trust
Narasimharao Kollipara	Consultant Neonatologist	United Lincolnshire Hospitals NHS Trust
Charlotte Biggs	Clinical Effectiveness Manager	University College London Hospitals NHS Foundation Trust
Cherie Raphael	Bereavement Coordinator	University College London Hospitals NHS Foundation Trust
Lyn Gilbert	Specialist Bereavement Midwife	University College London Hospitals NHS Foundation Trust
Lee Abbott	Consultant Neonatologist	University Hospital of North Midlands NHS Trust
Margaret Jennings	Midwife	University Hospital of North Midlands NHS Trust
Sarah Lake	Bereavement Specialist Midwife	University Hospital of North Midlands NHS Trust
Chris Navin	Specialist Midwife	University Hospital of South Manchester NHS Foundation Trust
Helen Thompson	Head of Midwifery	University Hospital of South Manchester NHS Foundation Trust
Kim Allsop	Labour Ward Manager	University Hospital Southampton NHS Foundation Trust
Robert Ironton	Consultant Neonatologist	University Hospital Southampton NHS Foundation Trust
Kate Blake	Consultant Neonatologist	University Hospitals Coventry and Warwickshire NHST
Letoya Smith	Safeguarding Children Clerk	University Hospitals Coventry and Warwickshire NHST
Samantha Collinge	Specialist Bereavement Midwife	University Hospitals Coventry and Warwickshire NHST
Emily Bradley	Midwife	University Hospitals of Bristol NHS Foundation Trust
Karen MacDonald-Taylor	Patient Safety Advisor	University Hospitals of Bristol NHS Foundation Trust
Teresa Gnani	Midwife	University Hospitals of Bristol NHS Foundation Trust
Nicola Savage	Quality and Safety Manager	University Hospitals of Leicester NHS Trust
Penny McParland	Consultant Obstetrician	University Hospitals of Leicester NHS Trust
Samantha Parker	Quality and Safety Facilitator	University Hospitals of Leicester NHS Trust
Alison Sambrook	Consultant Governance Lead	University Hospitals of Morecambe Bay NHS Foundation Trust
Celia Sykes	Bereavement Specialist Midwife	University Hospitals of Morecambe Bay NHS Foundation Trust
Louise Jones	Governance Lead For Women's and Children's Services	University Hospitals of Morecambe Bay NHS Foundation Trust
Rebecca Bleackley	Labour Ward Coordinator	University Hospitals of Morecambe Bay NHS Foundation Trust
Sharon Perkins	Maternity Risk Manager	University Hospitals of Morecambe Bay NHS Foundation Trust
Carol Hollington	Quality and Risk Management Matron	Walsall Healthcare NHS Trust
Maria Francis	Senior Sister - Neonatal Unit	Walsall Healthcare NHS Trust
Trudie Roberts	Delivery Suite Matron	Walsall Healthcare NHS Trust
Jude Haslam	Midwife	Warrington and Halton Hospitals NHS Foundation Trust
Anne Fairbrother	Clinical Governance Audit Co-Ordinator	West Hertfordshire Hospitals NHS Trust
Justine Chung	Midwife	West Hertfordshire Hospitals NHS Trust
Renton L'Heureux	Consultant Paediatrician and Neonatologist	West Hertfordshire Hospitals NHS Trust
Jacqueline Nash	Senior Midwife / Supervisor	West Middlesex University Hospital NHS Trust
Sally Kelly	Specialist Midwife - Bereavement	West Middlesex University Hospital NHS Trust
Abigail Buhagiar	Senior Midwife	West Suffolk NHS Foundation Trust
Helen Pratt	Senior Clinical Midwifery Manager	Western Sussex Hospitals NHS Trust
Louise Fairs	Clinical Manager Inpatient Services	Western Sussex Hospitals NHS Trust
Susan McRae	Deputy Sister - Neonatal Unit	Western Sussex Hospitals NHS Trust
Zita Warren	Neonatal Unit Ward Manager	Western Sussex Hospitals NHS Trust
Alison Deakins	Joint Head of Midwifery	Weston Area Health NHS Trust
Debbie Antoine	Screening Coordinator	Weston Area Health NHS Trust
Jenny Gamlin	Contact Supervisor of Midwives	Weston Area Health NHS Trust
Ruth Treble	Screening Coordinator	Weston Area Health NHS Trust

Jane Laking	Bereavement Support Midwife	Whittington Health
Diane Williams	Clinical Governance Co-Ordinator	Wirral University Teaching Hospital NHS Foundation Trust
Donna Lloyd-Jones	Quality and Safety Specialist	Wirral University Teaching Hospital NHS Foundation Trust
Judi Barratt	Clinical Midwife Specialist	Worcestershire Acute Hospitals NHS Trust
Trudy Berlet	Bereavement Support Midwife	Worcestershire Acute Hospitals NHS Trust
Vicky Bullock	Matron/ Neonatal Services	Worcestershire Acute Hospitals NHS Trust
Cathy Stanford	Governance Lead Maternity and Child Health	Wrightington Wigan and Leigh NHS Foundation Trust
Julie Armstrong	Lead Neonatal Nurse	Wrightington Wigan and Leigh NHS Foundation Trust
Andrea Walker	Senior Midwife	Wye Valley NHS Trust
Maxine Chong	Head of Midwifery and Nursing	Wye Valley NHS Trust
Simon Meyrick	Consultant Paediatrician	Wye Valley NHS Trust
Jacqui Tully	Lead Midwife and Risk Manager and Community and Outpatients Manager	Yeovil District Hospital NHS Foundation Trust
Olujimi Jibodu	Consultant Obstetrician and Gynaecologist	York Teaching Hospital NHS Foundation Trust
Freya Oliver	Matron For Maternity and Gynaecology	York Teaching Hospital NHS Foundation Trust
Guy Millman	Consultant Paediatrician	York Teaching Hospital NHS Foundation Trust
Kirsten Mack	Consultant Paediatrician	York Teaching Hospital NHS Foundation Trust

A2 Further details of the MBRRACE-UK data collection

A2.1 Data items collected by MBRRACE-UK for births in 2013

Table 19: Data items collected by MBRRACE-UK for births in 2013

Woman's Identifiers

- Family name/surname
- Given name/first name
- Address
- Postcode
- NHS/CHI number
- Date of birth
- Hospital number in this hospital

Woman's Details

- Ethnic category
- Country of birth
- Time resident in the UK at booking
- Documented communication difficulties?
- Age at leaving full-time education
- Main support during pregnancy
- Employment status at booking
- Did woman have a partner?
- Partner's employment status at booking
- Blood relationship of woman to baby's father
- Was woman refugee or asylum seeker?

Woman's Health

- Pre-existing medical problems (ICD-10)
- Smoking Status
- Breath carbon monoxide
- Weekly alcohol consumption pre-pregnancy
- Weekly alcohol consumption at booking
- Was there documented alcohol abuse?
- Was there documented substance abuse?

Previous Pregnancies[a]

- Outcome for fetus
- Birthweight
- Infant death
- Year
- Gestational age
- Fetal anomaly

Obstetric History

- Number of previous pregnancies
- Previous pregnancy complications (ICD-10)

Booking

- Intended type of unit at booking
- Intended type of care at booking
- Intended care provider
- Date of first booking appointment
- Final estimated date of delivery
- Basis for EDD
- Number of fetuses present at booking/ultrasound
- Chorionicity
- Assisted conception
- Woman's height in cm
- Woman's first recorded weight in kg
- Was woman too heavy for hospital scales?
- First recorded BMI (if height/weight unavailable)

Antenatal care provision

- Number of antenatal appointments attended
- Documented poor appointment attender
- Type of unit (intended at onset)
- Type of care (intended at onset)
- Care provider (intended at onset)
- Reason if transfer of care (between booking & onset)
- Type of unit (actual place of delivery)
- Type of care (actual place of delivery)
- Care provider (actual place of delivery)
- Reason if transfer of care (post-onset)

Delivery & Outcomes Summary[a]

- Case definition
- Was this a termination?
- Reason for termination

Labour & Delivery[a]

- Onset of labour
- Date and time of onset and care in labour
- Time of onset
- Prolonged rupture of membranes (> 24 hours)?
- Date of rupture
- Presentation at delivery
- Attempted modes of delivery
- Final mode of delivery
- Type of caesarean section
- Primary indication for caesarean section
- Was the baby born in water?
- Delivery complications
- Date of delivery/birth
- Time of delivery/birth
- Were blood gases done?
- Source of the blood gases
- Arterial:
- Cord PH
- Base excess/deficit
- Lactate
- Venous:
- Cord PH
- Base excess/deficit
- Lactate

Baby/Fetus Outcomes[a]

- NHS/CHI number
- Sex of baby/fetus
- Birth order
- Birthweight
- Gestational age at delivery: weeks & days
- Heart beat in first minute
- Cord pulse in first minute
- Active body movement in first minute
- Respiratory activity in first minute
- Apgar score at 1 minutes
- Apgar score at 5 minutes
- Documented child protection issues?
- Documented history of domestic abuse?
- Gestational age at confirmation of death: weeks & days[c]
- Date death confirmed[c]
- Was baby alive at onset of care?[c]
- Was baby admitted to a neonatal unit?[b]
- Was baby transferred to another organisation after birth[b]
- Primary reason for the first transfer[b]
- Number of transfers[b]
- Type of unit where death occurred[b]
- Care provider at time of death[b]
- Was the death unattended?[b]
- Date of death[b]
- Time of death[b]

Causes of Death[a]

- Sources of information used to determine cause of death
- Cause of death as written in notes or on the Death Certificate
- Primary cause of death:
  - Condition
  - CODAC Code
- Baby/fetus associated condition:
  - Condition
  - CODAC Code

Post-Mortem[a]

- Was a post-mortem offered?
- Was consent given for a post-mortem?
- Consented post-mortem procedures
- Was placenta sent for histology?
- Was the case discussed with a coroner/procurator fiscal?
- Was the case accepted as a coroner/procurator fiscal's case?

Clinicians

- Obstetrician responsible for care
- Neonatologist/paediatrician responsible for care

[a] recorded for each baby/fetus
[b] live births only
[c] stillbirth & late fetal losses only

A2.2 Approvals for collection of patient identifiable data

The necessary approvals obtained by the MNI-CORP programme prior to the start of the data collection process are listed below. These were acquired in order to collect patient identifiable data and access information collected by statutory organisation without consent.

Box 2: Approvals granted for UK collection of patient identifiable data and access to statutory data without consent

England and Wales
The Confidentiality Advisory Group of the Health Research Authority: ECC 5-05 (f)/2012
Health & Social Care Information Centre, Data Access Advisory Group: IC604DS

Scotland
The NHS Scotland Caldicott Guardian: 2014-62 MBRRACE-UK Programme – Update (2013-05)
The Privacy Advisory Committee, Information Services Division, NHS National Services Scotland: PAC16/14

Northern Ireland
Due to the different data privacy arrangements in Northern Ireland only de-identified data are provided to the MNI-CORP programme and these are provided via the NIMACH office

A2.3 The System for On-line Data Submission

Security

Access to the MBRRACE-UK website is via the internet using the secure HTTPS protocol. The web and database servers are housed in a secure data centre with firewall protection. Excluding MBRRACE-UK staff, over 1,000 different people have accessed the system since it was launched in April 2013.

All staff requesting on-line access must be approved by their Trust or Health Board and log-in is only possible with either an NHS or UK University email address. When an approved reporter first accesses the website they are required to request an activation code. This is used as a one-time password which must be changed on first access. All passwords must meet a set of criteria which ensures all passwords accepted are ‘strong’; in addition, they must be changed at regular intervals and are stored securely. Reporters are assigned to a profile which restricts their access to only the appropriate parts of the website for their role (the system is used both to report perinatal deaths and to provide access to the notes for assessors taking part in MBRRACE-UK confidential enquiries).

All patient identifiers are encrypted before they are stored. Access to identifiable data is only allowed under very limited circumstances. Reporters may view the data from their own Trust or Health Board and access to identifiable data by MBRRACE-UK staff is subject to NHS information governance, security and confidentiality regulation (Box 2).

Data integrity and validation

Reporters wishing to report a new death or edit an existing death record are required to confirm the mother’s details (NHS or Community Health Index (CHI) number, name, date of birth) on each occasion. The nationally defined algorithm for checking NHS and CHI numbers is used to ensure only valid numbers are entered.

Where appropriate, the information reported is checked against a range of acceptable values during the data entry process. For each such data item there is a range of expected values and an absolute range. If a value is outside the expected range the reporter is warned and informed of the range. If it is outside the absolute range then the value cannot be entered and, additionally, the record cannot be closed. Before the reporter can close a record additional checks are done: for example, date values across the whole record are validated against each other to test for consistency. Because of the very tight timescales in developing the data entry system some validation (birthweight for gestational age, for example) was deferred but will be included in future updates of the system.

There is a facility whereby reporters are allowed to indicate that particular data items are not known. The number of data items that allow 'not known' will gradually be reduced, as reporters become more familiar with the MBRRACE-UK system and the data requirements.

For a significant number of deaths some of the data required will be held in more than one hospital (e.g. some aspects of maternal data after the death of a baby following postnatal transfer). If the additional information is held within the same Trust or Health Board but on a different site then reporters can access all the information they need in collaboration with obstetric, midwifery, neonatal or nursing colleagues. However, if the missing information is held by a different Trust or Health Board then the MBRRACE-UK system allows the reporter to temporarily assign the MBRRACE-UK record to the other Trust or Health Board who then return it once the missing information has been provided.

Online Help

Help is available on every data entry screen through FAQs. In addition, many of the variables have specific help available by clicking on the help icon. Also, on every screen of the website there is a function to allow the reporter to enter a help request. This is sent via email to the MBRRACE-UK office for attention, either by the technical, clinicial or administrative staff.

Reports

Downloadable reports are available for each Trust and Health Board giving details of deaths reported, possible missing deaths, and summary information on reported deaths for that Trust or Health Board.

Web browser compatibility

The security requirements of the NHS in relation to electronic data flows mandate that the highest levels of security be employed. In order for this to be achieved, those accessing the MBRRACE-UK data entry system need access to an up-to-date web browser compatible with these security specifications. For many Trusts and Health Boards this proved to be a problem in the first instance as they were using an old version of Microsoft Internet Explorer which was incompatible with the security requirements. Appropriate browsers are available to download free of charge but since data reporting was from NHS sites the installation of such software required the co-operation of local IT Departments. Again we experienced a range of responses from those who facilitated the change of browser on one or two key computers without delay to, at the other extreme, those that refused to respond until the request was escalated to their Chief Executive.

A2.4 Ensuring all births for 2013 and extended perinatal deaths are identified

The sources of data used to ensure complete data collection of births in 2013 and extended perinatal deaths for this cohort are listed in Box 3. The combining and checking of these data is outlined briefly below and in Figure 20.

Box 3: Data sources for the ascertainment of UK births and perinatal deaths

England and Wales
Birth and death registration data - Office for National Statistics (ONS)
NHS Numbers for Babies (NN4B) data on all births - Health and Social Care Information Centre (HSCIC)

Scotland
Births and death registration data - National Records of Scotland
SMR2 inpatient data - Information Services Division Scotland, NHS National Statistics Scotland

Northern Ireland
Births, deaths and inpatient data - Northern Ireland Maternal and Child Health, HSC Public Health Agency – derived from the Northern Ireland Maternity Information System (NIMATS)

Crown Dependencies
Births and deaths data - Health and Social Services Department, States of Guernsey
Births and deaths data - Health Intelligence Unit, Public Health Services, States of Jersey
Births and deaths data - Noble's Hospital, Isle of Man

Identifying all extended perinatal deaths

Statutorily registered deaths (from ONS for England and Wales and NRS for Scotland) which meet the MBRRACE-UK reporting criteria are matched to the deaths reported to MBRRACE-UK in order to identify any stillbirths or neonatal deaths which have not been reported to MBRRACE-UK. Due to the different system of implementation in Northern Ireland, the NIMACH office staff ensured full validation of their data on our behalf.

For England, Wales and Scotland the matching is performed using a combination of deterministic and probabilistic matching methods based on the mother's given name, mother's family name, postcode of residence, Trust or Health Board of birth, baby's NHS number (where available), and gestational age at delivery.

Once the checking is complete the MBRRACE-UK Lead Reporters are notified of any known deaths that have occurred in their Trust or Health Board which could not be identified on the MBRRACE-UK system and asked to confirm that this was a death in their organisation and provide the missing information.

This checking for deaths missing from the MBRRACE-UK database cannot start until the registered deaths are provided to MBRRACE-UK by ONS (England and Wales) and NRS (Scotland), meaning that we cannot inform MBRRACE-UK Lead Reporters of missing deaths until some months after the event. This was a particular problem in Scotland for 2013 leading to reporters having much less time to report missing deaths before the closure of the dataset; this will not be the case for subsequent years. Figure 21 represents the timeline of receiving death registration data for 2013 and the corresponding reports sent to MBRRACE-UK Lead Reporters highlighting missing deaths that needed to be reported.

Although most missing deaths can be identified in this way, not all deaths to be reported to MBRRACE-UK are available from statutory sources in a timely manner:

1) a small percentage of statutorily registered deaths are registered only after considerable delay (perhaps because an inquest was being held);

2) late fetal losses delivered at 22^{+0} to 23^{+6} weeks gestational age are not officially registered;
3) RCOG guidance (10, 11) is that stillbirths delivered at 24^{+0} weeks gestational age or greater where the death was confirmed before 24^{+0} weeks gestational age should not be registered as stillbirths: however, in order to investigate variations in the reporting of stillbirths around 24^{+0} weeks gestational age, these cases should be reported to MBRRACE-UK.

There are no timely easily accessible data sources for these deaths that have not been officially registered and, therefore, it is not possible to ensure that all of these deaths have been reported to MBRRACE-UK. It is clear from examining the data (see Chapter 5) that some units are extremely diligent in recording these deaths, while other units have substantially lower rates of reporting.

Figure 20: Flow chart of process of combining datasets of births and extended perinatal deaths into a single dataset

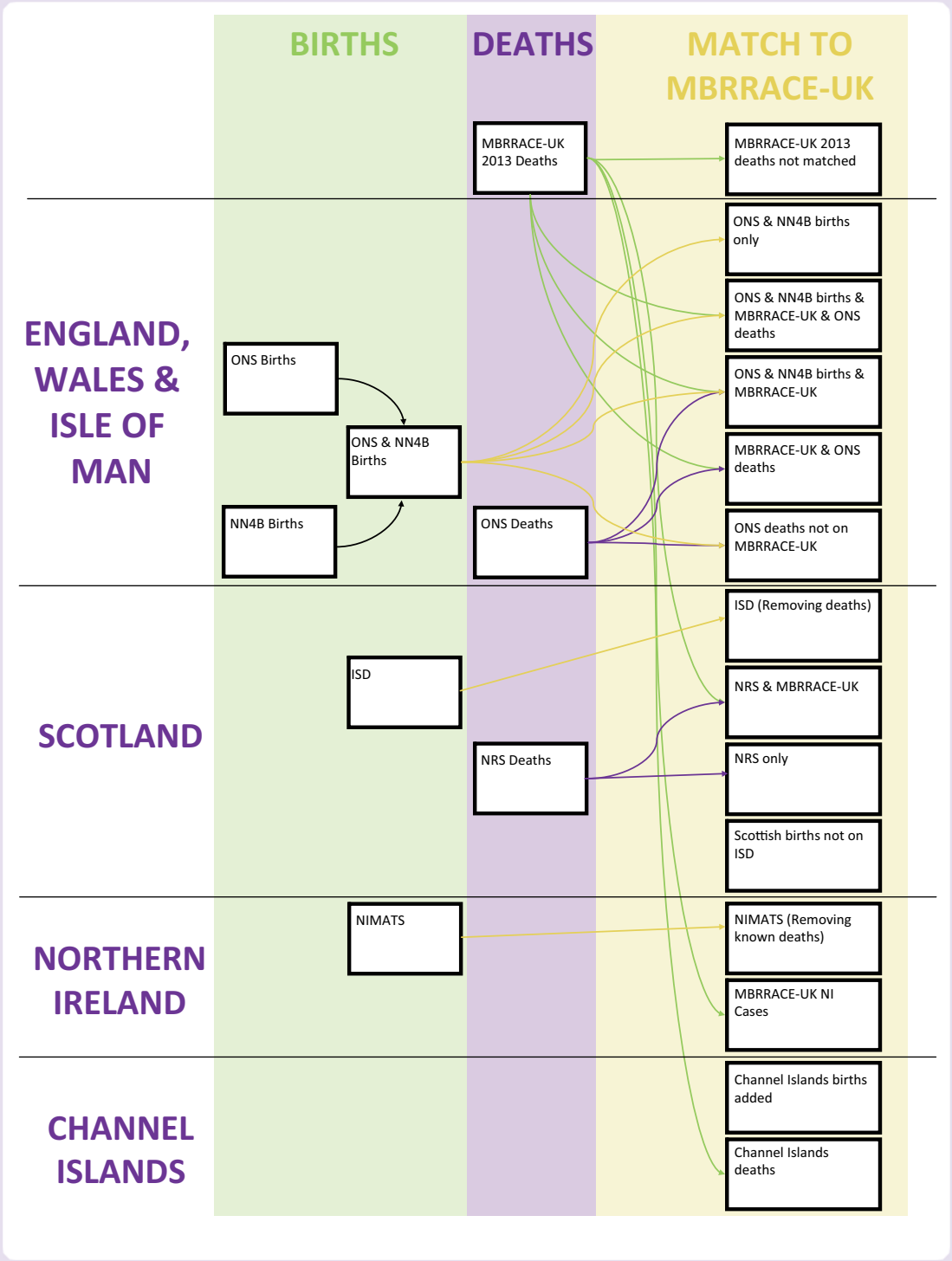
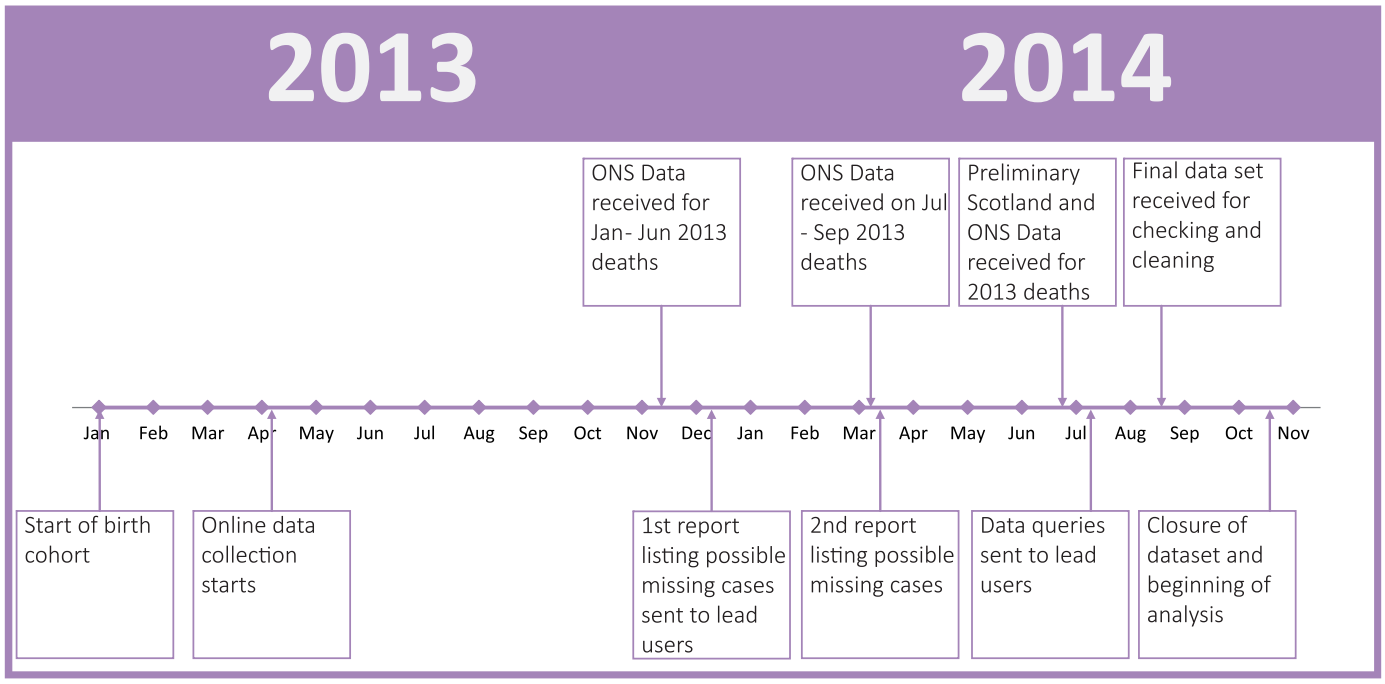


Figure 21: Timeline of receiving data on statutorily registered births and deaths in 2013 and for sending reports of missing cases to MBRRACE-UK Lead Reporters: England, Scotland and Wales



Identifying all births in 2013

Information on births in England and Wales are obtained from ONS birth registrations and NN4B (the system to allocate NHS numbers to babies born in England, Wales and the Isle of Man). As some births might be missing from each of the data sources, in order to provide a more complete list of all births in England and Wales the ONS births data are matched to the NN4B data. These data are then matched to both the ONS deaths register and the MBRRACE-UK dataset using information relating to both the mother (given name; family name; area of residence) and the baby (gestational age at birth; date of birth; Trust or Health Board of birth; sex; NHS number). Once matched, the data are cleaned.

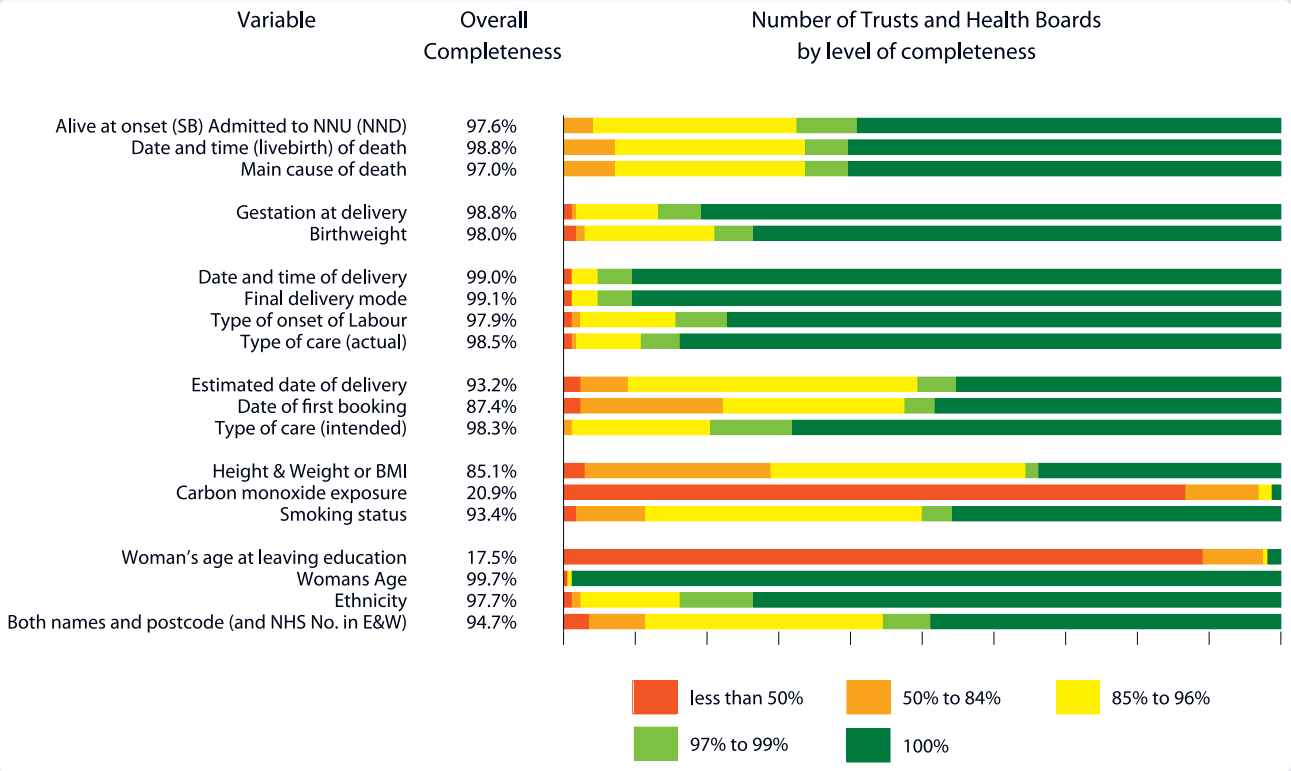
The process is repeated for data from Scotland by matching the NRS deaths to the ISD births hospital discharge data and MBRRACE-UK records. A complicating factor in Scotland is that ISD data are not available for some births, e.g. homebirths, non-residents. For 2013 routinely available aggregate data were used to impute information for 2,151 surviving births for which ISD data were not available and to obtain information about their sex and county and Health Board of residence (37). These needed to be included in the dataset for analysis in order to accurately calculate mortality rates.

The availability of information on births in 2013 differed between the Crown Dependencies. NN4B data for February to December 2013 are available for the Isle of Man and, therefore, their rates are reported for that time period. No individual denominator data were available for either the Bailiwick of Guernsey or the Bailiwick of Jersey for 2013; thus it is not possible to estimate stabilised & adjusted rates for the Channel Islands.

A2.5 Completeness of the data reported to MBRRACE-UK (further details)

One aspect of data quality is the completeness of the data. In Figure 22 the overall completeness of selected key variables is shown together with the number of Trusts or Heath Boards achieving different levels of completeness for their data.

Figure 22: Level of completeness of data reported by Trusts and Health Boards: United Kingdom and Crown Dependencies, for births in 2013



The completeness for groups of key data items reported to MBRRACE-UK for those deaths used in Chapter 4 is shown in Table 20 by reporting Trust and Health Board. The percentage shown is the combined percentage for all of the items in each group:

1. **Mother's details:** given name (not Northern Ireland); family name (not Northern Ireland); postcode of residence (not Northern Ireland); NHS Number (not Scotland or Northern Ireland); ethnicity; age, age at leaving full-time education.
2. **Booking information:** smoking status; breath carbon monoxide; BMI.
3. **Antenatal care:** intended type of care at booking; intended place of delivery at booking; estimated date of delivery (EDD).
4. **Delivery:** actual place of delivery; date and time of delivery; final delivery mode; type of onset of labour.
5. **Baby's characteristics:** birthweight; gestational age at delivery.
6. **Baby's outcome:** date death confirmed (stillbirths only); whether alive at onset of labour (stillbirths only), whether admitted to Neonatal Unit (neonatal deaths only); main cause of death.

The colours in the table represent the level of completeness for each Trust and Health Board:

- Red: less than 70.0% complete
- Amber: 70.0% to 84.9% complete
- Yellow: 85.0% to 96.9% complete
- Light green: 97.0% to 99.9% complete
- Dark green: 100% complete

Table 20: Completeness of selected data items reported to MBRRACE-UK by NHS Trust (England), Health Board (Scotland & Wales), Health & Social Care Trust (Northern Ireland) and Crown Dependency: United Kingdom and Crown Dependencies, for births in 2013

Trust or Health Board	Mother's Details	Booking information	Antenatal care	Delivery	Baby's characteristics	Baby's outcome
ENGLAND						
Airedale	87.5	75.0	87.5	93.8	93.8	91.7
Alder Hey Children's	50.0	0.0	33.3	34.1	36.4	97.0
Ashford & St Peter's Hospital	74.3	48.0	81.4	99.3	100.0	97.1
Barking Havering & Redbridge	74.0	67.4	97.9	100.0	99.0	99.3
Barnet & Chase Farm Hospitals	91.0	81.3	94.7	100.0	100.0	98.7
Barnsley Hospital	82.5	70.0	93.3	100.0	100.0	100.0
Barts Health	78.9	69.7	96.0	99.8	99.1	99.7
Basildon & Thurrock Univ. Hosps.	80.0	95.6	100.0	100.0	100.0	100.0
Bedford Hospital	78.1	66.7	100.0	100.0	100.0	91.7
Birmingham Children's Hosp	40.9	13.6	48.5	26.1	22.7	98.5
Birmingham Women's	81.6	66.3	94.2	98.8	99.4	99.6
Blackpool Teaching Hospitals	75.0	80.7	100.0	100.0	94.7	98.2
Bolton	78.9	57.0	93.3	99.4	96.7	99.3
Bradford Teaching Hospitals	73.0	71.4	95.3	96.5	98.4	95.3
Brighton & Sussex Univ. Hosps.	75.0	66.7	89.7	100.0	96.6	97.7
Buckinghamshire Healthcare	79.5	78.8	100.0	100.0	100.0	100.0
Burton Hospitals	87.5	76.7	100.0	100.0	100.0	100.0
Calderdale & Huddersfield	85.8	87.8	96.7	99.2	100.0	92.2
Cambridge University Hosps	71.3	43.1	75.5	99.3	94.1	98.0
Central Manchester Univ. Hosps.	73.7	52.4	85.3	97.7	100.0	99.1
Chelsea & Westminster Hosp	72.2	60.0	89.6	100.0	97.8	99.3
Chesterfield Royal Hospital	77.1	75.0	100.0	100.0	91.7	80.6
City Hospitals Sunderland	62.1	53.8	93.5	96.8	98.4	98.9
Colchester Hospital University	75.0	87.3	100.0	100.0	100.0	96.8
Countess of Chester Hospital	75.0	88.9	100.0	100.0	100.0	100.0
County Durham & Darlington	76.0	77.8	100.0	100.0	100.0	100.0
Croydon Health Services	76.5	62.7	92.2	98.5	100.0	98.0
Dartford & Gravesham	75.0	61.1	94.4	100.0	100.0	100.0

Trust or Health Board	Mother's Details	Booking information	Antenatal care	Delivery	Baby's characteristics	Baby's outcome
Derby Hospitals	75.0	67.5	98.3	99.4	100.0	100.0
Doncaster & Bassetlaw Hosps	80.0	69.3	97.3	99.0	98.0	94.7
Dorset County Hospital	59.4	66.7	95.8	100.0	100.0	100.0
Ealing Hospital	78.3	66.7	100.0	100.0	100.0	100.0
East Cheshire	58.3	100.0	100.0	100.0	75.0	94.4
East Kent Hospitals University	80.0	63.3	98.9	100.0	100.0	95.6
East Lancashire Hospitals	79.4	80.7	97.0	98.9	96.7	97.0
East Sussex Healthcare	73.8	68.3	100.0	100.0	97.5	96.7
East & North Hertfordshire	86.8	70.6	94.1	98.5	97.1	96.1
Epsom & St Helier Univ. Hosps.	86.5	68.1	100.0	100.0	100.0	97.2
Frimley Park Hospital	85.0	68.3	100.0	100.0	100.0	100.0
Gateshead Health	96.9	70.8	91.7	100.0	100.0	91.7
George Eliot Hospital	87.5	88.9	100.0	100.0	100.0	100.0
Gloucestershire Hospitals	75.0	65.3	98.7	99.0	98.0	93.3
Great Ormond Street Hospital for Children	68.8	19.4	44.4	72.9	87.5	100.0
Great Western Hospitals	86.9	76.2	100.0	100.0	100.0	98.4
Guy's & St Thomas'	73.1	58.1	84.8	95.8	100.0	99.5
Hampshire Hospitals	75.0	63.2	94.7	100.0	94.7	96.5
Harrogate & District	82.1	61.9	100.0	100.0	100.0	100.0
Heart of England	81.0	62.4	89.8	98.4	98.4	98.9
Heatherwood & Wexham Park Hosps.	72.6	63.5	92.1	100.0	97.6	98.4
Hinchingbrooke Health Care	77.3	48.5	87.9	97.7	95.5	97.0
Homerton Univ. Hosp.	68.5	74.1	90.2	99.1	100.0	98.9
Hull & East Yorkshire Hospitals	83.1	65.9	97.7	100.0	100.0	98.4
Imperial College Healthcare	79.3	56.7	83.7	97.5	99.5	99.0
Ipswich Hospital	75.0	66.7	100.0	100.0	100.0	100.0
Isle of Wight	75.0	66.7	88.9	100.0	91.7	94.4
James Paget University Hosps.	75.0	66.7	100.0	100.0	100.0	94.4
Kettering General Hospital	80.0	86.7	97.8	100.0	100.0	100.0
King's College Hospital	74.2	63.1	94.4	100.0	100.0	98.5
Kingston Hospital	72.1	66.7	100.0	100.0	94.1	92.2
Lancashire Teaching Hospitals	81.7	72.2	98.9	100.0	100.0	100.0
Lewisham & Greenwich	77.2	73.9	98.1	100.0	100.0	100.0
Liverpool Women's	74.2	58.9	91.1	97.5	99.2	98.3
Luton & Dunstable Hospital	75.0	59.0	95.7	100.0	100.0	94.9
Maidstone & Tunbridge Wells	75.0	74.2	100.0	100.0	97.7	98.5
Medway	84.0	62.7	89.3	100.0	98.0	97.3
Mid Cheshire Hospitals	81.3	75.0	100.0	100.0	100.0	100.0
Mid Essex Hospital Services	75.0	69.4	100.0	97.9	100.0	97.2
Mid Staffordshire	91.7	85.2	100.0	100.0	100.0	96.3
Milton Keynes Hospital	76.0	66.7	100.0	100.0	100.0	97.2

Trust or Health Board	Mother's Details	Booking information	Antenatal care	Delivery	Baby's characteristics	Baby's outcome
Norfolk & Norwich Univ. Hosps.	73.4	61.5	94.8	99.2	98.4	99.0
North Bristol	70.0	74.4	88.9	98.3	98.3	96.7
North Cumbria Univ. Hosps.	75.0	66.7	100.0	100.0	100.0	100.0
North Middlesex Univ. Hosp.	76.5	76.5	90.2	100.0	100.0	96.1
North Tees & Hartlepool	71.3	77.8	95.1	99.1	100.0	98.8
Northampton General Hospital	82.3	62.5	97.2	100.0	97.9	95.8
Northern Devon Healthcare	80.6	66.7	96.3	100.0	100.0	92.6
Northern Lincolnshire & Goole Hospitals	79.3	68.6	96.2	100.0	100.0	95.2
Northumbria Healthcare	83.3	77.8	92.6	100.0	100.0	100.0
Nottingham Univ. Hosps.	77.8	63.7	95.4	99.4	100.0	98.7
Oxford Univ. Hosps.	74.6	59.2	90.0	98.9	98.5	97.5
Peterborough & Stamford Hosps.	73.9	68.2	97.0	100.0	95.5	95.5
Plymouth Hospitals	74.3	53.9	82.4	100.0	100.0	100.0
Poole Hospital	98.1	97.4	100.0	100.0	100.0	94.9
Portsmouth Hospitals	75.0	59.1	89.2	98.4	100.0	97.8
Royal Berkshire	73.9	66.7	100.0	100.0	100.0	97.1
Royal Brompton & Harefield	87.5	16.7	66.7	100.0	100.0	100.0
Royal Cornwall Hospitals	89.1	68.8	100.0	100.0	100.0	97.9
Royal Devon & Exeter	82.4	66.7	100.0	100.0	100.0	100.0
Royal Free London	79.2	66.7	94.4	95.8	100.0	94.4
Royal Surrey County Hospital	75.0	80.0	100.0	100.0	100.0	100.0
Royal United Hospital Bath	78.6	66.7	98.4	100.0	100.0	95.2
Salisbury	75.0	66.7	100.0	100.0	91.7	97.2
Sandwell & West Birmingham Hospitals	71.9	72.2	94.4	100.0	95.8	98.6
Sheffield Children's	79.2	94.4	94.4	100.0	100.0	94.4
Sheffield Teaching Hospitals	75.4	61.6	87.9	99.6	100.0	99.5
Sherwood Forest Hospitals	75.0	75.0	100.0	96.9	100.0	100.0
South Devon Healthcare	94.4	74.1	100.0	100.0	100.0	100.0
South Tees Hospitals	73.6	72.1	96.4	100.0	100.0	97.3
South Tyneside	75.0	77.8	94.4	100.0	100.0	100.0
South Warwickshire	91.7	72.2	94.4	100.0	100.0	88.9
Southend Univ. Hosp.	100.0	76.9	92.3	100.0	100.0	97.4
Southport & Ormskirk Hospital	90.9	69.7	100.0	100.0	95.5	97.0
St George's Healthcare	76.8	52.4	86.5	98.8	100.0	99.2
St Helens & Knowsley Teaching Hosps	75.0	78.8	97.0	100.0	100.0	100.0
Stockport	75.0	70.2	100.0	98.7	100.0	98.2
Surrey & Sussex Healthcare	73.8	58.7	92.1	98.8	97.6	100.0
Tameside Hospital	75.0	66.7	92.6	100.0	94.4	100.0
Taunton & Somerset	84.4	50.0	83.3	93.8	93.8	87.5
The Dudley Group of Hospitals	78.4	81.8	100.0	100.0	100.0	98.5
The Hillingdon Hospitals	77.9	64.7	96.1	100.0	100.0	98.0
The Leeds Teaching Hospitals	82.7	64.1	75.1	99.2	98.4	96.7

Trust or Health Board	Mother's Details	Booking information	Antenatal care	Delivery	Baby's characteristics	Baby's outcome
The Mid Yorkshire Hospitals	68.8	77.1	91.7	100.0	98.4	99.0
The Newcastle upon Tyne Hospitals	74.6	56.1	86.7	97.9	100.0	97.2
The North West London Hospitals	78.3	66.7	94.2	100.0	97.8	94.2
The Pennine Acute Hospitals	81.7	69.2	98.3	99.0	98.1	97.4
The Princess Alexandra Hospital	85.7	66.7	100.0	98.8	100.0	98.4
The Queen Elizabeth Hospital King's Lynn	87.5	100.0	100.0	100.0	100.0	91.7
The Rotherham	95.8	66.7	100.0	100.0	100.0	100.0
The Royal Wolverhampton Hospitals	74.4	56.1	86.4	98.9	100.0	98.5
The Shrewsbury & Telford Hospital	74.3	79.4	100.0	100.0	100.0	98.0
United Lincolnshire Hospitals	88.7	83.9	96.8	99.2	98.4	87.1
University College London Hospitals	74.1	66.0	89.3	100.0	98.1	100.0
Univ. Hosp. Southampton	82.2	57.8	91.1	100.0	100.0	97.0
Univ. Hosp. of North Staffs	75.0	60.6	90.9	95.5	98.5	97.0
Univ. Hosp. of South Manchester	80.0	66.7	100.0	100.0	96.0	96.0
Univ. Hosps. Coventry & Warwickshire NHST	83.3	75.0	93.5	100.0	100.0	95.4
Univ. Hosps. of Bristol	74.0	70.1	87.1	100.0	100.0	95.9
Univ. Hosps of Leicester	77.5	66.7	95.5	98.1	99.4	97.9
Univ. Hosps. of Morecambe Bay	78.6	64.3	95.2	100.0	96.4	92.9
Walsall Healthcare	80.2	68.1	98.6	99.0	97.9	97.2
Warrington & Halton Hospitals	75.0	66.7	100.0	97.7	100.0	100.0
West Hertfordshire Hospitals	73.4	68.8	100.0	100.0	100.0	100.0
West Middlesex Univ. Hosp.	76.9	66.7	96.2	100.0	100.0	97.4
West Suffolk	88.5	92.3	100.0	100.0	100.0	97.4
Western Sussex Hospitals	83.3	81.0	98.4	100.0	100.0	98.4
Whittington Health	83.3	63.9	94.4	100.0	100.0	100.0
Wirral Univ. Teaching Hospital	75.0	54.2	90.3	99.0	95.8	100.0
Worcestershire Acute Hospitals	85.2	65.2	100.0	100.0	100.0	98.5
Wrightington, Wigan & Leigh	94.7	73.7	100.0	100.0	94.7	100.0
Wye Valley	85.7	66.7	100.0	100.0	100.0	97.6
Yeovil District Hospital	62.5	83.3	100.0	100.0	100.0	100.0
York Teaching Hospital	85.8	72.2	100.0	99.2	100.0	95.6
SCOTLAND						
NHS Ayrshire & Arran	81.8	65.7	88.9	100.0	98.5	96.0
NHS Borders	75.0	58.3	100.0	100.0	100.0	100.0
NHS Dumfries & Galloway	72.2	63.0	92.6	97.2	94.4	96.3
NHS Fife	76.6	81.3	95.8	100.0	96.9	97.9
NHS Forth Valley	75.0	97.8	100.0	100.0	100.0	88.9
NHS Grampian	76.8	68.3	93.7	100.0	100.0	97.6
NHS Greater Glasgow & Clyde	82.7	82.1	92.9	99.7	100.0	98.8
NHS Highland	78.1	75.0	100.0	100.0	100.0	100.0

Trust or Health Board	Mother's Details	Booking information	Antenatal care	Delivery	Baby's characteristics	Baby's outcome
NHS Lanarkshire	75.0	76.0	92.0	99.0	100.0	94.7
NHS Lothian	77.9	67.4	97.7	100.0	100.0	99.2
NHS Tayside	76.9	69.2	97.4	99.0	100.0	97.4
WALES						
Abertawe Bro Morgannwg Univ. Health Board	73.5	65.7	98.0	99.2	100.0	99.0
Aneurin Bevan Health Board	75.8	70.7	94.9	100.0	100.0	98.0
Betsi Cadwaladr Univ. Health Board	73.3	68.9	95.6	100.0	98.3	94.4
Cardiff & Vale Univ. Health Board	75.0	50.0	82.0	98.0	98.0	97.3
Cwm Taf Health Board	51.8	69.0	100.0	100.0	96.4	100.0
Hywel Dda Health Board	76.7	71.1	100.0	100.0	100.0	95.6
NORTHERN IRELAND						
Belfast Health & Social Care Trust	77.2	65.2	94.1	99.6	100.0	100.0
Northern Health & Social Care Trust	79.6	63.0	91.4	99.1	100.0	95.1
South Eastern Health & Social Care Trust	75.0	59.3	96.3	100.0	100.0	100.0
Southern Health & Social Care Trust	77.8	64.8	100.0	100.0	100.0	100.0
Western Health & Social Care Trust	78.2	65.6	96.8	100.0	100.0	100.0
CROWN DEPENDENCIES						
Isle of Man	0.0	0.0	0.0	0.0	0.0	0.0
Bailiwick of Guernsey	66.7	88.9	100.0	100.0	100.0	100.0
Bailiwick of Jersey	50.0	44.4	100.0	100.0	100.0	88.9

A3 Statistical methods to calculate stabilised & adjusted mortality rates

The reported stabilised & adjusted mortality rates are estimated using statistical models derived from methodology developed by the Centers for Medicare and Medicaid Services (CMS) (13).

A3.1 Statistical methodology

The stabilised & adjusted mortality rate for each organisation (*m*) is calculated by multiplying the appropriate observed overall mortality rate for the UK (*M*) by an organisation-specific standardised mortality rate (*SMR*) calculated from the data, i.e.:

$m_j = M \times SMR_j$

where m_j is the estimated stabilised & adjusted mortality rate for organisation *j*

M is the observed overall mortality rate for the UK

SMR_j is the estimated SMR for organisation *j*: $SMR_j = \frac{(\text{No. observed deaths})}{(\text{No. expected deaths})}$

The SMR is estimated using a multilevel logistic regression model:

$$\text{logit}\left[P_{ij}\left(Y_{ij}=1\middle|\mathbf{x_{ij}}\right)\right]=\alpha+\boldsymbol{\beta}\mathbf{x}_{ij}+\gamma_j$$

where Y_{ij} is the indicator variable of death for the i^{th} baby in the j^{th} organisation: Y_{ij}=1 if a death; 0 otherwise

$\mathbf{x}_{ij}$ is the vector of risk adjustment factors for the i^{th} baby in the j^{th} organisation

γ_j is the random term representing organisation *j*: $\Upsilon \sim \text{Normal}(0,\sigma^2)$

A multilevel model is used as it can accommodate the hierarchical structure of the data through the random term: that is, births clustered within organisations. These models also allow the calculation of stabilised (also known as shrunken or smoothed) estimates of the organisation-specific terms, which reduce the likelihood of organisations being falsely identified as outliers by chance alone.

Various approaches to calculating a SMR from a multilevel logistic model have been proposed (38). The method used for the MBRRACE-UK report "*… is determined by dividing the smoothed, risk-adjusted, provider-specific estimate of mortality by the estimate of expected mortality obtained using the average intercept for all … providers*" (39). In this approach, the observed number of deaths is replaced by a model-based predicted number reflecting sampling variation in the observed deaths: that is, a *stabilised* observed number of deaths is estimated for each organisation. Hence, the SMR is the ratio of the stabilised number of deaths to the deaths that would be expected if the organisation's patients were from an 'average' organisation:

$$SMR_j=\frac{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha-\boldsymbol{\beta}\mathbf{x_{ij}}-\gamma_j\right]\right)^{-1}}{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha-\boldsymbol{\beta}\mathbf{x_{ij}}\right]\right)^{-1}}$$

Therefore:

$$m_j=M\times\frac{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha-\boldsymbol{\beta}\mathbf{x_{ij}}-\gamma_j\right]\right)^{-1}}{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha-\boldsymbol{\beta}\mathbf{x_{ij}}\right]\right)^{-1}}$$

95% confidence intervals

The reported 95% confidence intervals for the stabilised & adjusted mortality rate are obtained through bootstrap methods: (13)

1. *J* organisations are sampled with replacement (where *J* is the total number of organisations);
2. The multilevel model is estimated for the sample, keeping each appearance of an organisation distinct if it is sampled more than once;
3. The estimated value, and prediction error, of the random term is obtained for each organisation: $\hat{\gamma}_j$ and $\hat{error}(\gamma_j)$ - if an organisation is sampled more than once then a single set of values is selected at random;
4. The bootstrap estimates for the fixed terms are noted (α^* and $\boldsymbol{\beta}^*$);
5. A new value (γ_j^*) for the organisation-specific random term is sampled, where $\gamma_j^* \sim N(\hat{\gamma}_j, \hat{error}(\gamma_j))$;
6. The bootstrap stabilised & adjusted mortality rate (m_j^*) is obtained by substituting γ_j^* for $\hat{\gamma}_j$ giving $m_j^* = M \times \frac{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha^* - \boldsymbol{\beta}^* \mathbf{x_{ij}} - \gamma_j^*\right]\right)^{-1}}{\sum_{i=1}^{n_j}\left(1+\exp\left[-\alpha^* - \boldsymbol{\beta}^* \mathbf{x_{ij}}\right]\right)^{-1}}$;
7. This is repeated 1,500 times, giving approximately 1,000 values for the bootstrap stabilised & adjusted mortality rate for each organisation since organisations are not necessarily included in each bootstrap sample;
8. The lower and upper limits of the 95% confidence interval are obtained for each organisation from the 2.5th and 97.5th percentiles respectively of the distribution the bootstrap stabilised & adjusted mortality rates.

Probability of falling above a benchmark

The statistical methodology used allows the calculation of empirical Bayes posterior probabilities to estimate the probability that the underlying mortality rate for an organisation falls above (or below) a specified benchmark: for example, it would be possible to report the probability that the underlying stabilised & adjusted mortality rate for organisation *j* is greater than 6 per 1,000 births ($m_j > 6.0$).

In this report organisations have been identified when the probability that they fall above, or below, a specified benchmark is greater than 0.5: that is, 'it is more likely than not' that their underlying mortality rate falls outside the benchmark (details of the benchmarks used are given on page 19).

However, with the specification of a set of nationally agreed benchmarks covering all types of perinatal death, this methodology can be used to explicitly report the probability that organisations are performing better than these agreed benchmarks. This approach will be explored in later MBRRACE-UK reports.

A3.2 Risk-adjustment model

The multilevel logistic regression model outlined in the previous section includes factors to adjust for differences in key factors which are known to increase the risk of stillbirth and neonatal mortality. The factors which can be included in the model are limited to those that are routinely collected for all births across the whole UK. For this report the risk-adjustment factors included in the statistical model were:

a) **mother's age**, categorised as <20 years, 20-24 year, 25-29 years, 30-34 years, 35-39 years, ≥40 years;

b) **socio-economic deprivation** based on mother's residence: measured using the Children in Low Income Families Local Measure, categorised into quintiles to ensure an (approximately) equal number of total births in each quintile;

c) **baby's ethnicity**, categorised as White, mixed or multiple ethnicity, Asian or Asian British, Black or Black British, other;

d) **baby's sex**, categorised as male, non-male;

e) **multiple birth**, categorised as singleton birth, multiple birth;

f) **gestational age at birth**, categorised as 24^{+0} to 27^{+6} weeks, 28^{+0} to 31^{+6} weeks, 32^{+0} to 33^{+6} weeks, 34^{+0} to 36^{+6} weeks, 37^{+0} to 41^{+6} weeks, $\geq 42^{+0}$ weeks (included for neonatal death rates only as gestational age at birth may potentially be influenced by the quality of obstetric care)

Missing data

Where information was unavailable for the risk-adjustment factors because it was missing from the routine data source, in order to allow all appropriate births to be included in the analyses the missing values were assumed to fall into the following categories:

a) mother's age - 30 to 34 years (for <0.1% of births);

b) socio-economic deprivation based on mother's residence - middle quintile (10.4%);

c) baby's ethnicity - white (4.2%);

d) baby's sex - male (<0.1%);

e) multiple birth - singleton (<0.1%);

f) gestational age at birth - 37^{+0} to 41^{+6} weeks (<0.1%);

A4 Further rates of mortality for organisations

A4.1 Rates of mortality by NHS Commissioning Board Area Team in England

Table 21: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Commissioning Board Area Team based on the CCG of mother's registered General Practitioner: England, for births in 2013

NHS Area Team	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊#	
Arden, Herefordshire & Worcestershire	18,459	3.63	4.13 (3.58 to 4.74)	2.00	1.85 (1.50 to 2.23)	5.63	6.10 (5.21 to 7.10)	
Bath, Gloucestershire, Swindon & Wiltshire	16,512	3.81	4.15 (3.54 to 4.89)	1.58	1.77 (1.43 to 2.15)	5.38	5.83 (5.02 to 6.81)	
Birmingham & The Black Country	35,643	5.05	4.28 (3.78 to 4.81)	2.45	2.00 (1.63 to 2.39)	7.48	6.37 (5.63 to 7.19)	
Bristol, North Somerset, Somerset & South Gloucestershire	17,224	3.14	3.87 (3.23 to 4.53)	1.39	1.71 (1.39 to 2.10)	4.53	5.26 (4.36 to 6.29)	
Cheshire, Warrington & Wirral	13,101	3.43	4.10 (3.46 to 4.77)	1.52	1.82 (1.49 to 2.25)	4.96	5.84 (4.95 to 6.88)	
Cumbria, Northumberland, Tyne & Wear	20,357	4.71	4.60 (3.87 to 5.41)	1.77	1.83 (1.49 to 2.21)	6.48	6.63 (5.62 to 7.82)	
Derbyshire & Nottinghamshire	22,800	4.03	4.24 (3.69 to 4.91)	2.25	2.02 (1.62 to 2.52)	6.26	6.42 (5.54 to 7.40)	
Devon, Cornwall & Isles Of Scilly	17,424	3.73	4.23 (3.63 to 4.92)	1.84	1.90 (1.51 to 2.35)	5.57	6.20 (5.29 to 7.24)	
Durham, Darlington & Tees	13,599	4.48	4.38 (3.76 to 5.24)	1.62	1.71 (1.35 to 2.14)	6.09	6.14 (5.18 to 7.22)	
East Anglia	27,307	3.44	3.97 (3.44 to 4.60)	1.50	1.73 (1.39 to 2.10)	4.94	5.46 (4.61 to 6.41)	
Essex	20,221	3.71	4.13 (3.56 to 4.77)	1.63	1.72 (1.36 to 2.09)	5.34	5.84 (5.01 to 6.79)	
Greater Manchester	37,416	5.34	4.68 (4.03 to 5.49)	1.83	1.73 (1.47 to 2.04)	7.15	6.57 (5.78 to 7.43)	
Hertfordshire & The South Midlands	35,614	3.71	3.99 (3.45 to 4.58)	1.58	1.68 (1.36 to 2.03)	5.28	5.55 (4.85 to 6.33)	
Kent & Medway	20,360	3.19	3.84 (3.22 to 4.54)	1.08	1.61 (1.21 to 2.04)	4.26	5.15 (4.26 to 6.15)	
Lancashire	17,093	5.15	4.62 (3.91 to 5.49)	2.28	1.89 (1.55 to 2.29)	7.42	6.93 (5.81 to 8.22)	
Leicestershire & Lincolnshire	19,505	4.15	4.17 (3.62 to 4.80)	2.31	2.05 (1.65 to 2.54)	6.46	6.34 (5.48 to 7.30)	
London	127,924	4.75	4.05 (3.65 to 4.45)	1.77	1.60 (1.37 to 1.87)	6.53	5.54 (4.99 to 6.11)	
Merseyside	14,081	3.26	3.86 (3.18 to 4.63)	1.71	1.74 (1.36 to 2.13)	4.96	5.40 (4.51 to 6.46)	
North Yorkshire & Humber	17,586	5.51	4.85 (3.93 to 5.91)	2.46	1.99 (1.60 to 2.52)	7.96	7.39 (6.22 to 8.80)	
Shropshire & Staffordshire	17,108	4.26	4.21 (3.64 to 4.92)	1.94	1.86 (1.48 to 2.25)	6.19	6.10 (5.17 to 7.02)	

NHS Area Team	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
South Yorkshire & Bassetlaw	17,433	4.13	4.18 (3.65 to 4.91)	2.13	1.92 (1.58 to 2.36)	6.25	6.17 (5.31 to 7.13)	
Surrey & Sussex	29,857	4.19	4.43 (3.87 to 5.13)	1.48	1.71 (1.36 to 2.08)	5.65	6.10 (5.28 to 7.01)	
Thames Valley	25,188	4.05	4.11 (3.56 to 4.76)	2.10	1.97 (1.62 to 2.38)	6.15	6.08 (5.28 to 6.98)	
Wessex	29,454	3.32	3.82 (3.18 to 4.45)	1.36	1.64 (1.27 to 2.04)	4.69	5.25 (4.48 to 6.14)	
West Yorkshire	30,963	4.88	4.42 (3.85 to 5.11)	2.26	1.96 (1.63 to 2.37)	7.13	6.47 (5.68 to 7.31)	

† per 1,000 total births
‡ per 1,000 live births
§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
◊ excluding January 2013 births due to unavailability of NN4B data
colours represent variation from UK average extended perinatal mortality rate, see page 19

Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

A4.2 Rates of mortality by Local Authority based on mother's residence

Figure 23: Crude stillbirth rates by local authority based on mother's residence: United Kingdom, for births in 2013

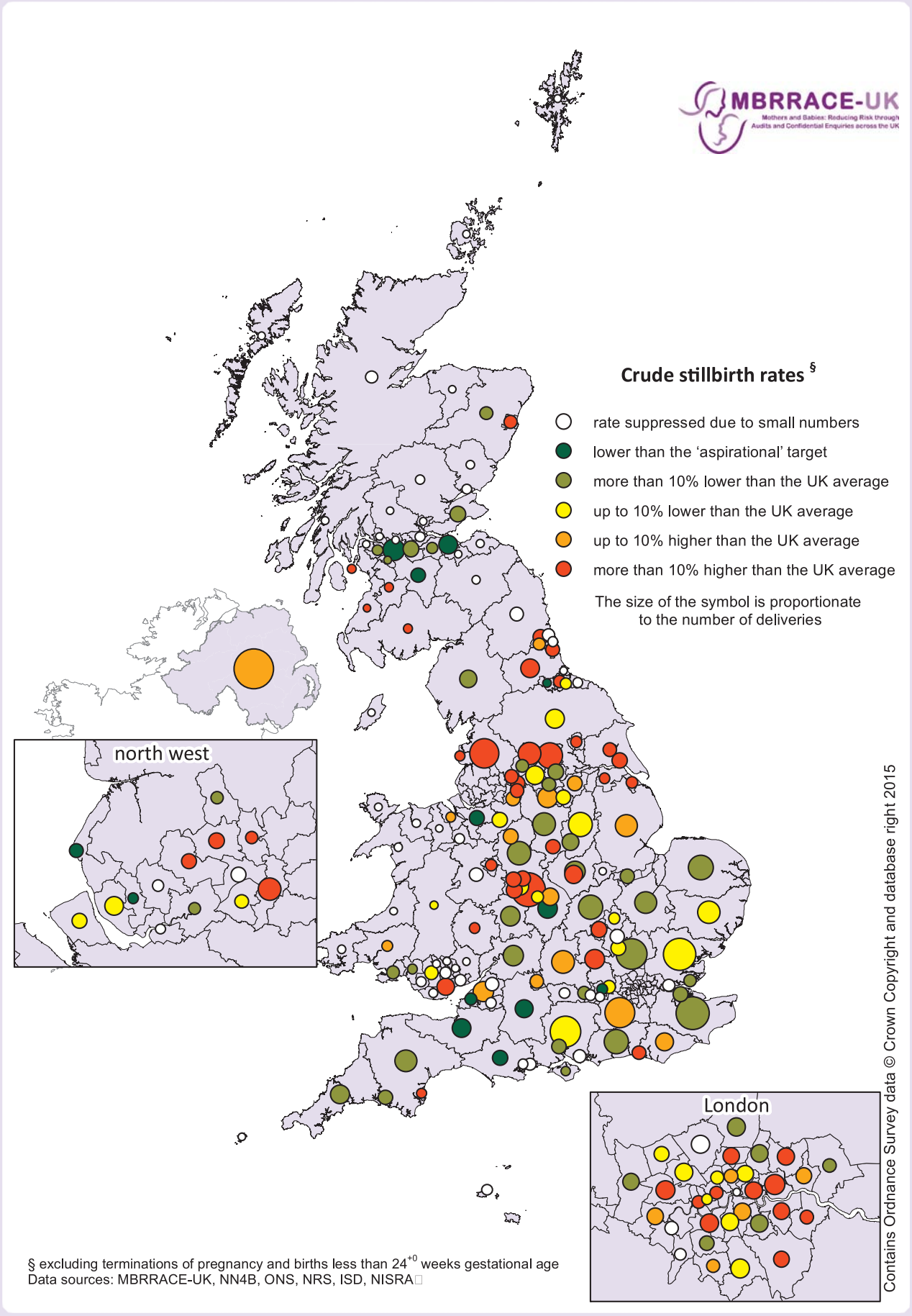


Figure 24: Stabilised & adjusted stillbirth rates by local authority based on mother's residence: United Kingdom, for births in 2013

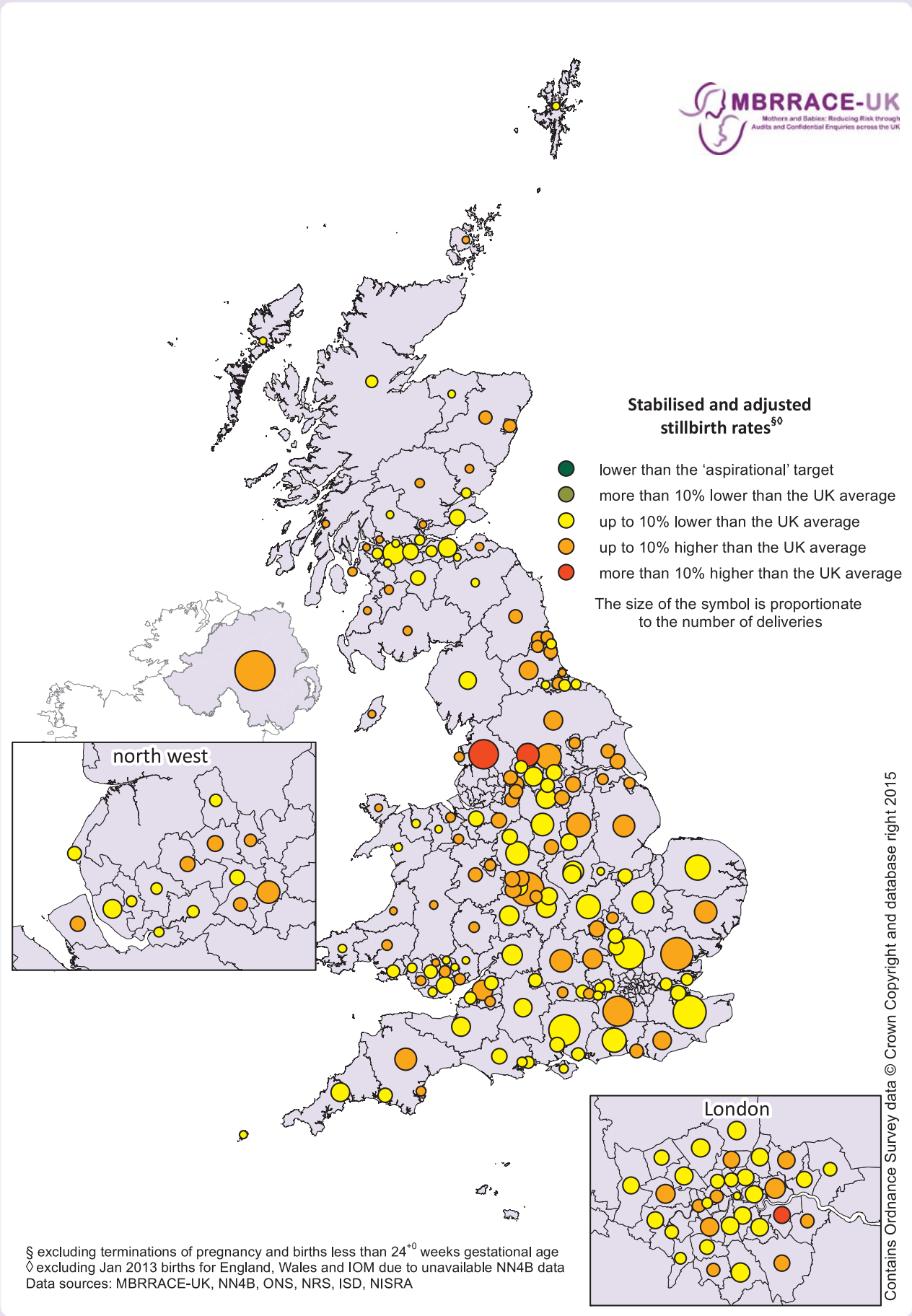
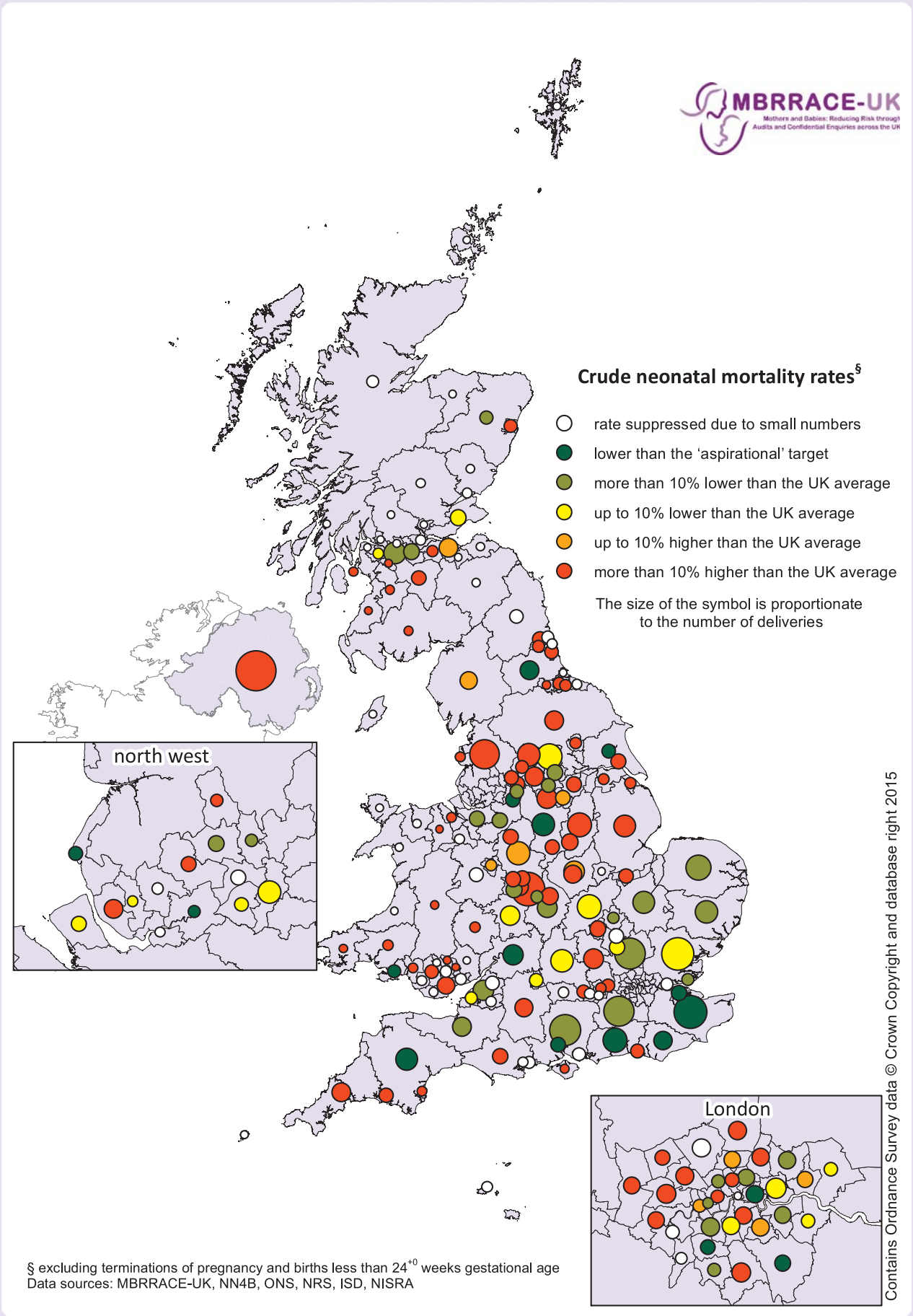
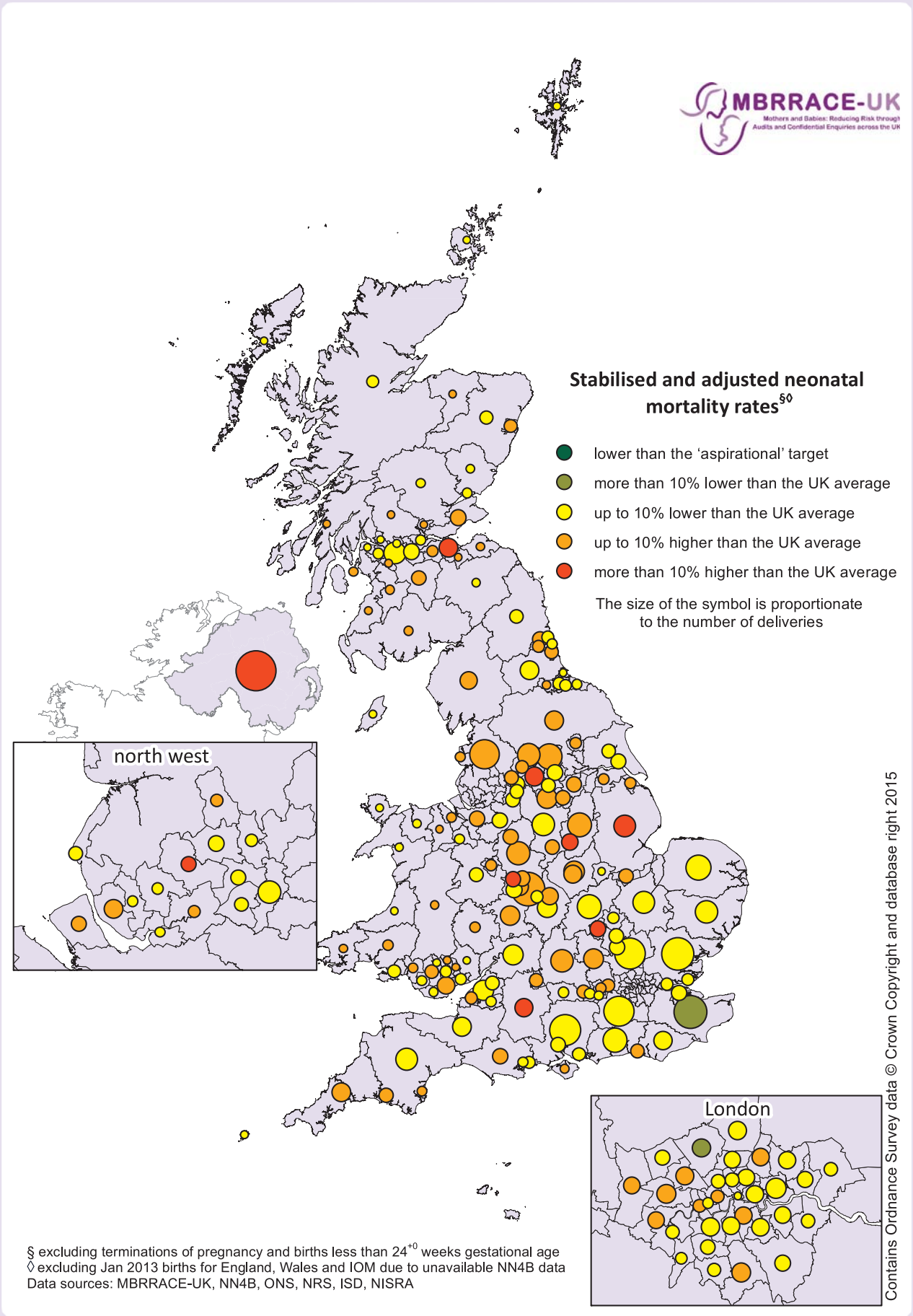


Figure 25: Crude neonatal mortality rates by local authority based on mother's residence: United Kingdom, for births in 2013



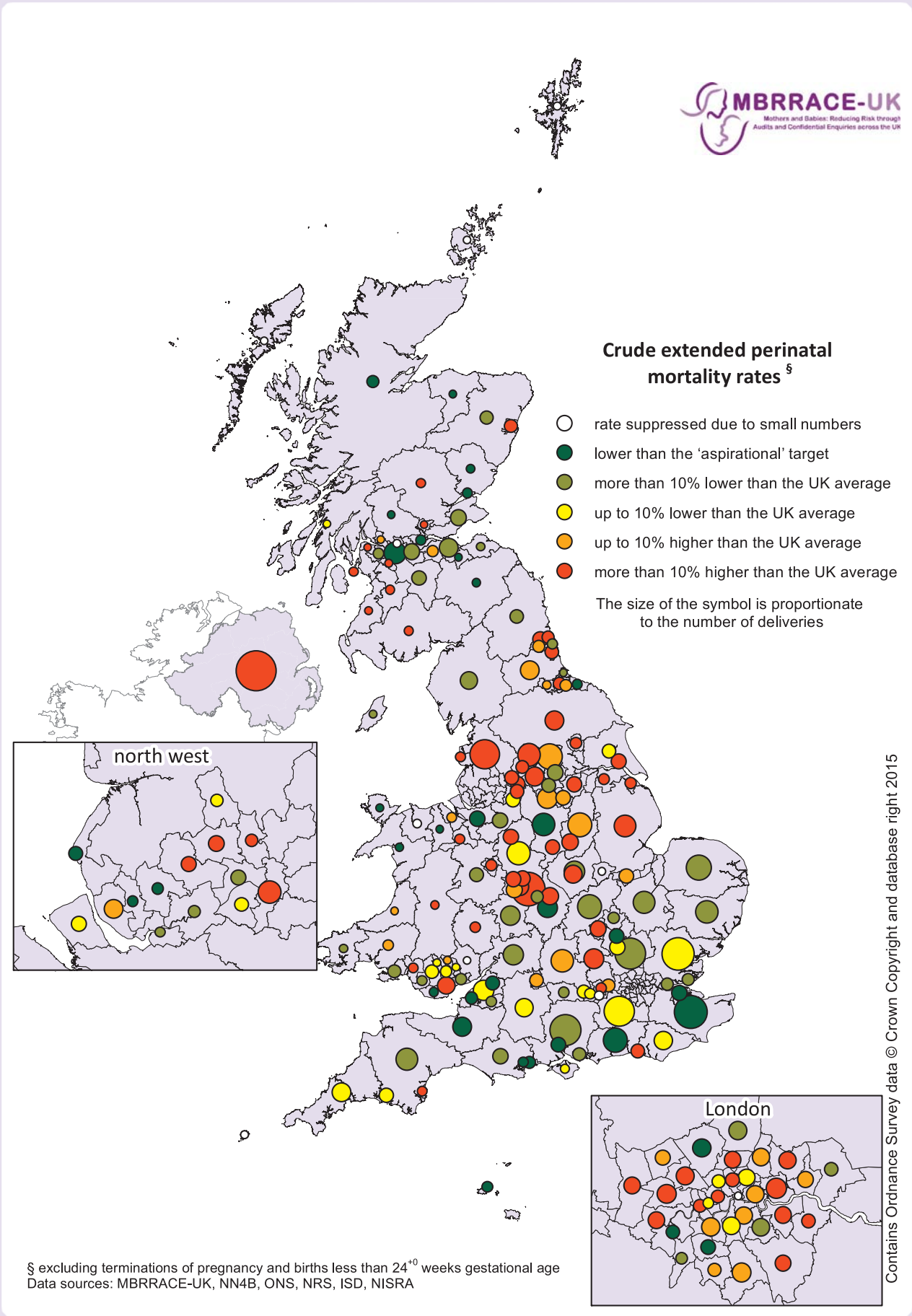
§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 26: Stabilised & adjusted neonatal mortality rates by local authority based on mother's residence: United Kingdom, for births in 2013



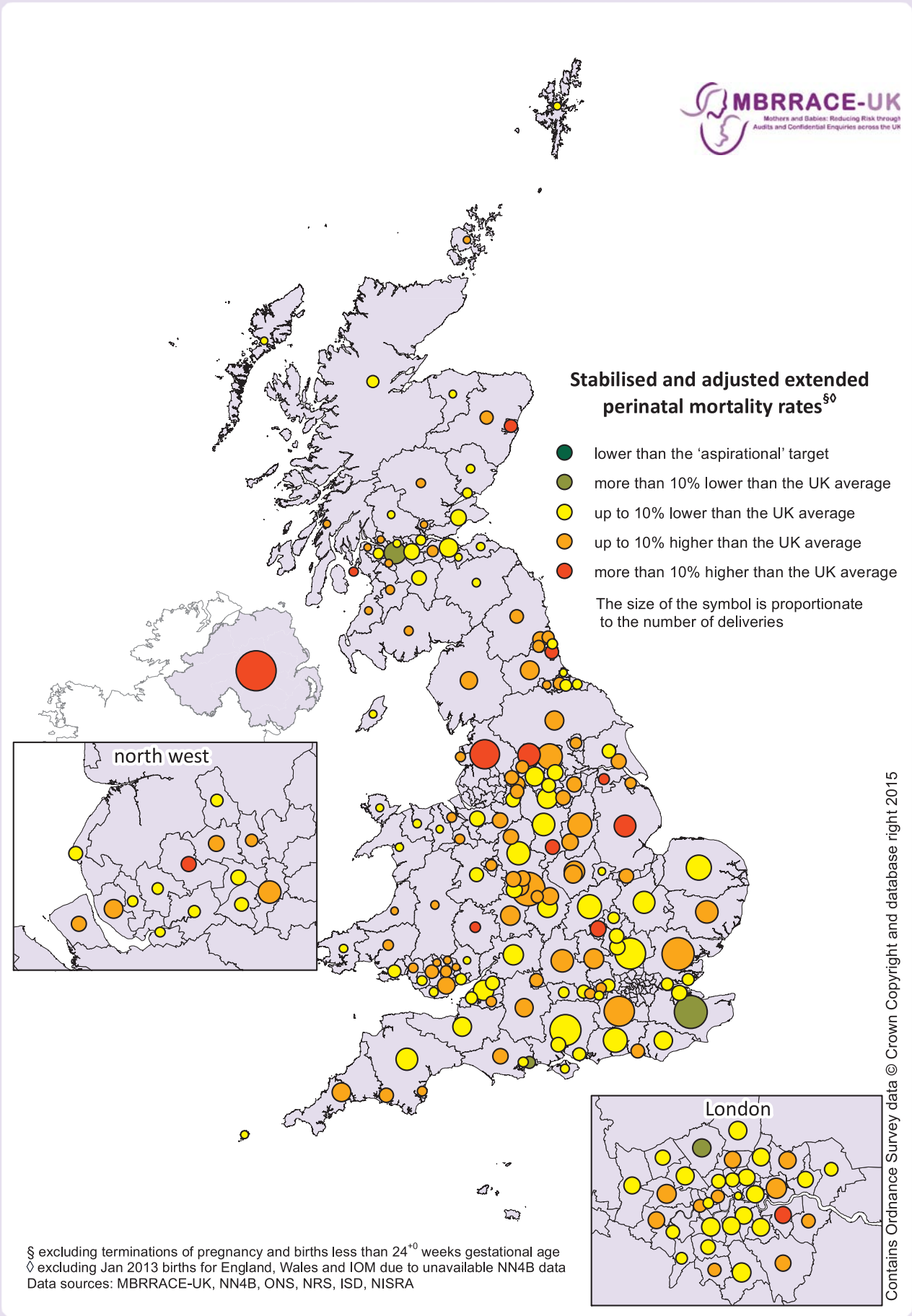
§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
◊ excluding Jan 2013 births for England, Wales and IOM due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 27: Crude extended perinatal mortality rates by local authority based on mother's residence: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Figure 28: Stabilised & adjusted extended perinatal mortality rates by local authority based on mother's residence: United Kingdom, for births in 2013



§ excluding terminations of pregnancy and births less than 24^{+0} weeks gestational age
◊ excluding Jan 2013 births for England, Wales and IOM due to unavailable NN4B data
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

Table 22: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by Local Authority based on mother's residence: United Kingdom, for births in 2013

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
ENGLAND								
Barking & Dagenham	3,779	4.50	4.09 (3.38 to 4.88)	1.86	1.80 (1.40 to 2.34)	6.35	5.77 (4.72 to 7.10)	
Barnet	5,174	*	4.03 (3.33 to 4.79)	*	1.63 (1.10 to 2.21)	3.29	5.25 (4.15 to 6.50)	
Barnsley	2,810	3.56	4.20 (3.47 to 5.10)	1.43	1.83 (1.35 to 2.42)	4.98	5.99 (4.91 to 7.38)	
Bath & North East Somerset	1,867	*	4.35 (3.65 to 5.40)	*	1.75 (1.29 to 2.28)	5.36	6.12 (4.92 to 7.67)	
Bedford	2,077	3.85	4.20 (3.47 to 5.03)	1.45	1.83 (1.34 to 2.36)	5.30	6.01 (4.84 to 7.49)	
Bexley	2,965	5.06	4.27 (3.52 to 5.12)	1.69	1.82 (1.38 to 2.35)	6.75	6.16 (5.09 to 7.78)	
Birmingham	17,402	5.80	4.36 (3.75 to 5.03)	2.20	1.95 (1.55 to 2.53)	7.99	6.38 (5.44 to 7.34)	
Blackburn With Darwen	2,257	3.54	4.13 (3.39 to 4.97)	2.22	1.87 (1.43 to 2.50)	5.76	5.94 (4.80 to 7.39)	
Blackpool	1,673	5.98	4.26 (3.60 to 5.23)	2.41	1.87 (1.42 to 2.47)	8.37	6.26 (5.14 to 7.78)	
Bolton	3,805	5.78	4.33 (3.65 to 5.36)	1.59	1.78 (1.34 to 2.31)	7.36	6.17 (5.06 to 7.67)	
Bournemouth	2,364	*	4.00 (3.23 to 4.80)	*	1.71 (1.17 to 2.22)	1.69	5.37 (4.15 to 6.79)	
Bracknell Forest	1,434	*	4.08 (3.34 to 4.98)	*	1.77 (1.24 to 2.38)	*	5.62 (4.44 to 7.10)	
Bradford	8,074	6.81	4.80 (3.77 to 6.08)	2.37	1.89 (1.49 to 2.45)	9.17	7.17 (5.87 to 8.70)	
Brent	5,183	4.05	4.02 (3.29 to 4.80)	2.91	1.91 (1.50 to 2.52)	6.95	5.86 (4.87 to 7.10)	
Brighton & Hove	2,967	5.06	4.35 (3.67 to 5.40)	2.71	1.91 (1.47 to 2.58)	7.75	6.54 (5.30 to 8.19)	
Bristol, City Of	6,524	4.60	4.21 (3.54 to 4.98)	1.39	1.72 (1.25 to 2.27)	5.98	5.76 (4.70 to 6.90)	
Bromley	3,923	5.61	4.38 (3.64 to 5.46)	1.28	1.79 (1.39 to 2.35)	6.88	6.27 (5.16 to 7.68)	
Buckinghamshire	5,815	4.64	4.27 (3.62 to 5.12)	2.25	1.90 (1.48 to 2.49)	6.88	6.26 (5.13 to 7.60)	
Bury	2,459	6.10	4.27 (3.55 to 5.15)	1.64	1.83 (1.41 to 2.35)	7.73	6.19 (5.01 to 7.71)	
Calderdale	2,512	3.58	4.13 (3.36 to 4.94)	3.20	1.93 (1.45 to 2.69)	6.77	6.04 (4.87 to 7.39)	
Cambridgeshire	7,389	3.11	4.00 (3.25 to 4.81)	1.36	1.76 (1.31 to 2.26)	4.47	5.50 (4.41 to 6.76)	
Camden	2,761	3.98	4.08 (3.31 to 4.94)	1.45	1.78 (1.38 to 2.31)	5.43	5.71 (4.64 to 7.10)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Central Bedfordshire	3,220	*	4.19 (3.47 to 5.15)	*	1.75 (1.20 to 2.33)	4.04	5.73 (4.54 to 7.01)	
Cheshire East	3,691	3.79	4.22 (3.53 to 5.11)	1.63	1.82 (1.37 to 2.32)	5.42	6.10 (5.05 to 7.58)	
Cheshire West & Chester	3,576	2.80	4.07 (3.33 to 4.90)	1.40	1.84 (1.36 to 2.44)	4.19	5.76 (4.63 to 7.12)	
City Of London	81	*	4.18 (3.44 to 5.09)	*	1.83 (1.36 to 2.53)	*	5.99 (4.76 to 7.58)	
Cornwall	5,582	3.40	4.14 (3.40 to 5.01)	2.16	1.90 (1.45 to 2.53)	5.55	6.10 (5.00 to 7.60)	
County Durham	5,413	5.17	4.49 (3.75 to 5.55)	1.11	1.75 (1.28 to 2.26)	6.28	6.38 (5.27 to 7.80)	
Coventry	4,506	4.22	4.16 (3.40 to 5.00)	2.45	1.87 (1.46 to 2.41)	6.66	6.07 (4.99 to 7.32)	
Croydon	5,624	3.91	3.91 (3.09 to 4.71)	2.32	1.91 (1.48 to 2.49)	6.22	5.65 (4.66 to 6.78)	
Cumbria	4,822	3.32	4.19 (3.44 to 5.06)	1.87	1.86 (1.42 to 2.44)	5.18	6.11 (5.04 to 7.43)	
Darlington	1,230	2.44	4.14 (3.40 to 5.06)	4.07	1.91 (1.43 to 2.65)	6.50	6.15 (4.91 to 7.70)	
Derby	3,373	5.93	4.41 (3.61 to 5.44)	3.28	1.95 (1.46 to 2.57)	9.19	6.73 (5.46 to 8.41)	
Derbyshire	7,855	3.18	4.08 (3.37 to 4.80)	1.02	1.74 (1.30 to 2.27)	4.20	5.62 (4.59 to 6.76)	
Devon	7,192	3.62	4.20 (3.59 to 5.04)	1.12	1.78 (1.33 to 2.28)	4.73	5.87 (4.79 to 7.02)	
Doncaster	3,685	4.61	4.29 (3.60 to 5.20)	3.00	1.93 (1.49 to 2.57)	7.60	6.49 (5.29 to 7.95)	
Dorset	3,557	2.81	4.10 (3.33 to 4.88)	2.54	1.89 (1.49 to 2.48)	5.34	6.03 (4.84 to 7.34)	
Dudley	3,871	4.91	4.24 (3.53 to 5.14)	1.56	1.80 (1.37 to 2.45)	6.46	6.00 (4.93 to 7.27)	
Ealing	5,412	6.10	4.39 (3.69 to 5.38)	2.60	1.93 (1.47 to 2.50)	8.68	6.55 (5.37 to 7.94)	
East Riding Of Yorkshire	2,990	4.68	4.24 (3.54 to 5.32)	1.01	1.80 (1.31 to 2.35)	5.69	5.99 (4.89 to 7.38)	
East Sussex	5,275	4.55	4.26 (3.52 to 5.17)	1.14	1.72 (1.24 to 2.27)	5.69	5.95 (4.85 to 7.21)	
Enfield	4,917	3.05	3.93 (3.15 to 4.72)	2.04	1.83 (1.41 to 2.36)	5.08	5.52 (4.46 to 6.86)	
Essex	15,999	3.81	4.27 (3.69 to 4.96)	1.76	1.79 (1.45 to 2.24)	5.56	6.16 (5.25 to 7.21)	
Gateshead	2,298	4.35	4.22 (3.49 to 5.13)	2.19	1.89 (1.46 to 2.62)	6.53	6.16 (4.92 to 7.57)	
Gloucestershire	6,562	3.66	4.12 (3.44 to 4.92)	1.07	1.69 (1.22 to 2.25)	4.72	5.62 (4.63 to 6.75)	
Greenwich	4,468	10.07	4.80 (3.77 to 6.44)	1.36	1.76 (1.30 to 2.30)	11.41	7.00 (5.64 to 8.81)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Hackney	4,423	4.07	4.02 (3.26 to 4.77)	1.59	1.74 (1.32 to 2.31)	5.65	5.50 (4.41 to 6.81)	
Halton	1,600	*	4.13 (3.39 to 4.90)	*	1.79 (1.33 to 2.39)	5.00	5.78 (4.65 to 7.31)	
Hammersmith & Fulham	2,565	5.07	4.25 (3.51 to 5.06)	1.96	1.85 (1.37 to 2.44)	7.02	6.13 (4.97 to 7.53)	
Hampshire	14,252	3.79	4.15 (3.46 to 4.91)	1.48	1.81 (1.41 to 2.32)	5.26	5.89 (5.03 to 6.89)	
Haringey	4,160	5.77	4.31 (3.66 to 5.20)	1.93	1.83 (1.38 to 2.30)	7.69	6.20 (5.08 to 7.41)	
Harrow	3,566	3.93	4.09 (3.38 to 4.86)	2.25	1.83 (1.38 to 2.36)	6.17	5.84 (4.75 to 7.18)	
Hartlepool	1,027	*	4.24 (3.45 to 5.20)	*	1.78 (1.22 to 2.39)	4.87	5.95 (4.70 to 7.40)	
Havering	2,994	3.34	4.11 (3.39 to 4.90)	1.68	1.78 (1.29 to 2.41)	5.01	5.71 (4.57 to 6.97)	
Herefordshire, County Of	1,850	7.57	4.48 (3.62 to 5.79)	2.72	1.90 (1.45 to 2.55)	10.27	6.80 (5.34 to 8.83)	
Hertfordshire	14,526	3.17	3.95 (3.27 to 4.65)	1.31	1.75 (1.36 to 2.27)	4.47	5.45 (4.53 to 6.50)	
Hillingdon	4,300	3.49	3.99 (3.25 to 4.77)	3.27	1.98 (1.52 to 2.67)	6.74	5.96 (4.88 to 7.24)	
Hounslow	4,459	4.49	4.15 (3.46 to 5.02)	2.70	1.96 (1.50 to 2.65)	7.18	6.15 (5.08 to 7.53)	
Isle Of Wight	1,290	3.10	4.10 (3.28 to 4.92)	2.33	1.86 (1.41 to 2.50)	5.43	5.90 (4.68 to 7.28)	
Isles Of Scilly	24	*	4.19 (3.42 to 5.21)	*	1.84 (1.36 to 2.58)	*	6.02 (4.80 to 7.62)	
Islington	2,824	4.60	4.16 (3.43 to 5.09)	2.13	1.82 (1.41 to 2.42)	6.73	5.99 (4.91 to 7.36)	
Kensington & Chelsea	1,826	3.83	4.18 (3.38 to 5.04)	1.65	1.81 (1.33 to 2.33)	5.48	5.88 (4.76 to 7.38)	
Kent	16,955	3.13	3.84 (3.15 to 4.59)	1.01	1.63 (1.21 to 2.11)	4.13	5.13 (4.35 to 6.14)	
Kingston Upon Hull, City Of	3,720	6.45	4.51 (3.71 to 5.80)	2.16	1.83 (1.42 to 2.41)	8.60	6.57 (5.41 to 8.06)	
Kingston Upon Thames	2,088	*	4.16 (3.41 to 5.04)	*	1.77 (1.22 to 2.33)	4.31	5.78 (4.66 to 7.32)	
Kirklees	5,677	3.88	4.01 (3.28 to 4.83)	3.18	2.04 (1.55 to 2.92)	7.05	6.02 (4.89 to 7.24)	
Knowsley	1,818	2.20	4.08 (3.36 to 4.90)	1.65	1.80 (1.33 to 2.39)	3.85	5.72 (4.57 to 7.25)	
Lambeth	4,574	4.15	4.13 (3.50 to 4.95)	1.76	1.77 (1.35 to 2.27)	5.90	5.78 (4.68 to 7.11)	
Lancashire	13,311	5.26	4.69 (3.85 to 5.71)	2.34	1.92 (1.53 to 2.40)	7.59	7.12 (5.90 to 8.45)	
Leeds	10,210	4.90	4.32 (3.68 to 5.08)	1.67	1.85 (1.47 to 2.37)	6.56	6.17 (5.18 to 7.33)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Leicester	5,087	5.11	4.18 (3.53 to 4.93)	2.77	1.94 (1.50 to 2.59)	7.86	6.18 (5.08 to 7.56)	
Leicestershire	6,601	3.33	4.14 (3.50 to 4.89)	1.98	1.90 (1.47 to 2.53)	5.30	6.06 (5.00 to 7.25)	
Lewisham	4,836	3.52	3.99 (3.26 to 4.78)	1.87	1.80 (1.39 to 2.32)	5.38	5.62 (4.62 to 6.86)	
Lincolnshire	7,575	4.49	4.32 (3.67 to 5.24)	2.52	2.05 (1.56 to 2.77)	7.00	6.64 (5.42 to 8.20)	
Liverpool	5,666	4.06	4.19 (3.50 to 5.00)	2.13	1.86 (1.43 to 2.42)	6.18	6.12 (5.10 to 7.52)	
Luton	3,492	4.01	4.08 (3.35 to 4.77)	1.73	1.72 (1.26 to 2.24)	5.73	5.62 (4.55 to 6.97)	
Manchester	8,026	6.11	4.39 (3.72 to 5.27)	1.76	1.77 (1.37 to 2.21)	7.85	6.35 (5.32 to 7.65)	
Medway	3,511	3.42	4.17 (3.47 to 5.08)	0.86	1.73 (1.23 to 2.24)	4.27	5.78 (4.66 to 7.13)	
Merton	3,359	3.27	4.10 (3.45 to 4.89)	0.90	1.77 (1.29 to 2.38)	4.17	5.67 (4.59 to 7.03)	
Middlesbrough	1,955	4.09	4.16 (3.40 to 5.07)	2.05	1.83 (1.35 to 2.50)	6.14	5.97 (4.77 to 7.41)	
Milton Keynes	3,905	5.38	4.38 (3.70 to 5.23)	3.60	2.05 (1.53 to 2.90)	8.96	6.88 (5.53 to 8.66)	
Newcastle Upon Tyne	3,402	5.58	4.28 (3.50 to 5.13)	2.07	1.85 (1.42 to 2.43)	7.64	6.24 (5.09 to 7.60)	
Newham	6,242	7.53	4.56 (3.76 to 5.58)	1.78	1.73 (1.28 to 2.25)	9.29	6.41 (5.33 to 7.64)	
Norfolk	9,184	3.27	4.05 (3.32 to 4.73)	1.42	1.76 (1.36 to 2.30)	4.68	5.58 (4.64 to 6.80)	
North East Lincolnshire	1,952	6.15	4.34 (3.63 to 5.37)	2.58	1.88 (1.42 to 2.55)	8.71	6.46 (5.13 to 8.22)	
North Lincolnshire	1,850	6.49	4.38 (3.59 to 5.57)	3.81	2.00 (1.55 to 2.87)	10.27	6.73 (5.31 to 8.69)	
North Somerset	2,213	1.81	4.06 (3.32 to 4.90)	1.81	1.88 (1.43 to 2.57)	3.62	5.82 (4.67 to 7.24)	
North Tyneside	2,255	*	4.44 (3.69 to 5.43)	*	1.75 (1.28 to 2.30)	7.10	6.36 (5.16 to 8.02)	
North Yorkshire	5,545	4.15	4.28 (3.57 to 5.15)	2.90	1.98 (1.54 to 2.69)	7.03	6.60 (5.41 to 8.12)	
Northamptonshire	8,997	3.56	4.06 (3.33 to 4.74)	1.78	1.78 (1.39 to 2.23)	5.34	5.80 (4.87 to 6.93)	
Northumberland	2,773	*	4.29 (3.55 to 5.22)	*	1.76 (1.28 to 2.35)	5.05	6.03 (4.87 to 7.34)	
Nottingham	4,306	3.48	4.04 (3.30 to 4.79)	3.50	2.04 (1.57 to 2.88)	6.97	6.07 (4.90 to 7.45)	
Nottinghamshire	8,832	3.96	4.31 (3.67 to 5.14)	2.16	1.97 (1.54 to 2.60)	6.11	6.51 (5.33 to 7.89)	
Oldham	3,291	6.38	4.41 (3.63 to 5.51)	2.14	1.80 (1.36 to 2.29)	8.51	6.50 (5.26 to 7.99)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Oxfordshire	7,825	4.35	4.28 (3.60 to 4.95)	1.80	1.85 (1.43 to 2.39)	6.13	6.15 (5.13 to 7.49)	
Peterborough	3,193	3.76	4.16 (3.48 to 4.96)	2.51	1.91 (1.45 to 2.54)	6.26	6.08 (5.01 to 7.49)	
Plymouth	3,169	3.47	4.19 (3.50 to 5.01)	2.53	1.94 (1.45 to 2.58)	6.00	6.21 (5.11 to 7.59)	
Poole	1,626	*	4.09 (3.31 to 5.03)	*	1.75 (1.19 to 2.34)	1.85	5.63 (4.52 to 7.01)	
Portsmouth	2,759	*	4.14 (3.40 to 4.96)	*	1.74 (1.27 to 2.25)	4.71	5.81 (4.63 to 7.27)	
Reading	2,618	3.06	4.03 (3.24 to 4.92)	2.68	1.90 (1.47 to 2.62)	5.73	5.81 (4.59 to 7.24)	
Redbridge	4,602	7.17	4.40 (3.63 to 5.37)	1.31	1.78 (1.34 to 2.29)	8.47	6.18 (5.16 to 7.58)	
Redcar & Cleveland	1,552	*	4.06 (3.20 to 4.96)	*	1.82 (1.33 to 2.39)	2.58	5.70 (4.57 to 7.16)	
Richmond Upon Thames	2,791	*	4.13 (3.34 to 4.97)	*	1.75 (1.27 to 2.36)	3.22	5.66 (4.55 to 7.03)	
Rochdale	3,050	4.92	4.25 (3.59 to 5.21)	2.31	1.85 (1.41 to 2.42)	7.21	6.17 (5.07 to 7.67)	
Rotherham	3,127	4.16	4.21 (3.55 to 5.02)	1.93	1.84 (1.38 to 2.47)	6.08	6.04 (4.94 to 7.40)	
Rutland	337	*	4.15 (3.33 to 5.04)	*	1.81 (1.37 to 2.40)	*	5.87 (4.73 to 7.43)	
Salford	3,541	*	4.06 (3.33 to 4.90)	*	1.74 (1.25 to 2.24)	4.52	5.52 (4.38 to 6.79)	
Sandwell	4,854	3.91	4.13 (3.48 to 4.85)	3.31	1.95 (1.49 to 2.55)	7.21	6.20 (5.17 to 7.56)	
Sefton	2,843	2.46	4.04 (3.32 to 4.92)	1.06	1.77 (1.28 to 2.31)	3.52	5.55 (4.44 to 6.92)	
Sheffield	6,585	4.25	4.13 (3.44 to 4.91)	2.14	1.90 (1.48 to 2.45)	6.38	5.99 (4.93 to 7.20)	
Shropshire	2,847	*	4.26 (3.57 to 5.13)	*	1.79 (1.33 to 2.34)	5.27	5.98 (4.86 to 7.31)	
Slough	2,603	3.84	4.10 (3.32 to 4.94)	2.70	1.91 (1.46 to 2.61)	6.53	5.99 (4.79 to 7.36)	
Solihull	2,225	4.04	4.22 (3.49 to 5.12)	1.35	1.79 (1.34 to 2.37)	5.39	6.04 (4.95 to 7.45)	
Somerset	5,531	1.99	3.91 (3.14 to 4.75)	1.63	1.84 (1.40 to 2.36)	3.62	5.50 (4.46 to 6.69)	
South Gloucestershire	3,017	*	4.16 (3.40 to 5.03)	*	1.76 (1.26 to 2.33)	3.65	5.78 (4.69 to 7.10)	
South Tyneside	1,630	*	4.19 (3.39 to 5.18)	*	1.83 (1.39 to 2.47)	4.91	5.95 (4.82 to 7.42)	
Southampton	3,286	3.35	4.06 (3.34 to 4.91)	0.92	1.74 (1.24 to 2.26)	4.26	5.59 (4.48 to 6.95)	
Southend-On-Sea	2,233	3.13	4.08 (3.35 to 4.91)	1.35	1.79 (1.31 to 2.33)	4.48	5.75 (4.56 to 7.12)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Southwark	4,708	4.25	4.08 (3.37 to 4.98)	2.13	1.90 (1.48 to 2.50)	6.37	5.84 (4.79 to 7.10)	
St. Helens	2,056	*	4.10 (3.39 to 4.89)	*	1.76 (1.36 to 2.29)	3.89	5.73 (4.54 to 7.13)	
Staffordshire	8,579	3.61	4.06 (3.39 to 4.82)	1.99	1.87 (1.48 to 2.42)	5.60	5.91 (4.93 to 7.14)	
Stockport	3,379	4.44	4.27 (3.58 to 5.24)	1.19	1.76 (1.31 to 2.34)	5.62	6.01 (4.93 to 7.31)	
Stockton-On-Tees	2,433	6.58	4.38 (3.59 to 5.54)	2.07	1.77 (1.34 to 2.29)	8.63	6.30 (5.06 to 7.92)	
Stoke-On-Trent	3,567	4.21	4.19 (3.49 to 5.02)	3.10	1.94 (1.48 to 2.65)	7.29	6.20 (5.07 to 7.57)	
Suffolk	7,776	3.99	4.29 (3.56 to 5.15)	1.42	1.83 (1.45 to 2.37)	5.40	6.16 (5.13 to 7.44)	
Sunderland	3,034	5.60	4.37 (3.62 to 5.52)	2.98	1.96 (1.48 to 2.68)	8.57	6.65 (5.40 to 8.37)	
Surrey	13,582	4.42	4.41 (3.75 to 5.25)	1.48	1.80 (1.40 to 2.33)	5.89	6.23 (5.33 to 7.41)	
Sutton	2,642	4.54	4.27 (3.47 to 5.18)	1.52	1.82 (1.37 to 2.36)	6.06	6.13 (4.92 to 7.67)	
Swindon	2,886	4.50	4.19 (3.41 to 5.03)	1.74	1.85 (1.42 to 2.44)	6.24	6.04 (4.83 to 7.42)	
Tameside	2,914	6.18	4.44 (3.71 to 5.49)	1.38	1.80 (1.34 to 2.33)	7.55	6.44 (5.17 to 8.02)	
Telford & Wrekin	2,183	5.50	4.27 (3.57 to 5.31)	1.84	1.86 (1.42 to 2.42)	7.33	6.19 (4.96 to 7.75)	
Thurrock	2,324	*	4.11 (3.37 to 5.00)	*	1.76 (1.33 to 2.28)	4.30	5.71 (4.59 to 7.23)	
Torbay	1,483	4.72	4.27 (3.46 to 5.27)	2.71	1.87 (1.42 to 2.58)	7.42	6.23 (4.97 to 7.96)	
Tower Hamlets	4,600	5.00	4.05 (3.37 to 4.82)	1.09	1.69 (1.23 to 2.19)	6.09	5.49 (4.43 to 6.76)	
Trafford	2,820	3.90	4.21 (3.57 to 5.13)	1.78	1.83 (1.37 to 2.40)	5.67	6.02 (4.91 to 7.29)	
Wakefield	4,028	3.72	4.19 (3.48 to 4.94)	1.50	1.76 (1.33 to 2.27)	5.21	5.87 (4.78 to 7.11)	
Walsall	3,729	4.83	4.27 (3.59 to 5.16)	2.96	1.89 (1.47 to 2.54)	7.78	6.32 (5.18 to 7.91)	
Waltham Forest	4,740	3.59	4.05 (3.30 to 4.87)	2.75	1.92 (1.45 to 2.55)	6.33	5.88 (4.87 to 7.07)	
Wandsworth	5,160	4.84	4.32 (3.60 to 5.26)	1.36	1.78 (1.35 to 2.38)	6.20	6.01 (4.95 to 7.30)	
Warrington	2,369	3.38	4.19 (3.44 to 5.01)	1.27	1.84 (1.36 to 2.44)	4.64	5.96 (4.83 to 7.40)	
Warwickshire	6,084	2.47	4.00 (3.27 to 4.83)	1.65	1.81 (1.39 to 2.33)	4.11	5.72 (4.69 to 7.01)	
West Berkshire	1,744	*	4.20 (3.49 to 5.12)	*	1.80 (1.32 to 2.39)	4.59	5.90 (4.69 to 7.27)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
West Sussex	8,844	3.05	4.09 (3.44 to 4.89)	1.13	1.70 (1.24 to 2.24)	4.18	5.55 (4.58 to 6.85)	
Westminster	2,718	6.25	4.26 (3.57 to 5.37)	2.96	1.86 (1.44 to 2.45)	9.20	6.37 (5.06 to 7.90)	
Wigan	3,719	4.84	4.38 (3.61 to 5.37)	3.78	2.07 (1.56 to 2.97)	8.60	6.92 (5.53 to 8.77)	
Wiltshire	5,125	2.93	4.09 (3.38 to 5.01)	2.94	2.02 (1.54 to 2.84)	5.85	6.18 (5.04 to 7.67)	
Windsor & Maidenhead	1,697	2.95	4.15 (3.31 to 5.03)	4.14	2.01 (1.51 to 2.93)	7.07	6.27 (5.02 to 7.90)	
Wirral	3,530	3.97	4.23 (3.50 to 5.15)	1.71	1.85 (1.44 to 2.50)	5.67	6.10 (4.96 to 7.62)	
Wokingham	1,795	*	4.23 (3.46 to 5.10)	*	1.79 (1.31 to 2.32)	5.57	6.03 (4.81 to 7.40)	
Wolverhampton	3,465	5.19	4.23 (3.54 to 5.06)	3.48	2.04 (1.53 to 2.83)	8.66	6.55 (5.30 to 8.17)	
Worcestershire	6,081	3.45	4.20 (3.52 to 5.01)	1.82	1.84 (1.43 to 2.39)	5.26	6.07 (5.00 to 7.34)	
York	2,057	6.32	4.40 (3.62 to 5.42)	2.45	1.86 (1.40 to 2.42)	8.75	6.49 (5.18 to 8.10)	
SCOTLAND								
Aberdeen City	2,506	6.78	4.49 (3.75 to 5.63)	2.41	1.90 (1.43 to 2.52)	9.18	6.72 (5.48 to 8.44)	
Aberdeenshire	2,694	3.71	4.22 (3.44 to 5.13)	1.49	1.84 (1.36 to 2.51)	5.20	6.05 (4.89 to 7.52)	
Angus	1,124	*	4.20 (3.41 to 5.21)	*	1.75 (1.27 to 2.31)	3.56	5.89 (4.70 to 7.35)	
Argyll & Bute	708	*	4.22 (3.54 to 5.11)	*	1.84 (1.40 to 2.58)	5.65	6.05 (4.75 to 7.65)	
Clackmannanshire	555	*	4.31 (3.55 to 5.39)	*	1.84 (1.34 to 2.51)	10.81	6.27 (5.01 to 7.95)	
Dumfries & Galloway	1,333	6.00	4.32 (3.66 to 5.36)	3.02	1.92 (1.44 to 2.74)	9.00	6.44 (5.19 to 8.20)	
Dundee City	1,593	*	4.17 (3.46 to 5.04)	*	1.73 (1.25 to 2.28)	3.77	5.75 (4.60 to 7.20)	
East Ayrshire	1,351	7.40	4.39 (3.64 to 5.61)	2.98	1.89 (1.40 to 2.53)	10.36	6.57 (5.24 to 8.19)	
East Dunbartonshire	,925	*	4.06 (3.26 to 4.93)	*	1.82 (1.40 to 2.48)	*	5.70 (4.45 to 7.22)	
East Lothian	1,060	*	4.21 (3.46 to 5.16)	*	1.84 (1.36 to 2.56)	4.72	5.99 (4.86 to 7.51)	
East Renfrewshire	881	3.41	4.18 (3.41 to 5.09)	3.42	1.88 (1.44 to 2.55)	6.81	6.13 (4.88 to 7.74)	
Edinburgh, City Of	5,494	2.37	3.91 (3.12 to 4.68)	2.01	2.04 (1.53 to 2.96)	4.37	5.62 (4.51 to 6.92)	
Eilean Siar	248	*	4.16 (3.36 to 4.98)	*	1.82 (1.34 to 2.40)	*	5.92 (4.77 to 7.44)	
Falkirk	1,671	*	4.15 (3.41 to 5.07)	*	1.77 (1.30 to 2.38)	3.59	5.80 (4.63 to 7.51)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Fife	3,852	3.37	4.14 (3.41 to 4.95)	1.82	1.86 (1.40 to 2.48)	5.19	5.95 (4.80 to 7.30)	
Glasgow City	7,273	2.75	3.85 (3.04 to 4.72)	1.38	1.78 (1.37 to 2.27)	4.12	5.27 (4.29 to 6.51)	
Highland	2,240	*	4.19 (3.45 to 5.07)	*	1.78 (1.30 to 2.33)	4.02	5.82 (4.74 to 7.19)	
Inverclyde	762	*	4.41 (3.63 to 5.48)	*	1.79 (1.35 to 2.35)	10.50	6.35 (5.07 to 7.90)	
Midlothian	1,018	*	4.13 (3.32 to 5.04)	*	1.88 (1.40 to 2.62)	3.93	5.92 (4.67 to 7.43)	
Moray	,956	*	4.10 (3.38 to 5.11)	*	1.86 (1.38 to 2.60)	3.14	5.87 (4.73 to 7.45)	
North Ayrshire	1,317	8.35	4.43 (3.62 to 5.83)	3.06	1.89 (1.41 to 2.55)	11.39	6.63 (5.30 to 8.51)	
North Lanarkshire	3,746	3.47	4.16 (3.46 to 5.11)	1.34	1.81 (1.34 to 2.41)	4.81	5.87 (4.72 to 7.16)	
Orkney Islands	203	*	4.25 (3.44 to 5.16)	*	1.83 (1.36 to 2.53)	*	6.12 (4.87 to 7.75)	
Perth & Kinross	1,331	*	4.45 (3.62 to 5.67)	*	1.79 (1.29 to 2.36)	9.02	6.46 (5.23 to 8.23)	
Renfrewshire	1,791	3.35	4.16 (3.42 to 5.02)	1.68	1.83 (1.39 to 2.40)	5.03	5.95 (4.73 to 7.49)	
Scottish Borders	1,141	*	4.16 (3.38 to 5.11)	*	1.83 (1.37 to 2.50)	3.51	5.89 (4.74 to 7.29)	
Shetland Islands	261	*	4.16 (3.31 to 5.08)	*	1.83 (1.32 to 2.48)	*	5.91 (4.63 to 7.38)	
South Ayrshire	998	5.01	4.25 (3.54 to 5.29)	4.03	1.94 (1.47 to 2.76)	9.02	6.33 (5.06 to 8.01)	
South Lanarkshire	3,275	2.44	4.05 (3.23 to 4.83)	2.14	1.91 (1.48 to 2.55)	4.58	5.85 (4.74 to 7.25)	
Stirling	806	*	4.12 (3.36 to 5.05)	*	1.87 (1.41 to 2.53)	3.72	5.91 (4.69 to 7.41)	
West Dunbartonshire	981	*	4.24 (3.53 to 5.20)	*	1.83 (1.34 to 2.45)	6.12	6.07 (4.89 to 7.60)	
West Lothian	2,033	3.44	4.18 (3.46 to 5.08)	2.96	1.96 (1.46 to 2.71)	6.39	6.20 (5.06 to 7.76)	
WALES								
Blaenau Gwent	806	*	4.16 (3.41 to 5.10)	*	1.89 (1.45 to 2.49)	6.20	6.08 (5.02 to 7.68)	
Bridgend	1,548	*	4.26 (3.49 to 5.16)	*	1.73 (1.23 to 2.27)	5.17	5.96 (4.79 to 7.48)	
Caerphilly	1,999	*	4.31 (3.58 to 5.40)	*	1.74 (1.28 to 2.30)	5.50	6.07 (4.87 to 7.54)	
Cardiff	4,623	4.76	4.17 (3.51 to 4.97)	3.04	1.97 (1.51 to 2.69)	7.79	6.23 (5.18 to 7.50)	
Carmarthenshire	1,820	4.40	4.27 (3.52 to 5.26)	2.21	1.87 (1.42 to 2.57)	6.59	6.19 (4.96 to 7.71)	
Ceredigion	636	*	4.23 (3.53 to 5.13)	*	1.81 (1.36 to 2.41)	6.29	6.10 (4.82 to 7.71)	

Local Authority	Total births §	Mortality rate per 1,000 births §						
		Stillbirth †		Neonatal ‡		Extended perinatal †		
		Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊	Crude	Stabilised & adjusted (95% CI) ◊ #	
Conwy	1,072	*	4.13 (3.40 to 4.97)	*	1.79 (1.31 to 2.42)	*	5.75 (4.61 to 7.00)	
Denbighshire	1,019	*	4.09 (3.33 to 5.02)	*	1.89 (1.43 to 2.60)	3.93	5.92 (4.76 to 7.31)	
Flintshire	1,662	4.21	4.26 (3.53 to 5.24)	2.42	1.87 (1.44 to 2.48)	6.62	6.27 (5.05 to 8.02)	
Gwynedd	1,233	*	4.15 (3.36 to 5.04)	*	1.83 (1.35 to 2.53)	3.24	5.87 (4.72 to 7.43)	
Isle Of Anglesey	764	*	4.21 (3.50 to 5.17)	*	1.80 (1.33 to 2.41)	3.93	5.96 (4.73 to 7.53)	
Merthyr Tydfil	680	*	4.26 (3.49 to 5.17)	*	1.80 (1.30 to 2.39)	5.88	6.06 (4.76 to 7.57)	
Monmouthshire	791	*	4.18 (3.42 to 5.12)	*	1.79 (1.29 to 2.43)	*	5.89 (4.65 to 7.40)	
Neath Port Talbot	1,501	3.33	4.15 (3.40 to 5.04)	3.34	1.92 (1.48 to 2.63)	6.66	6.13 (4.90 to 7.86)	
Newport	1,962	*	4.22 (3.52 to 5.00)	*	1.77 (1.32 to 2.33)	5.10	5.97 (4.85 to 7.46)	
Pembrokeshire	1,136	*	4.09 (3.31 to 5.01)	*	1.88 (1.45 to 2.48)	4.40	5.99 (4.77 to 7.54)	
Powys	1,232	4.06	4.24 (3.49 to 5.28)	4.89	1.88 (1.42 to 2.58)	8.93	6.20 (4.99 to 7.82)	
Rhondda Cynon Taf	2,825	3.89	4.16 (3.37 to 4.98)	2.13	1.85 (1.41 to 2.46)	6.02	6.06 (4.80 to 7.55)	
Swansea	2,495	3.61	4.15 (3.42 to 5.00)	1.21	1.79 (1.30 to 2.32)	4.81	5.85 (4.74 to 7.19)	
Torfaen	1,037	*	4.13 (3.32 to 5.09)	*	1.91 (1.44 to 2.61)	5.79	6.08 (4.80 to 7.73)	
Vale Of Glamorgan	1,366	*	4.09 (3.27 to 4.88)	*	1.80 (1.32 to 2.37)	2.93	5.73 (4.51 to 7.31)	
Wrexham	1,620	*	4.33 (3.58 to 5.28)	*	1.82 (1.34 to 2.36)	6.79	6.24 (4.93 to 7.70)	
NORTHERN IRELAND	24,260	4.33	4.45 (3.79 to 5.20)	2.44	2.26 (1.76 to 3.00)	6.76	6.92 (5.89 to 7.97)	
CROWN DEPENDENCIES								
Isle of Man	767	*	4.20 (4.09 to 4.97)	*	1.82 (1.25 to 2.24)	5.22	6.01 (5.21 to 6.14)	
Channel Islands Δ	1,685	*	-	*	-	4.15	-	

† per 1,000 total births
‡ per 1,000 live births
§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
◊ excluding January 2013 births for England and Wales due to unavailability of NN4B data
Δ stabilised & adjusted rate not calculated due to unavailability of individual level data
* entry suppressed because of small number of deaths
# colours represent variation from UK average extended perinatal mortality rate, see page 19
Data sources: MBRRACE-UK, NN4B, ONS, NRS, ISD, NISRA

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MBRRACE-UK

Department of Health Sciences
University of Leicester
22-28 Princess Road West
Leicester, LE1 6TP

Tel: +44-116 252 5425

Email: mbrrace-uk@npeu.ox.ac.uk

Web: www.npeu.ox.ac.uk/mbrrace-uk

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Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK