Maternal, Newborn and Infant Clinical Outcome Review Programme

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

MBRRACE-UK
Perinatal Mortality Surveillance Report

UK Perinatal Deaths for Births from January to December 2015

June 2017

UNIVERSITY OF OXFORD
HQIP Healthcare Quality Improvement Partnership
UNIVERSITY OF LEICESTER
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UNIVERSITY OF BIRMINGHAM
Sands Stillbirth & neonatal death charity
NHS Bradford Teaching Hospitals NHS Foundation Trust
npeu National Perinatal Epidemiology Unit

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Bradley N Manktelow, Lucy K Smith, Caroline Prunet,
Peter W Smith, Thomas Boby, Pauline Hyman-Taylor,
Jennifer J Kurinczuk, David J Field, Elizabeth S Draper

on behalf of the MBRRACE-UK collaboration

June 2017

Department of Health Sciences
University of Leicester
Centre for Medicine
University Road
Leicester LE1 7RH

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The Healthcare Quality Improvement Partnership (HQIP) is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. HQIP's aim is to promote quality improvement, and it hosts the contract to manage and develop the Clinical Outcome Review Programmes, one of which is the Maternal, Newborn and Infant Clinical Outcome Review Programme, funded by NHS England, NHS Wales, the Health and Social Care division of the Scottish government, the Northern Ireland Department of Health, the States of Jersey, Guernsey, and the Isle of Man. The programmes, which encompass confidential enquiries, are designed to help assess the quality of healthcare, and stimulate improvement in safety and effectiveness by systematically enabling clinicians, managers and policy makers to learn from adverse events and other relevant data.

More details can be found at: www.hqip.org.uk/clinical-outcome-review-programmes-2/.

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Foreword

We welcome the publication of this third MBRRACE-UK annual report of the national perinatal mortality statistics for 2015. In reflecting on its findings, our starting point must be to remember that each one of the 4,392 extended perinatal deaths reported here represents the tragic loss of a much-loved and much-wanted child. For every family affected, the death of a baby is also the loss of a family's hopes and dreams for the future.

This report comes at a time of significant change to maternity and neonatal services in different parts of the UK. In England, in late 2015 the Health Secretary announced an ambition to reduce the rate of stillbirths, neonatal and maternal deaths by 50% by 2030. This ambition is being supported by the Maternity Transformation Programme now under way, which has at its heart the goal of safer, more personalised, kinder, professional and family friendly care, with the aspiration for every woman to have access to information to enable her to make decisions about her care. Following on from the Maternity Review which led to this Transformation Programme, NHS England is also undertaking a Neonatal Transformation Review. In Scotland, we have recently seen the publication of 'The Best Start: A Five-Year Forward Plan for Maternity and Neonatal Care in Scotland', which highlights the importance of evidence-based service redesign to deliver truly family-centred, safe and compassionate care. These changes are occurring in the context of the UK and the devolved Governments striving to reduce the rate of perinatal death, and so are also reflected in the work of NHS Wales' 100.00 Lives Improvement National Stillbirth Working Group, and Northern Ireland's Maternal and Infant Steering Group.

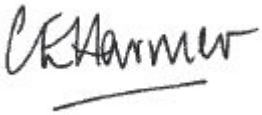
As highlighted in the Kirkup Report a key role of MBRRACE-UK is to provide information to enable the assessment of safety of care. The findings from the surveillance data this year are generally positive, with an overall reduction in stillbirth and neonatal death rates continuing the trend from last year. With three years' data having been collected MBRRACE-UK are now able to track the changes over time for the UK overall, as well as country-specific rates. It is welcome to see the effects of actions to reduce stillbirths – including the Saving Babies' Lives Care Bundle – becoming evident nationally.

However, in contrast neonatal death rates have only reduced marginally, and this merits far greater attention and action over the coming years. Just less than a third of all perinatal deaths occur in the neonatal period, with two thirds of the babies who die at this stage having been born preterm. Similarly two-thirds of stillbirths occur prior to the pregnancy reaching full term. Prematurity is not the primary cause of death for all of these babies, and in particular congenital anomalies play an important role, but complications in the context of prematurity inevitably increase the chances of a poor outcome. A better understanding of the causes of preterm birth and the development of interventions to prevent preterm birth are therefore urgently needed if we are to see a sustained reduction in the rates of perinatal deaths and in particular neonatal deaths.

Parents whose baby has died have the greatest stake of all in the review of their baby's death. For most parents, understanding what happened and sharing that information with friends, family, and existing or future siblings is part of coming to terms with the loss of a child. As two of the leading charities representing parents and families we would urge all maternity and neonatal units to follow the recommendation by MBRRACE-UK to review the care provided for all mothers and babies where a death has occurred. The need for a standardised tool to assist in local reviews has been championed for many years by charities such as ours, and by individual parents who have bravely spoken out about the need for change. We are therefore very pleased that the collaboration led by MBRRACE-UK has been commissioned to develop the national, standardised Perinatal Mortality Review Tool (PMRT) to support local review processes. Roll out of the early phase of the tool, together with training, is planned by the end of the year. In parallel the Royal College of Obstetricians and Gynaecologists (RCOG), the Royal College of Midwives, the British Association of Perinatal Medicine and research teams from Bristol and Manchester are investigating how best to incorporate the views and experiences of parents into the review process – an essential component of an effective review.

Use of the PMRT – in conjunction with the findings from the MBRRACE-UK perinatal confidential enquiries and the Each Baby Counts progr0amme from the RCOG – has the capacity to be world-leading in the critical

evaluation of care leading up to the death of a baby, as well as the quality of care for families in the aftermath. Harnessing the learning from review will inform service improvements to ensure that the NHS across the UK is able to provide the very best care for every mother, baby and family and to prevent every perinatal death which is potentially avoidable. We therefore strongly commend this report to every individual and organisation involved in providing, commissioning and evaluating maternity and neonatal care across the UK. Together we can and must strive to go further and faster to reduce stillbirths and neonatal deaths.



Clea Harmer

Chief Executive

Sands

Caroline Lee-Davey

Chief Executive

Bliss

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 have been alive at the onset of care in labour.
Neonatal death	A liveborn 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	A liveborn 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 liveborn 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 after 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.
Termination of pregnancy	The deliberate ending of a pregnancy, normally carried out before the embryo or fetus is capable of independent life.

Executive Summary

Background

This is the third MBRRACE-UK Perinatal Mortality Surveillance Report and provides information on extended perinatal deaths in the UK and Crown Dependencies arising from births during 2015. MBRRACE-UK are commissioned by the Healthcare Quality Improvement Partnership (HQIP) to undertake the Maternal, Newborn and Infant Clinical Outcome Review Programme (MNI-CORP) on behalf of NHS England, NHS Wales, the Scottish Government Health and Social Care Directorate, the Northern Ireland Department of Health, the States of Guernsey, the States of Jersey, and the Isle of Man Government.

The aims of MNI-CORP are to collect, analyse and report national surveillance data and conduct national confidential enquiries in order to stimulate and evaluate improvements in health care for mothers and babies.

As in the surveillance reports for 2013 and 2014, the main report summarised here focuses on **the surveillance of all late fetal losses (22^{+0} to 23^{+6} weeks gestational age), stillbirths, and neonatal deaths**, with data presented by country, by Trust or Health Board of birth, by commissioning organisation, by local authority and by "network".

The availability of three years' data from across the UK (a cohort of well over two million births) and improving quality of the data submitted to MBRRACE-UK has permitted, in addition, an exploration of:

- the influence on UK mortality rates of babies born at 22^{+0} to 23^{+6} weeks gestational age;
- the influence on UK mortality rates of babies who die due to a major congenital anomaly;
- time trends in neonatal, stillbirth and extended perinatal mortality rates for the UK and each of the constituent countries.

Also included in this report are crude and stabilised & adjusted mortality rates based on English populations covered by individual Sustainability and Transformation Plans (STPs), with comparative data for the whole of each of the devolved nations.

Methods

Deaths to be reported to MBRRACE-UK since 1 January 2013 through the secure online reporting system 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 liveborn 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.

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. This information is acquired through the collaboration of the following organisations: Patient Demographic Service (PDS) and Office for National Statistics (ONS) birth registration data (for England, Wales, and the Isle of Man); National Records Scotland (NRS) and Information Services Division (ISD) (for Scotland); Northern Ireland Maternity System (NIMATS) (for Northern Ireland), Health and Social Services Department (for the Bailiwick of Guernsey), and Health Intelligence Unit (for the Bailiwick of Jersey). The data is amalgamated to give a single dataset of births for the whole of the UK and the

Crown Dependencies. This data is amalgamated with the information on the deaths to obtain the final data for analysis.

Analysis

The main findings of the report are represented in a combination of maps and tables showing both the crude and the stabilised & adjusted mortality rates for stillbirths, neonatal deaths, and extended perinatal deaths (stillbirths and neonatal deaths combined). Stabilisation is designed to take account of some of the random variation inherent in this type of data and adjustment takes account of some of the factors known to affect rates of survival in particular populations, e.g. the level of deprivation.

In order to ensure comparability of mortality rates, data is shown after excluding births occurring at less than 24^{+0} weeks gestational age and terminations of pregnancy. Analysis of data for countries, commissioning organisations, local authorities, and populations covered by Sustainability and Transformation Plans (STPs) is based on mother's postcode at the time of birth. Analysis of data for Trusts and Health Boards as well as neonatal networks is based on the place of birth. For comparison purposes, the mortality rates for individual organisations are presented compared to the UK average, except for Trusts and Health Boards where the average mortality in similar organisations is used.

This year's report contains for the first time a more detailed assessment of the extent to which babies born at 22^{+0} to 23^{+6} weeks gestational age and babies affected by severe congenital anomalies influence reported mortality rates. A variety of factors aside from the quality of medical care influence the outcome for these babies. These include uptake of termination of pregnancy for severe anomalies recognised antenatally, local policies regarding the care of babies born at the limit of viability and differences in the attitude of both parents and medical staff about the advisability of treating severe congenital anomalies for which palliation is possible but is not a cure.

Key findings

1. The rate of extended perinatal mortality in the UK has fallen from 6.04 to 5.61 deaths per 1,000 total births over the period 2013 to 2015 for babies born at 24^{+0} weeks gestational age or later.

2. The fall in the extended perinatal mortality rate for the UK is mainly due to a reduction in the rate of stillbirth, which has fallen from 4.20 to 3.87 stillbirths per 1,000 total births, in particular for antepartum stillbirths of at least 32^{+0} weeks gestational age.

3. There has been a small change in the rate of neonatal mortality in the UK over the period 2013 to 2015 from 1.84 to 1.74 deaths per 1,000 live births.

4. Deaths to babies born before 24^{+0} weeks gestational age (both late fetal losses and neonatal deaths) and deaths due to congenital anomalies account for much of the variation in mortality rates between health organisations and geographical areas.

5. For the Trusts and Health Boards which care for the most complex pregnancies and deliveries, the reported mortality rates are likely to reflect their high-risk case-mix which cannot be fully accounted for by stabilisation and adjustment.

6. Data for Sustainability and Transformation Plan (STP) footprints (presented for the first time in this report) shows that there are marked variations in stabilised & adjusted rates of neonatal mortality between those areas in the north of England compared to those in the south, with rates ranging from 1.17 to 2.45 deaths per 1,000 live births.

7. Whilst there has been a steady improvement in data quality overall there continues to be a problem with the completion of maternal data for deaths occurring in children's hospitals.

8. There has been little improvement in the percentage of stillbirths in the UK for which placental histology is carried out: 88.8% in 2015 compared to 88.4% in 2014.

9. Almost one third of stillbirths (30.3%: 360 out of 1,190) with an unknown primary cause of death were potentially growth restricted (<10th centile birth weight).

10. Significant variation in the rates of extended perinatal mortality across the UK persist, even after taking into account the effects of chance variation and the case-mix differences we are able to account for, with stabilised & adjusted extended perinatal mortality rates for commissioning organisations ranging from 5.00 to 6.75 deaths per 1,000 total births.

Recommendations

1. Close monitoring of mortality rates is required to ensure that the decline in rates of stillbirth is continued in order to meet Government ambitions.

2. A renewed focus on neonatal deaths is required in order to achieve a significant reduction in neonatal mortality rates from the position seen over the past three years.

3. More research is required to identify the extent to which deaths before 32 weeks gestational age are avoidable and to try to develop practices and policies which could reduce potential variation in management across the UK.

4. A national forum should be established by NHS England, NHS Scotland, NHS Wales, and Health and Social Care in Northern Ireland, in conjunction with professional bodies and national healthcare advisors responsible for clinical standards in relevant specialties, to agree the appropriate approach to reporting the influence on overall mortality rates of neonatal deaths and late fetal losses amongst babies born before 24 weeks gestational age and of deaths due to congenital anomalies.

5. Those Trusts and Health Boards providing the most complex care to particularly high-risk mothers and babies should ensure that the data provided to MBRRACE-UK is of the highest quality. This will permit more appropriate sub-analyses and comparisons.

6. Sustainability and Transformation Plans (STPs) in England need to address existing inequalities, particularly in relation to neonatal mortality.

7. All Trusts and Health Boards should endeavour to continue to improve the quality and completeness of data reported to MBRRACE-UK. Children's hospitals should develop and embed systems that allow for consistent liaison with birth hospitals to facilitate the collection of maternal details.

8. Placental histology should be undertaken (if possible) for all stillbirths, preferably by a perinatal pathologist.

9. Trusts and Health Boards should ensure that systems are in place to implement appropriate national guidance related to monitoring fetal growth.

10. There is a continuing need for Trusts and Health Boards with a stabilised & adjusted extended perinatal mortality rate that falls in the red or amber band to conduct a local review in order to develop an action plan to improve the quality of their care provision. However, all Trusts and Health Boards, irrespective of their extended perinatal mortality rate, should investigate individual stillbirths and neonatal deaths using a standardised process and independent multidisciplinary peer review as recommended in the Report of the Morecambe Bay Investigation as well as by the Perinatal Mortality Review Task and Finish Group convened by Sands and the Department of Health. The information within the MBRRACE-UK Perinatal Surveillance Reports (including the reports for individual Trusts and Health Boards) and recommendations from MBRRACE-UK Confidential Enquiries can facilitate this process.

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Abbreviations

BMI	Body Mass Index
CCG	Clinical Commissioning Group
CHI	Community Health Index (Scotland)
CI	Confidence interval
CMACE	Centre for Maternal and Child Enquiries
CODAC	Cause Of Death & Associated Conditions
EDD	Estimated Date of Delivery
EUROSTAT	Statistical Office of the European Union
FAQ	Frequently Asked Question
GSS	Government Statistical Service
HQIP	Healthcare Quality Improvement Partnership
HSCIC	Health and Social Care Information Centre
ICD-10	International Statistical Classification of Diseases and Related Health Problems, 10th Revision
ISD	Information Services Division
IVF	In Vitro Fertilisation
LCG	Local Commissioning Group (Northern Ireland)
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
NICU	Neonatal Intensive Care Unit
NIMACH	Northern Ireland Maternal and Child Health
NIMATS	Northern Ireland Maternity System
NIMI	Northern Ireland Maternal and Infant Loss
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
PDS	Personal Demographics Service
RCOG	Royal College of Obstetricians and Gynaecologists
SMR	Standardised Mortality Ratio
SMR02	Maternity Inpatient and Day Case Dataset (Scotland)
STP	Sustainability and Transformation Plan
WHO	World Health Organization

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Members of the MBRRACE-UK collaboration

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

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

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

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

Charlotte Bevan, Senior Research and Prevention Officer, Sands

Peter Brocklehurst, Professor of Women's Health, Director Birmingham Clinical Trials Unit, Institute of Applied Health Research, University of Birmingham

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

Sara Kenyon, Professor of Evidence Based Maternity Care, University of Birmingham

Bradley Manktelow, Associate Professor, University of Leicester

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

Maggie Redshaw, Associate Professor and Senior Social Scientist, National Perinatal Epidemiology Unit, University of Oxford

Janet Scott, Head of Research and Prevention, Sands

Judy Shakespeare, Retired General Practitioner, Oxford

Lucy Smith, Senior Research Fellow, University of Leicester

Derek Tuffnell, Professor of Obstetrics and Gynaecology, Bradford Hospitals NHS Foundation Trust (from 2015)

Members of the Leicester based MBRRACE-UK team

Caroline Ellershaw, Administrative Support

Ian Gallimore, Administrative Support

Pauline Hyman-Taylor, Programme Manager/Research Fellow

Nahida Karim, Administrative Support

Frances Mielewczyk, Administrative Support

Caroline Prunet, Statistician

Members of the Oxford based MBRRACE-UK team

Faye Anderton, Events Coordinator

Thomas Boby, Senior Programmer

Lucila Canas Bottos, Programmer

Xuejuan Fan, Data Analyst

Jane Forrester-Barker, Data Coordinator

Dagmar Hutt, Interim Events Coordinator

Marketa Laube, Programme Manager

Joanna Oakley, Administrator

Peter Smith, Senior Programmer

Brenda Strohm, Acting Programme Manager

Office for National Statistics

Karen J Williams, Molly Rogers

National Records of Scotland

Julie Ramsay, Mary McDonald, Maria Kay, Eileen Crichton

Information Services Division Scotland, NHS National Statistics Scotland

Rachael Wood, Kirsten Monteath, Carole Morris, Susan Frame, Meena Johnstone

Health Improvement Scotland

Leslie Marr, Jan Warner

All Wales Perinatal Service

Sarah Kotecha, Saranya Ulaganathan

Northern Ireland Maternal and Child Health, HSC Public Health Agency

Heather Reid, Joanne Gluck, Malcolm Buchanan, Sinead Magill, Gillian Weir

Health and Social Services Department, States of Guernsey

Jenny Cataroche, Stephen Bridgman

Health Intelligence Unit, Public Health Services, Jersey

Marguerite Clarke, Steve Hardwidge

Noble's Hospital, Isle of Man

Emma Hearnden

Tarun Ghosh

Melanie Capewell

Barbara Scott

NHS Digital

Vicki Hartley, Oliver Smith, Sarah Freeman, Neil Matthews

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

Matthew Jolly, National Clinical Director: Maternity Review and Women's Health, NHS England (Chair)

Janice Allister, General Practitioner, Peterborough

Kate Brian, Women's Voices Lead, Royal College of Obstetricians and Gynaecologists

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

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

Jaqueline Dunkley-Bent, Head of Maternity, NHS England

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

Nigel Kennea, Consultant Neonatologist & Associate Medical Director for Governance & Quality, St Georges' University Hospital NHS Foundation Trust

Corrinne Love, Senior Medical Officer for Maternity and Women's Health for the Scottish Government

Liz McDonald, Consultant Perinatal Psychiatrist and Clinical Lead for Perinatal Psychiatry, East London Foundation Trust

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

Karen Todd, Maternity Safety Programme Team, Department of Health

Michele Upton, Patient Safety Lead, Maternity and Newborn, NHS Improvement

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

Healthcare Quality Improvement Partnership

Tina Strack, Associate Director, Clinical Outcome Review Programmes

Vivien Seagrove, Programme Support Office

MBRRACE-UK Third Sector Stakeholder Group Representatives who attended meetings

Francine Bates, Lullaby Trust (formerly FSID)

Beverley Beech, AIMS

Charlotte Bevan, Sands

Jane Brewin, Tommy's

Ann Chalmers, Child Bereavement UK

Jenny Chambers, OC Support

Debbie Chippington Derrick, AIMS

Caroline Davey, Bliss

Jane Denton, Multiple Birth Foundation

Jane Fisher, ARC

Sarah Fitzgerald, Miscarriage Association

Marcus Green, APEC

Penny Kerry, Miscarriage Association

Helen Kiranne, Bliss

Beckie Lang, Health Campaigns Tommy's

Amy McCarthy, TAMBA

Sarah McMullen, NCT

Jane Plumb, Group B Strep Support

Niluskha Perera, Best Beginnings

Jean Robinson, AIMS

Keith Reed, TAMBA

Jacqui Scott, Child Bereavement UK

Claire Storey, International Stillbirth Alliance

Liz Thomas, AVMA

Maureen Treadwell, Birth Trauma Association

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

Sarah Armstrong, Obstetric Anaesthetists Association and Royal College of Anaesthetists

Carmel Bagness, Royal College of Nursing

Pamela Boyd, Neonatal Nurses Association

Sanjeev Deshpande, British Association of Perinatal Medicine

Roshan Fernando, Obstetric Anaesthetists Association & Royal College of Anaesthetists

Jacqueline Gerrard, Royal College of Midwives

Flora Jessop, British and Irish Paediatric Pathology Association

Sara Johnson, Royal College of Obstetricians and Gynaecologists

Alison Elderfield, Royal College of Obstetricians and Gynaecologists

Liz McDonald, Royal College of Psychiatrists

Catherine Nelson-Piercy, Royal College of Physicians

Tim Overton, British Maternal and Fetal Medicine Society

Lesley Page, Royal College of Midwives

Marcia Philbin, Royal College of Paediatrics and Child Health

David Richmond, Royal College of Obstetricians and Gynaecologists

Neil Sebire, Royal College of Pathologists

Trudi Seneviratne, Royal College of Psychiatrist

1. Introduction

This is the third MBRRACE-UK Perinatal Mortality Surveillance Report and provides information on extended perinatal deaths in the UK and Crown Dependencies arising from births during 2015.

MBRRACE-UK are commissioned by the Healthcare Quality Improvement Partnership (HQIP) to undertake the Maternal, Newborn and Infant Clinical Outcome Review Programme (MNI-CORP). The aims of MNI-CORP are to collect, analyse and report national surveillance data and conduct national confidential enquiries in order to stimulate and evaluate improvements in health care for mothers and babies (Box 1). This report focuses on the **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

- 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.
- Confidential enquiries of an annual rolling programme of topic-specific serious maternal morbidity.
- Surveillance of all late fetal losses (22^{+0} to 23^{+6} weeks gestational age), stillbirths, and neonatal deaths.
- A biennial programme of topic-specific confidential enquiries into aspects of stillbirth and infant death or serious infant morbidity.

Perinatal mortality surveillance involves the identification and notification of all eligible deaths and the collection of a limited and tightly defined demographic and clinical dataset. The goal is to receive notification of every death and to collect high-quality data about each one. This information allows the calculation of national, regional and local mortality rates and, with appropriate denominator data, the calculation of 'stabilised & adjusted' mortality rates which take into account the effects of chance variation and also allow for key factors known to increase the risk of perinatal mortality (see Chapter 2 for further explanation). This information is presented in order to assist clinicians, commissioners, managers, parents, and the public in raising standards of obstetric and neonatal care in order to reduce perinatal mortality across the UK.

1.1 Overview of this report and changes from previous reports

This report is divided into 8 chapters, with additional information provided in the Appendices.

In Chapter 2 the MBRRACE-UK data collection process is described together with the methods used for reporting mortality.

The organisation of the following chapters of the report is a little different from previous MBRRACE-UK Perinatal Mortality Surveillance Reports. This year the national mortality rates for stillbirth, neonatal mortality, and extended perinatal mortality rates for babies born at 24^{+0} weeks gestational age or later (excluding terminations of pregnancy) are presented in Chapter 3. In Chapter 4 crude and stabilised & adjusted mortality rates are presented for babies born at 24^{+0} weeks gestational age or later (excluding terminations of pregnancy) by the organisation responsible for population based care commissioning (based on mother's postcode at time of delivery). In addition, in this chapter mortality rates are also reported by Sustainability and Transformation Plan (STP) footprint areas in England for the first time. Mortality rates by service delivery organisation based on place of birth are reported in Chapter 5. Equivalent mortality rates are presented later in the report by Neonatal Network (Appendix 7.1) and local authority of residence (Appendix 7.2).

The effect on the mortality rates of including or excluding the deaths of those babies who die as a result of a congenital anomaly, or are born at 22^{+0} to 23^{+6} weeks gestational age is explored in Chapter 6. The influence of these two groups on the reported mortality rates for neonatal networks is presented.

The reported causes of death (known and unknown), with a focus on the tests carried out for unknown stillbirths, are discussed in Chapter 7. Data reported by local teams is provided in detail using all levels from the Cause of Death & Associated Conditions (CODAC) categorisation of cause of death.

In the final chapter (Chapter 8), trends in the mortality rates for those mothers and babies who are considered to have significant risk factors are shown and how these have changed over time is discussed.

This year the full version of this report will only be available as downloadable document, available from the MBRRACE-UK website (www.npeu.ox.ac.uk/mbrrace-uk/reports). A limited number of a print (paper) version of a summary of the report will also be available.

1.2 Perinatal mortality in the UK

Rates of stillbirth reported from statutory birth and death registrations in 2015 continued to fall across the UK, although a reduction was not seen in the rate of neonatal death (see Appendix 1). Despite this fall, rates of stillbirth and neonatal death are still higher in the UK than the rates seen in many other high income countries.

Over the past year much attention has been focussed on improving maternity services with the publication of national initiatives and recommendations for improvements to care for mothers and babies across the UK. In November 2015 the Secretary of State for England, Jeremy Hunt, announced a Government national ambition to halve the rates of stillbirth, neonatal and maternal deaths and intrapartum brain injuries in England by 2030 with a reduction of 20% by 2020. In order to achieve this goal, maternity services were asked to make a public commitment to placing a “Spotlight on Maternity” [1] focussing on a number of areas including improving data capture and knowledge in maternity services by improving the collection and reporting of high quality data to national data collections such as MBRRACE-UK. Similarly, the National Maternity Review - Better Births [2] also identified the importance of collecting the right information in order to identify best practice and monitor organisational performance, facilitating between organisation comparisons and improvements over time.

Alongside the publication of the MBRRACE-UK 2015 Perinatal Confidential Enquiry into term, singleton, normally-formed, antepartum stillbirth [3], the Saving Babies’ Lives initiative highlighted the importance of risk assessment and surveillance for fetal growth restriction, raising awareness of reduced fetal movement and effective fetal monitoring during labour. This initiative also highlights the importance of carbon monoxide testing at antenatal booking appointments to identify smokers and refer them to smoking cessation services [4].

Health Improvement Scotland reported [5] an 18% reduction in the rate of stillbirths in Scotland over the period 2012 to 2015, following the launch of the Scottish Patient Safety Programme, with increased activity to address smoking in pregnant women and a focus on highlighting the importance of being aware of their babies’ movements: including the work of Maternity and Children Quality Improvement Collaborative (MCQIC) and the expert Scottish Stillbirth Group. The relatively low rate of autopsy uptake was highlighted as an issue of concern in the All Wales Perinatal Survey’s Annual Report [6], while the Registrar General’s Annual Report for Northern Ireland highlighted the lowest rate of stillbirths ever recorded for Northern Ireland in 2014 [7].

Information provided in this MBRRACE-UK report will feed into national initiatives by using the detailed information provided by healthcare professionals across the UK to identify areas for improvement in the care of mothers and babies in the UK.

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2. MBRRACE-UK Methods for Reporting Perinatal Mortality Rates

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 baby born alive 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.

These definitions also include any late fetal loss, stillbirth, or neonatal death resulting from a termination of pregnancy.

In an effort to ensure complete data collection and to facilitate 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.

MBRRACE-UK has established a secure online reporting system which can be accessed by all UK Trusts and Health Boards. Responsibility for reporting a death and for the completeness and the quality of the data reported to MBRRACE-UK lies with the Trust or Health Board where the death occurred. Each Trust and Health Board has identified a small number of MBRRACE-UK Lead Reporters who act as key points of contact between their organisation and MBRRACE-UK. A comprehensive network of more than 500 Lead Reporters has been established across all UK delivery sites (see Appendix A2). Arrangements in Northern Ireland are managed through the NIMACH office. In order to check that all relevant deaths have been reported to MBRRACE-UK, details of statutorily registered deaths are obtained from the Office for National Statistics (ONS) for England and Wales, National Records of Scotland (NRS) for Scotland, and Northern Ireland Maternity System (NIMATS) and Northern Ireland Statistics and Research Agency (NISRA) for Northern Ireland. More details of the MBRRACE-UK reporting system are given in Appendix A4.

2.2 Information collected by MBRRACE-UK

Comprehensive information about each death is requested by MBRRACE-UK in order to allow detailed examination of the risk factors for perinatal mortality in the UK. Data items are collected with the aim of, first, offering more appropriate adjustment of the crude mortality rates than had previously been possible and, second, providing a clearer insight into the health, social and lifestyle factors most commonly associated with stillbirth or neonatal death.

The data relating to each death consists of 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 data requested for each late fetal loss, stillbirth and neonatal death can be found in Appendix A3. Approvals have been obtained from all of the relevant authorities in order for identifiable data to be collected without consent and to access statutory birth and death information (Appendix A4.1).

Details of the completeness of key variables reported by Trusts and Health Boards in relation to deaths of babies born in 2015 are given in Appendix A5. In order to help reporters, a 'traffic light' system has also been developed within the MBRRACE-UK reporting system to highlight the completeness of data collection in the various sections of the case record form.

2.3 The 2015 birth cohort

In this report, rates of stillbirth, neonatal death and extended perinatal death are presented for births from 1 January 2015 to 31 December 2015; thus, neonatal deaths of babies born in December 2015 who died in January 2016 are included. The reporting of mortality for a birth cohort is in contrast to both statutory publications and previous perinatal mortality reports published by the Centre for Maternal and Child Enquiries (CMACE), which were based on deaths in a calendar year. The birth cohort method of reporting allows more accurate estimates of mortality rates to be produced as appropriate denominators are available.

Individual level information on all births in the UK and Crown Dependencies is obtained in order to generate mortality rates adjusted for maternal, baby, and socio-demographic risk factors. Information for England, Wales, and the Isle of Man (Patient Demographic Service (PDS) and ONS birth registration data), Scotland (NRS and ISD), Northern Ireland (NIMATS), Bailiwick of Guernsey (Health and Social Services Department) and the Bailiwick of Jersey (Health Intelligence Unit) were combined to give a single dataset of births for the whole UK and Crown Dependencies. This data was then combined with the information on the deaths to obtain the final data for analysis. Details of the generation of the births dataset are given in Appendix A4.

It is important to note that, since 29 April 2016, NHS Digital removes certain patient records from data provided for England where a patient has requested an opt-out. The NHS Constitution states "*You have the right to request that your confidential information is not used beyond your own care and treatment and to have your objections considered*". To support these NHS constitutional rights, patients within England are able to opt out from their personal confidential information being shared by NHS Digital for purposes other than their own direct care; this is known as the 'Type 2 opt-out'. Patients are able to register the opt-out at their GP practice. There were over 19,000 Type 2 opt-outs relating to births in 2015. These do not appear to be distributed randomly across the country. As a result of the opt-outs, there are considerably higher numbers of births with missing information on gestational age and ethnicity in this report for England than in previous MBRRACE-UK reports, since the data from NHS Digital is the only source of this information for all births in England.

2.4 Deaths included in reported mortality rates

In order to facilitate the comparability of mortality rates between organisations, births less than 24^{+0} weeks gestational age and terminations of pregnancy have been excluded from the mortality rates reported in the main maps and tables. 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 as well as the known variation in the rate of termination of pregnancy for congenital anomaly across the UK. The mortality rates reported in the main maps and tables include all eligible deaths, including deaths due to congenital anomalies.

In order to explore the influence on the reported mortality rates of including births between 22^{+0} and 23^{+6} weeks gestational age and deaths due to congenital anomalies, the mortality rates including and excluding these two groups have been reported in Chapter 6. We hope that this will help to inform the discussion on the most

informative cohort to report in the future. Information is not reported for the Crown Dependencies, to avoid disclosure of information which could potentially identify individuals due to the small number of deaths.

The number of deaths of babies born in 2015 in the UK in this report will differ from that of statutorily registered deaths published by ONS (England and Wales), NRS (Scotland), and NIMATS and NISRA (Northern Ireland) because of the exclusion criteria used in this report to ensure comparability of mortality rates. It is important to recognise that data sources from statutorily registered births and deaths include both birth and death registrations following termination of pregnancy from 24^{+0} weeks gestational age and variable inclusion of births at 23^{+6} weeks gestational age and below. MBRRACE-UK received stillbirth and neonatal death registrations from statutory sources for babies born in 2015. This data was matched to the detailed MBRRACE-UK death notifications. Of these registered deaths, neonatal deaths were excluded if they occurred before 24^{+0} weeks gestational age or were a termination of pregnancy (deaths were classified as resulting from a termination of pregnancy based on the detailed MBRRACE-UK data).

In addition to registered deaths obtained from ONS, NRS and NIMACH, additional deaths are reported to MBRRACE-UK for:

- the small number of statutorily registered deaths registered with ONS only after considerable delay; most often because an inquest was being held;
- late fetal losses delivered at 22^{+0} to 23^{+6} weeks gestational age which are not subject to statutory registration;
- stillbirths delivered at 24^{+0} weeks gestational age or greater where the death was confirmed before 24^{+0} weeks gestational age: these are not routinely registered as stillbirths, as recommended by Royal College of Obstetricians and Gynaecologists (RCOG) guidance and agreed with the Department of Health [1, 2].

2.5 Organisations for which mortality rates are reported

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

1. Organisations responsible for population based care commissioning:
    - England: Clinical Commissioning Groups (CCG) based on postcode of mother's residence at time of delivery; Sustainability and Transformation Plan (STP) footprint areas based on postcode of mother's residence at time of delivery;
    - Scotland: Health Boards based on postcode of mother's residence at time of delivery;
    - Wales: Health Boards based on postcode of mother's residence at time of delivery;
    - Northern Ireland: Local Commissioning Groups (LCG) based on postcode of mother's residence at time of delivery;
    - Crown Dependencies: Isle of Man, Bailiwick of Guernsey, and Bailiwick of Jersey based on mother's residence at time of delivery.
2. Service delivery organisations based on place of birth:
    - England: NHS Trusts;
    - Scotland: Health Boards;
    - Wales: Health Boards;
    - Northern Ireland: Health and Social Care Trusts;

- Crown Dependencies: Isle of Man, Bailiwick of Guernsey, and Bailiwick of Jersey.

3. Neonatal networks based on place of birth: UK only (Appendix A7.1).
4. Local government areas based on postcode of mother's residence at the time of delivery (Appendix A7.2):
    - England: single tier authorities, upper tier authorities and London boroughs;
    - Scotland: unitary authorities;
    - Wales: local authorities;
    - Northern Ireland: local government districts^;
    - Crown Dependencies: Isle of Man, Bailiwick of Guernsey, and Bailiwick of Jersey.

2.6 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 2015 and provides a snapshot of the annual mortality in an organisation.

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 annual 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, due to 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 is only a small number of births in an organisation it is difficult in any one year 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 average 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 of the 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 because they are not universally collected on all births; for example, maternal smoking and body mass index (BMI). (See Appendix A5 for more details.)

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. Some of the variation in mortality rates shown in this report might be the result of differences in the proportion of high-risk pregnancies that cannot be accounted for in the analyses due

^ Local councils in Northern Ireland are not responsible for the delivery of health, education or social services.

to a lack of routinely collected detailed clinical information for all births (as described above). However, given the information that is available, the rates reported here are robust and make an important contribution in highlighting to organisations where extra investigations should be targeted in order to improve the quality of perinatal and neonatal care in the UK.

2.7 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 'average' mortality rate. For the organisations based on the postcodes of the mothers' residences at the time of delivery, and for neonatal networks, this average is the overall observed mortality rate for the whole of the UK and the Crown Dependencies.

However, it is known that service delivery organisations based on the place of birth vary widely in the risk profile of pregnancies referred to their service and, therefore, it is reasonable to anticipate variation in their expected mortality rates. To help account for the variation due to the risk profile, all of the Trusts and Health Boards have been classified hierarchically into five mutually exclusive comparator groups based on their level of service provision and they are compared to the average mortality rate within their comparator group. The five comparator groups are:

1. Level 3 Neonatal Intensive Care Unit (NICU) and neonatal surgery
2. Level 3 NICU
3. 4,000 or more births per annum at 24 weeks or later
4. 2,000-3,999 births per annum at 24 weeks or later
5. Under 2,000 births per annum at 24 weeks or later

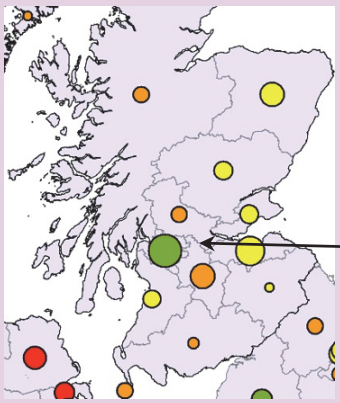
The colour coding used in the maps and tables is:

- green: more than 10% lower than the average;
- yellow: up to 10% lower than the average;
- amber: up to 10% higher than the average;
- red: more than 10% higher than the average.

The size of the circles on each 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 both 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, particular emphasis is given to the extended perinatal mortality rate and each organisation has been colour coded based on their stabilised & adjusted extended perinatal mortality rate in an identical manner to the maps.

Figure 1: Example of the presentation of the mortality rates in this report



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

Organisation	Total births§	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	3,773	2.92	3.81 (3.02 to 4.72)	1.33	1.68 (1.11 to 2.80)	4.24	5.48 (4.88 to 7.11)	○
Forth Valley	2,959	2.70	3.82 (3.15 to 4.56)	1.69	1.83 (1.24 to 2.64)	4.39	5.64 (4.95 to 6.83)	○
Grampian	6,442	3.88	3.99 (3.43 to 4.90)	0.62	1.40 (0.94 to 2.14)	4.50	5.36 (4.79 to 6.52)	○
Greater Glasgow & Clyde	12,297	3.09	3.69 (3.25 to 4.43)	1.06	1.34 (0.97 to 1.81)	4.15	5.00 (4.52 to 6.35)	○

2.8 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 [3] and the Government Statistical Service (GSS) [4]. Suppressed mortality rates are shown as a white dot ○ on the maps and in the tables where appropriate.

References

1. Royal College of Obstetricians and Gynaecologists. Registration of Stillbirths and Certification for Pregnancy Loss Before 24 Weeks of Gestation (Good Practice No. 4). Available online at www.rcog.org.uk/en/guidelines-research-services/guidelines/good-practice-4/. RCOG, 2005.

2. Royal College of Obstetricians and Gynaecologists. Late Intrauterine Fetal Death and Stillbirth (Green-top Guideline No. 55). Available online at www.rcog.org.uk/en/guidelines-research-services/guidelines/gtg55/. IRCOG, 2010.

3. Office for National Statistics. Disclosure control guidance for birth and death statistics. Available online at www.ons.gov.uk/ons/guide-method/best-practice/disclosure-control-policy-for-birth-and-death-statistics/index.html. ONS, 2007-2013.

4. Government Statistical Service. GSS/GSR Disclosure Control Guidance for Tables Produced from Administrative Sources. Available online at www.ons.gov.uk/ons/guide-method/best-practice/disclosure-control-policy-for-tables/index.html. Office for National Statistics, 2014.

3. Perinatal death in 2015 in the UK

The data in this chapter relates to the information available for the UK about the rates of stillbirth, neonatal death, and extended perinatal death (stillbirth and neonatal deaths combined) for births that occurred in 2015 at 24^{+0} weeks gestational age or later (excluding terminations of pregnancy).

Here we have largely followed the approach taken in the previous MBRRACE-UK Perinatal Mortality Surveillance reports. However, one change this year is that we have presented the main information on rates of stillbirth, neonatal death and extended perinatal death across three chapters in order to make the information more straightforward to find. Therefore, within this chapter we have included data for the UK as a whole and individually for the four countries of the UK and for the Crown Dependencies.

Mortality rates for the various commissioning organisations across the UK based on the postcode of the mother's place of residence at time of delivery are presented in Chapter 4. In Chapter 5 mortality rates are presented for Trusts and Health Boards across the UK who provide perinatal care, where deaths have been allocated based on the Trust or Health Board in which the baby was born.

Additional analyses of the 2015 deaths relating to other organisational structures can be found in Appendix A3 of this report:

- neonatal networks based on the place of birth (Appendix A7.1);
- local authority based on the postcode of the mother's residence at time of delivery (Appendix A7.2).

3.1 Mortality rates for the UK as a whole, the four countries of the UK, and the Crown Dependencies.

The data shown in Table 1 and Table 2 below is derived from a number of sources in addition to the information submitted via the MBRRACE-UK reporting system: ONS, PDS, NRS, ISD, NISRA website, Health and Social Services Department (Bailiwick of Guernsey), and the Health Intelligence Unit (Bailiwick of Jersey).

The data shown in these tables is based on all births for which the country of residence of the mother was known. As previously, this led to the exclusion of a small number of births for mothers not resident in the UK (N = 423). Using this approach, the total number of births at 24^{+0} weeks or greater gestational age (excluding terminations of pregnancy) in 2015 was slightly higher than in 2014: (782,720 versus 782,311 births respectively). However, there was a further decrease in both the total number of stillbirths (3,032 in 2015 compared with 3,252 in 2014) and neonatal deaths (1,360 in 2015 compared with 1,381 in 2014). More importantly, these combined changes led to a decrease in the reported mortality rates for 2015 across the UK as a whole; the crude extended perinatal mortality rate was 5.61 per 1,000 total births (5.92 in 2014), comprising 3.87 stillbirths per 1,000 total births (4.16 in 2014) and 1.74 neonatal deaths per 1,000 live births (1.77 in 2014).

In addition to the UK totals, in Table 1 the number of births, stillbirths, neonatal deaths and extended perinatal deaths are shown separately for the four countries of the UK and the Crown Dependencies based on the mother's country of residence. The associated mortality rates are shown in Table 2. Neither overall rates of stillbirth nor any of the different types of stillbirth showed significant variation between countries. However, the neonatal mortality rate for Scotland in 2015 was significantly lower than those observed for England, Wales and Northern Ireland as well as for the UK as a whole. Similarly, rates of extended perinatal mortality were lower in Scotland than all other parts of the UK. It is important to note that stillbirth and neonatal mortality rates in Northern Ireland are affected by differences in the law relating to termination of pregnancy, with more babies affected by major congenital anomalies being carried into the later stages of pregnancy and resulting in early neonatal deaths (see Chapter 6). The number of babies born in the Crown Dependencies is too few to permit reliable comparison with the four countries of the UK.

Table 1: Number of births, stillbirths, neonatal deaths, and extended perinatal deaths by country of residence: United Kingdom and Crown Dependencies, for births in 2015

Number[§]	UK[^]	England	Scotland	Wales	Northern Ireland[○]	Crown Dep.
Total births	**782,720**	**667,398**	**55,100**	**33,442**	**24,382**	**2,398**
Live births	**779,688**	**664,777**	**54,909**	**33,305**	**24,303**	**2,394**
Stillbirths	**3,032**	**2,621**	**191**	**137**	**79**	**4**
Antepartum	*2,612*	*2,269*	*156*	*116*	*69*	*2*
Intrapartum	*288*	*240*	*25*	*16*	*5*	*2*
Unknown timing	*132*	*112*	*10*	*5*	*5*	*0*
Neonatal deaths	**1,360**	**1,140**	**69**	**70**	**78**	**3**
Early neonatal deaths	*954*	*796*	*42*	*48*	*66*	*2*
Late neonatal deaths	*406*	*344*	*27*	*22*	*12*	*1*
Perinatal deaths	**3,986**	**3,417**	**233**	**185**	**145**	**6**
Extended perinatal deaths	**4,392**	**3,761**	**260**	**207**	**157**	**7**

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[^] including the Crown Dependencies
[○] different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, ONS, PDS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 2: Stillbirth, neonatal, and extended perinatal mortality rates (95% confidence intervals (CIs)) by country of residence: United Kingdom and Crown Dependencies, for births in 2015

Rate per 1,000 births[§]	UK[^]	England	Scotland	Wales	Northern Ireland[○]	Crown Dep.
Stillbirths[†]	**3.87 (3.74 to 4.01)**	**3.93 (3.78 to 4.08)**	**3.47 (2.98 to 3.96)**	**4.10 (3.41 to 4.78)**	**3.24 (2.53 to 3.95)**	**1.67 (0.03 to 3.30)**
Antepartum[†]	*3.34 (3.21 to 3.46)*	*3.40 (3.26 to 3.54)*	*2.83 (2.39 to 3.27)*	*3.47 (2.84 to 4.10)*	*2.83 (2.16 to 3.50)*	*0.83 (0.00 to 1.99)*
Intrapartum[†]	*0.37 (0.33 to 0.41)*	*0.36 (0.31 to 0.41)*	*0.45 (0.28 to 0.63)*	*0.48 (0.24 to 0.71)*	*0.21 (0.03 to 0.38)*	*0.83 (0.00 to 1.99)*
Unknown timing[†]	*0.17 (0.14 to 0.20)*	*0.17 (0.14 to 0.20)*	*0.18 (0.07 to 0.29)*	*0.15 (0.02 to 0.28)*	*0.21 (0.03 to 0.38)*	*0.00 (0.00 to 0.25)*
Neonatal deaths[‡]	**1.74 (1.65 to 1.84)**	**1.71 (1.62 to 1.81)**	**1.26 (0.96 to 1.55)**	**2.10 (1.61 to 2.59)**	**3.21 (2.50 to 3.92)**	**1.25 (0.00 to 2.67)**
Early neonatal deaths[‡]	*1.22 (1.15 to 1.30)*	*1.20 (1.11 to 1.28)*	*0.76 (0.53 to 1.00)*	*1.44 (1.03 to 1.85)*	*2.72 (2.06 to 3.37)*	*0.84 (0.00 to 1.99)*
Late neonatal deaths[‡]	*0.52 (0.47 to 0.57)*	*0.52 (0.46 to 0.57)*	*0.49 (0.31 to 0.68)*	*0.66 (0.38 to 0.94)*	*0.49 (0.21 to 0.77)*	*0.42 (0.00 to 1.24)*
Perinatal deaths[†]	**5.09 (4.93 to 5.25)**	**5.12 (4.95 to 5.29)**	**4.23 (3.69 to 4.77)**	**5.53 (4.74 to 6.33)**	**5.95 (4.98 to 6.91)**	**2.50 (0.50 to 4.50)**
Extended perinatal deaths[†]	**5.61 (5.45 to 5.78)**	**5.64 (5.46 to 5.81)**	**4.72 (4.15 to 5.29)**	**6.19 (5.35 to 7.03)**	**6.44 (5.44 to 7.44)**	**2.92 (0.76 to 5.08)**

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[^] including the Crown Dependencies
[○] different laws exist in Northern Ireland for the termination of pregnancy
[†] per 1,000 total births
[‡] per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

In Table 3 and Table 4 the various categories of stillbirth and neonatal death are shown based on the whole UK data but subdivided by gestational age at birth. Those babies without a recorded gestational age (N = 27,096) have been allocated to the 37^{+0} to 41^{+6} weeks gestational age group. This data continues to illustrate the marked impact of preterm birth in relation to both stillbirth and neonatal death rates in the UK. Preterm birth is a particular problem in the UK. Government initiatives to reduce stillbirth and neonatal death rates, if they are to succeed, will almost certainly need to focus on ways of reducing the number of preterm births.

MBRRACE-UK Recommendation

More research is required to identify the extent to which deaths before 32 weeks gestational age are avoidable and to try to develop practices and policies which could reduce potential variation in management across the UK.

Table 3: Number of births, stillbirths, neonatal deaths, and extended perinatal deaths by gestational age at birth: United Kingdom and Crown Dependencies, for births in 2015

Number§	UK^	Gestational age at birth (weeks)				
		24^{+0}-27^{+6}	28^{+0}-31^{+6}	32^{+0}-36^{+6}	37^{+0}-41^{+6} ◦	≥42^{+0}
Total births	**783,144**	**3,221**	**6,558**	**49,652**	**704,733**	**18,980**
Live births	**780,114**	**2,488**	**6,063**	**48,890**	**703,708**	**18,965**
Stillbirths	**3,030**	**733**	**495**	**762**	**1,025**	**15**
Antepartum	*2,613*	*602*	*439*	*685*	*876*	*11*
Intrapartum	*288*	*101*	*33*	*41*	*109*	*4*
Unknown timing	*129*	*30*	*23*	*36*	*40*	*0*
Neonatal deaths	**1,361**	**383**	**205**	**271**	**495**	**7**
Early neonatal deaths	*955*	*266*	*146*	*207*	*330*	*6*
Late neonatal deaths	*406*	*117*	*59*	*64*	*165*	*1*
Perinatal deaths	**3,985**	**999**	**641**	**969**	**1,355**	**21**
Extended perinatal deaths	**4,391**	**1,116**	**700**	**1,033**	**1,520**	**22**

§ excluding terminations of pregnancy, births <24^{+0} weeks gestational age and deaths with unknown gestation
^ including the Crown Dependencies
◦ births with missing information for gestational age were included in the group 37^{+0}-41^{+6} weeks (N=27,096)
Data sources: MBRRACE-UK, ONS, PDS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 4: Stillbirth, neonatal, and extended perinatal mortality rates (95% CIs) by gestational age at birth: United Kingdom and Crown Dependencies, for births in 2015

Rate per 1,000 births[§]	UK[^]	Gestational age at birth (weeks)				
		24^{+0}-27^{+6}	28^{+0}-31^{+6}	32^{+0}-36^{+6}	37^{+0}-41^{+6} ○	≥42^{+0}
Stillbirths[†]	**3.87 (3.73 to 4.01)**	**227.57 (213.09 to 242.05)**	**75.48 (69.09 to 81.87)**	**15.35 (14.27 to 16.43)**	**1.45 (1.37 to 1.54)**	**0.79 (0.39 to 1.19)**
Antepartum[†]	*3.34 (3.21 to 3.46)*	*186.90 (173.44 to 200.36)*	*66.94 (60.89 to 72.99)*	*13.80 (12.77 to 14.82)*	*1.24 (1.16 to 1.33)*	*0.58 (0.24 to 0.92)*
Intrapartum[†]	*0.37 (0.33 to 0.41)*	*31.36 (25.34 to 37.38)*	*5.03 (3.32 to 6.74)*	*0.83 (0.57 to 1.08)*	*0.15 (0.13 to 0.18)*	*0.21 (0.00 to 0.42)*
Unknown timing[†]	*0.16 (0.14 to 0.19)*	*9.31 (6.00 to 12.63)*	*3.51 (2.08 to 4.94)*	*0.73 (0.49 to 0.96)*	*0.06 (0.04 to 0.07)*	*0.00 (0.00 to 0.16)*
Neonatal deaths[‡]	**1.74 (1.65 to 1.84)**	**153.94 (139.76 to 168.12)**	**33.81 (29.26 to 38.36)**	**5.54 (4.88 to 6.20)**	**0.70 (0.64 to 0.77)**	**0.37 (0.10 to 0.64)**
Early neonatal deaths[‡]	*1.22 (1.15 to 1.30)*	*106.91 (94.77 to 119.06)*	*24.08 (20.22 to 27.94)*	*4.23 (3.66 to 4.81)*	*0.47 (0.42 to 0.52)*	*0.32 (0.06 to 0.57)*
Late neonatal deaths[‡]	*0.52 (0.47 to 0.57)*	*47.03 (38.71 to 55.34)*	*9.73 (7.26 to 12.20)*	*1.31 (0.99 to 1.63)*	*0.23 (0.20 to 0.27)*	*0.05 (0.00 to 0.16)*
Perinatal deaths[†]	**5.09 (4.93 to 5.25)**	**310.15 (294.18 to 326.13)**	**97.74 (90.56 to 104.93)**	**19.52 (18.30 to 20.73)**	**1.92 (1.82 to 2.02)**	**1.11 (0.63 to 1.58)**
Extended perinatal deaths[†]	**5.61 (5.44 to 5.77)**	**346.48 (330.04 to 362.91)**	**106.74 (99.27 to 114.21)**	**20.80 (19.55 to 22.06)**	**2.16 (2.05 to 2.27)**	**1.16 (0.68 to 1.64)**

[§] excluding terminations of pregnancy, births <24^{+0} weeks gestational age and deaths with unknown gestation
[^] including the Crown Dependencies
○ births with missing information for gestational age were included in the group 37^{+0}-41^{+6} weeks (N=27,096)
[†] per 1,000 total births
[‡] per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

3.2 Time Trend

The data shown in Figure 2 has been included for the first time as it reflects trends in the various mortality rates produced by MBRRACE-UK over the past three years. The data is equivalent to that included in Table 1, i.e. it excludes the small number of babies whose mothers could not be allocated to a country of residence. The data for the UK as a whole is probably the most useful since it is the least likely to be affected by short term variation. The trend in extended perinatal mortality in the UK clearly reflects a decline in the rate over these years but this appears mainly to be the result of a fall in the rate of stillbirth with the rate of neonatal mortality remaining largely unchanged.

Figure 2: Stillbirth, neonatal, and extended perinatal mortality rates for the UK and by country of residence: United Kingdom, for births in 2015

† per 1,000 total births
‡ per 1,000 live births
Excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

MBRRACE-UK Recommendation

Close monitoring of mortality rates is required to ensure that the decline in rates of stillbirth is continued in order to meet Government ambitions.

MBRRACE-UK Recommendation

A renewed focus on neonatal deaths is required in order to achieve a significant reduction in neonatal mortality rates from the position seen over the past three years.

Table 5: Stillbirth, neonatal, and extended perinatal mortality rates for the UK and by country of residence: United Kingdom, for births from 2013 to 2015

Rate per 1,000 births[§]	UK[^]	England	Scotland	Wales	Northern Ireland[◦]	Crown Dep.
Stillbirths[†]						
2013	4.20 (4.06 to 4.35)	4.26 (4.10 to 4.42)	3.78 (3.30 to 4.32)	3.78 (3.18 to 4.50)	4.33 (3.58 to 5.24)	3.25 (1.65 to 6.40)
2014	4.16 (4.01 to 4.30)	4.19 (4.04 to 4.35)	3.69 (3.19 to 4.19)	4.71 (3.98 to 5.44)	3.76 (2.99 to 4.52)	1.24 (0.00 to 2.64)
2015	3.87 (3.74 to 4.01)	3.93 (3.78 to 4.08)	3.47 (2.98 to 3.96)	4.10 (3.41 to 4.78)	3.24 (2.53 to 3.95)	1.67 (0.03 to 3.3)
Neonatal deaths[‡]						
2013	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)
2014	1.77 (1.68 to 1.87)	1.73 (1.63 to 1.83)	1.86 (1.51 to 2.22)	1.67 (1.23 to 2.10)	2.99 (2.31 to 3.68)	1.24 (0.00 to 2.65)
2015	1.74 (1.65 to 1.84)	1.71 (1.62 to 1.81)	1.26 (0.96 to 1.55)	2.10 (1.61 to 2.59)	3.21 (2.5 to 3.92)	1.25 (0 to 2.67)
Extended perinatal deaths[†]						
2013	6.04 (5.87 to 6.21)	6.09 (5.90 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)
2014	5.92 (5.75 to 6.09)	5.91 (5.73 to 6.10)	5.55 (4.93 to 6.16)	6.37 (5.52 to 7.22)	6.74 (5.71 to 7.76)	2.48 (0.50 to 4.46)
2015	5.61 (5.45 to 5.78)	5.64 (5.46 to 5.81)	4.72 (4.15 to 5.29)	6.19 (5.35 to 7.03)	6.44 (5.44 to 7.44)	2.92 (0.76 to 5.08)

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[^] including the Crown Dependencies
[◦] different laws exist in Northern Ireland for the termination of pregnancy
[†] per 1,000 total births
[‡] per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

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

As set out in Section 2.6, an important aim of this report is to present data that has 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, e.g. organisations treating women identified as low risk versus those providing high risk care.

In this chapter the geographical distribution of stillbirth, neonatal, and extended perinatal mortality rates by CCG (England), Health Board (Scotland and Wales), Health and Social Care Trust (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 based on the approach described in Section 2.7.

The maps are followed by Table 6 in which are given the numeric values of the crude and the stabilised & adjusted rates for each of the relevant organisations. The process of stabilisation and adjustment has a major effect in terms of smoothing apparently extreme (very high or very low) crude mortality rates by taking into account known influences on stillbirth and neonatal mortality. There are some organisations where mortality rates increase 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 comparatively low risk population.

Commissioning organisations will need to work with their relevant care providers to try to understand more fully the factors underlying their particular mortality rates in the context of their data quality, population characteristics and quality of care provision. We would also wish to highlight the new analysis included in Chapter 6 which explores the impact of congenital anomalies and the deaths of babies born before 24 weeks gestational age on the various mortality rates. It seems clear that these births are responsible for significant variation in the rates of death observed and therefore local factors and policies affecting the number of deaths in these categories should also be considered as part of any review.

4.1 Mortality rates by CCG (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency

Figure 3: Crude stillbirth rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

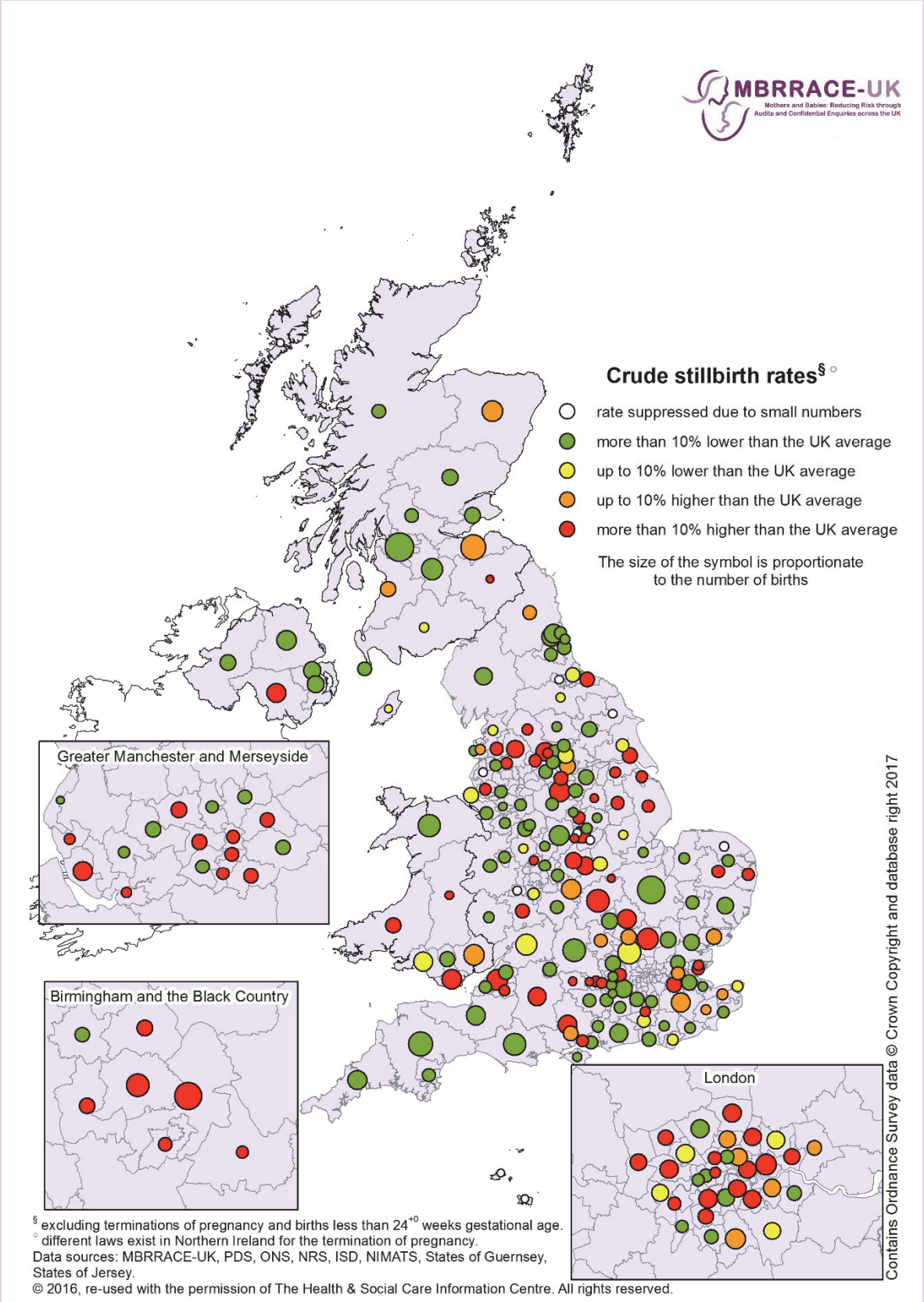


Figure 4: Stabilised & adjusted stillbirth rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

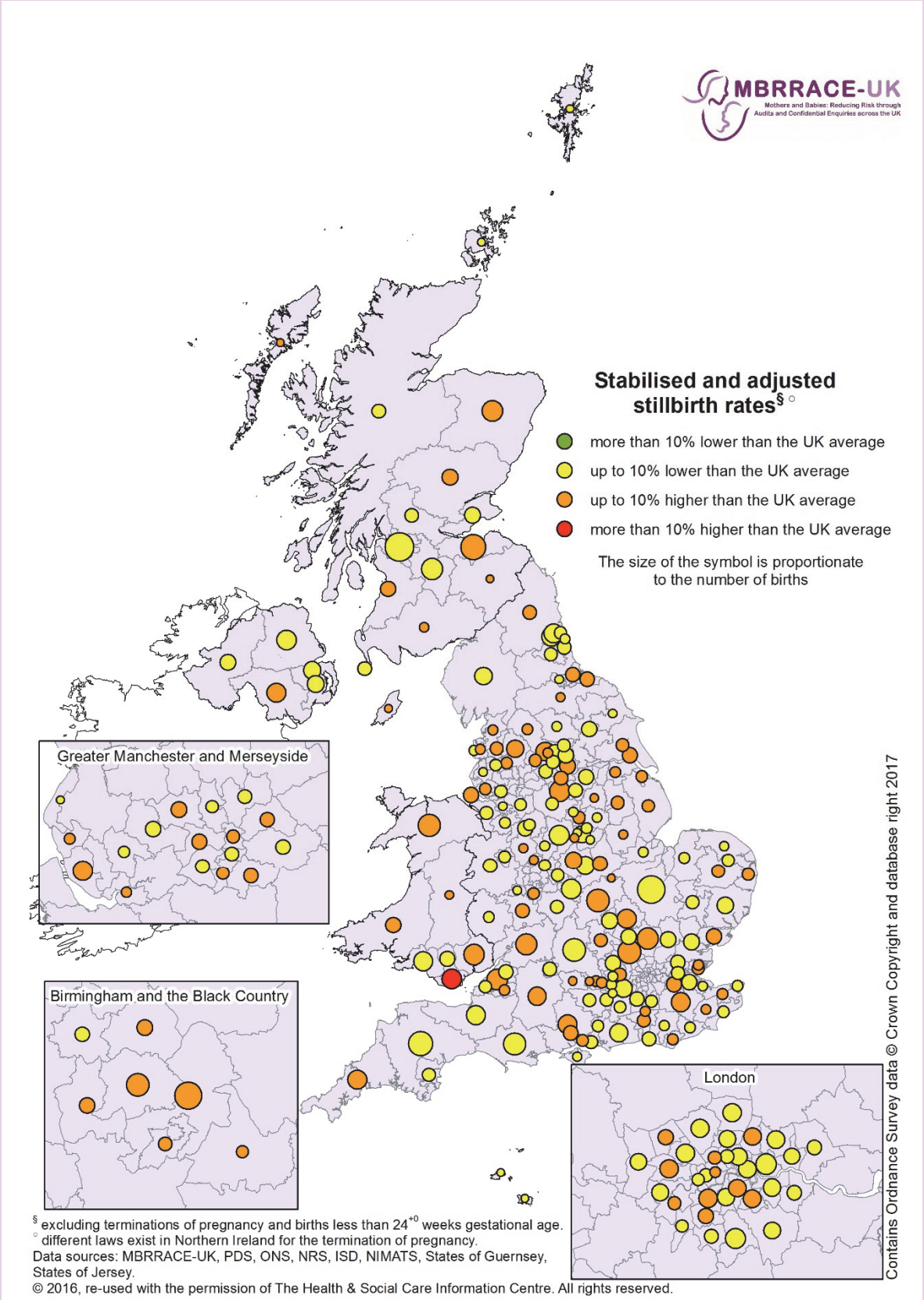


Figure 5: Crude neonatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence: United Kingdom and Crown Dependencies, for births in 2015

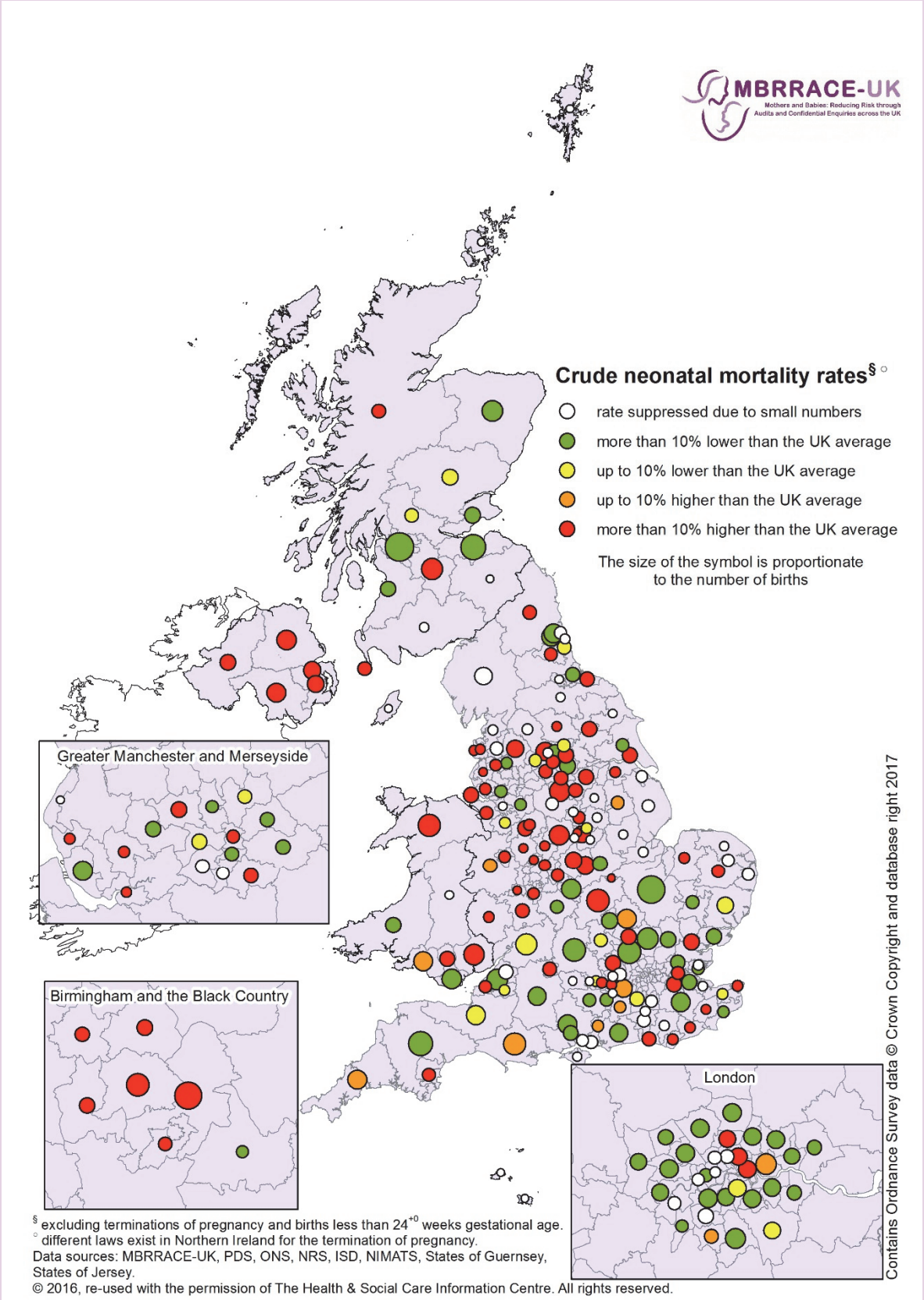


Figure 6: Stabilised & adjusted neonatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2015

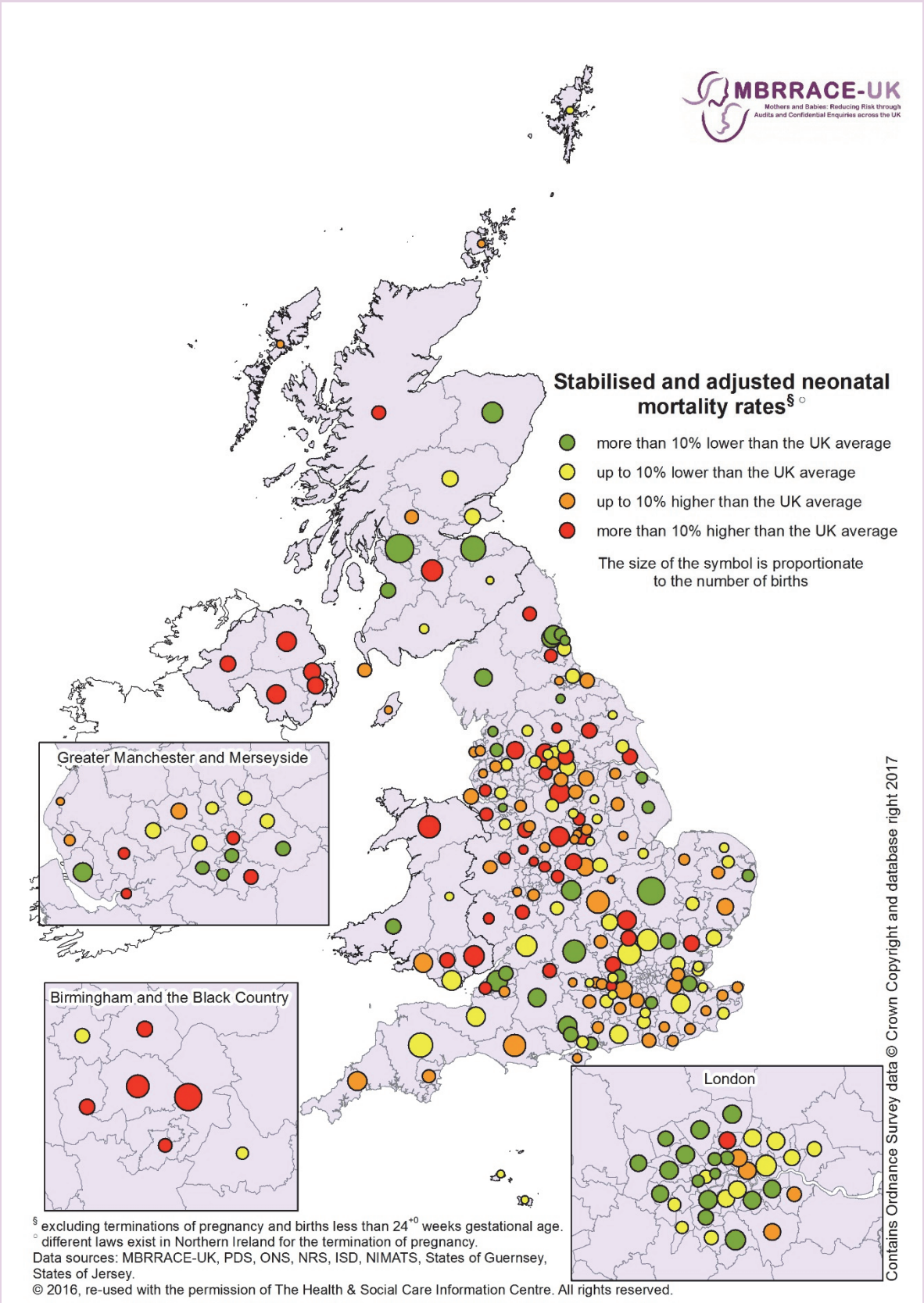


Figure 7: Crude extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2015

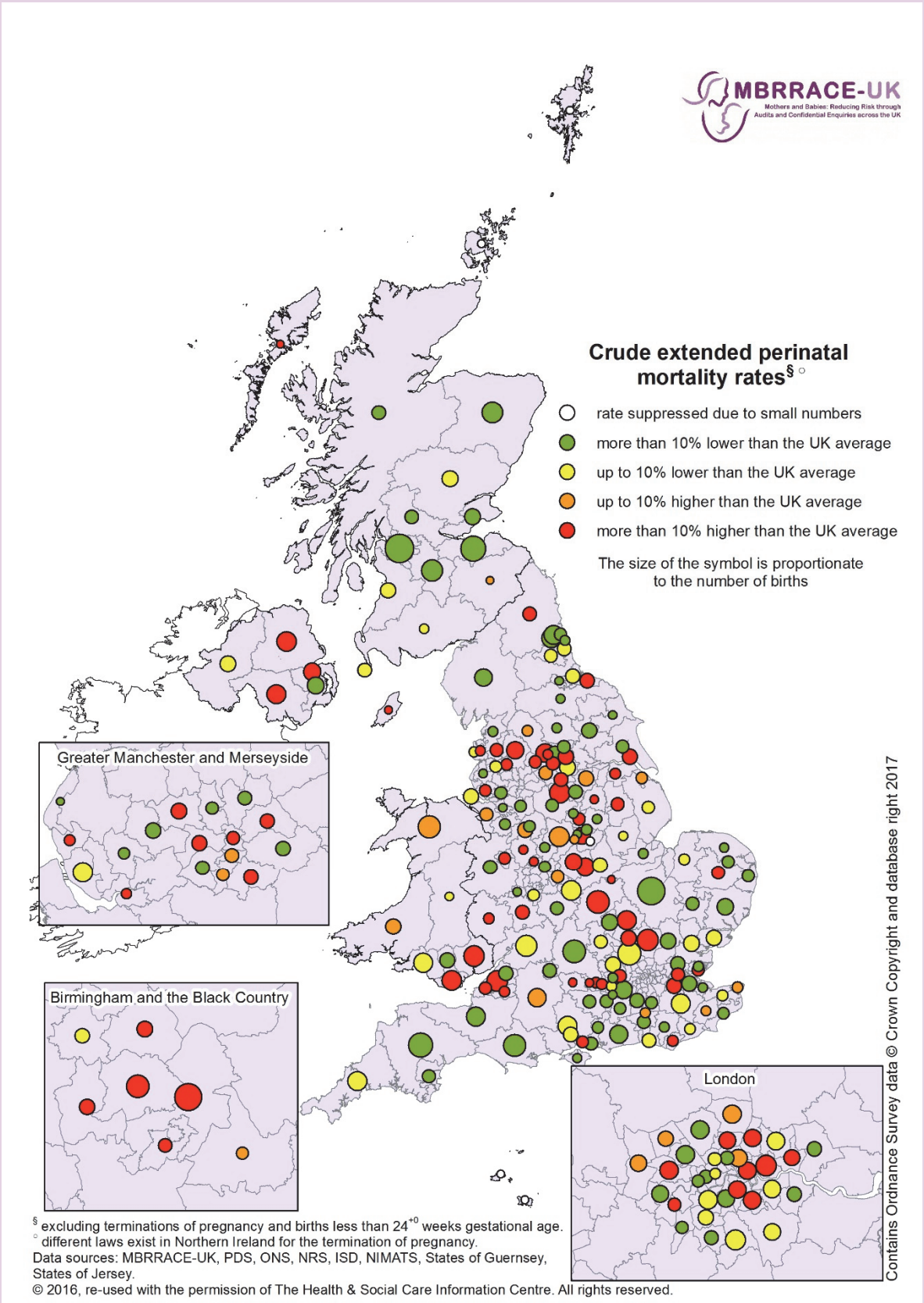


Figure 8: Stabilised & adjusted extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on mother's residence: United Kingdom and Crown Dependencies, for births in 2015

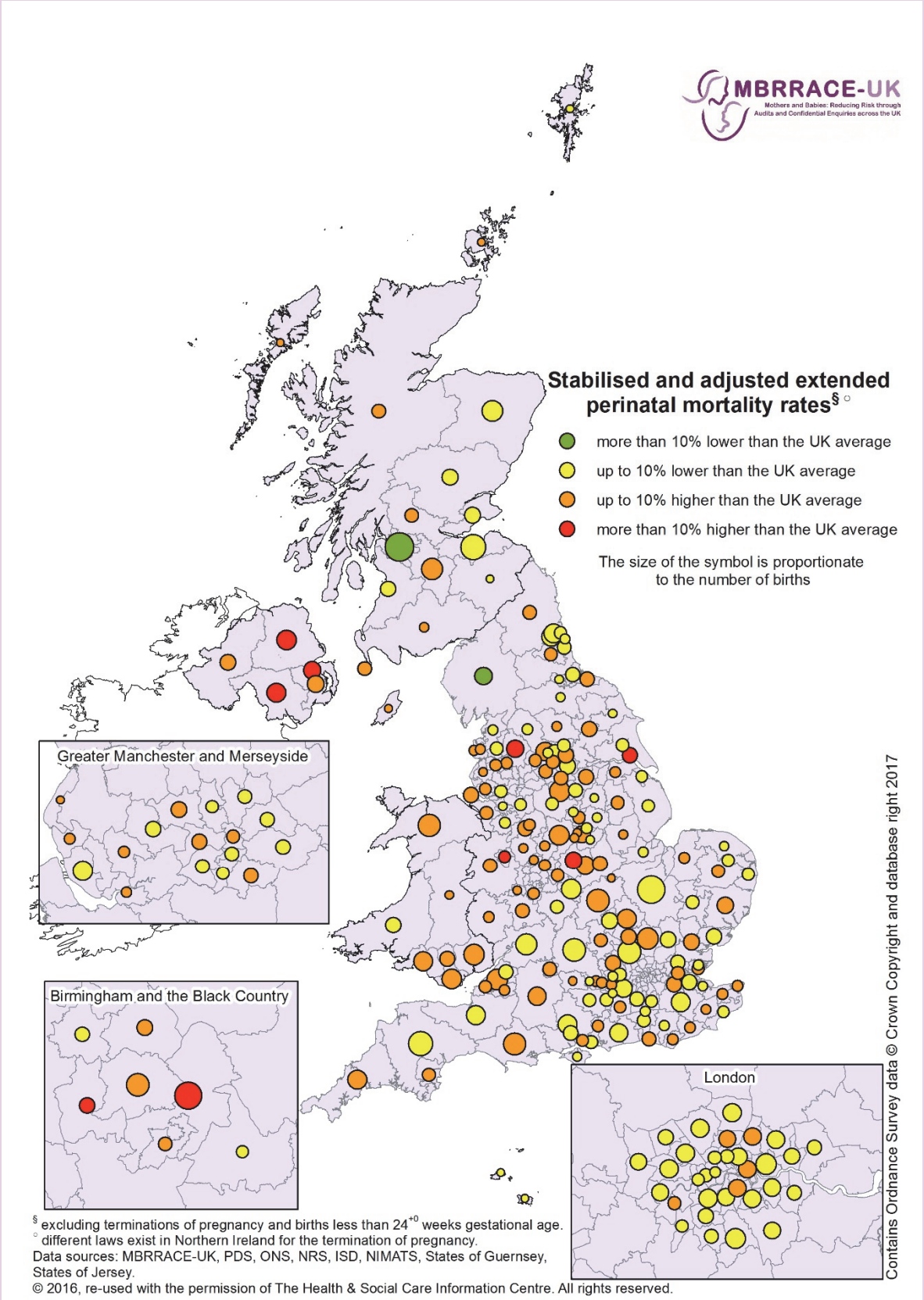


Table 6: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by Clinical Commissioning Group (England), Health Board (Scotland and Wales), Local Commissioning Group (Northern Ireland), and Crown Dependency based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

Organisation	Total births§	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 and Craven	1,761	*	3.91 (3.34 to 4.54)	*	1.65 (1.04 to 2.52)	5.68	5.54 (4.79 to 7.03)	
Ashford	1,528	3.93	3.89 (3.23 to 4.63)	1.97	1.82 (1.22 to 3.04)	5.89	5.70 (5.02 to 7.38)	
Aylesbury Vale	2,495	4.01	3.91 (3.28 to 5.01)	1.61	1.77 (1.20 to 2.83)	5.61	5.67 (5.10 to 7.28)	
Barking and Dagenham	3,872	4.65	3.80 (3.18 to 4.59)	1.56	1.64 (1.10 to 2.53)	6.20	5.44 (4.63 to 6.85)	
Barnet	5,287	3.40	3.80 (3.03 to 4.24)	0.76	1.44 (0.99 to 2.04)	4.16	5.25 (4.55 to 6.12)	
Barnsley	2,827	6.01	4.06 (3.48 to 4.90)	2.14	1.85 (1.27 to 2.66)	8.14	5.91 (5.29 to 7.08)	
Basildon and Brentwood	3,390	2.36	3.76 (3.07 to 4.67)	1.48	1.76 (1.10 to 2.93)	3.83	5.51 (4.68 to 7.11)	
Bassetlaw	1,237	*	4.02 (3.37 to 5.18)	*	1.63 (0.96 to 2.78)	8.08	5.59 (4.79 to 7.59)	
Bath and North East Somerset	1,816	4.96	3.97 (3.34 to 4.71)	1.66	1.86 (1.13 to 2.92)	6.61	5.81 (4.89 to 7.47)	
Bedfordshire	5,492	4.37	3.99 (3.41 to 4.94)	1.83	2.00 (1.43 to 2.89)	6.19	5.97 (5.46 to 7.57)	
Bexley	3,173	2.52	3.73 (3.02 to 4.41)	1.58	1.77 (1.10 to 3.02)	4.10	5.48 (4.76 to 6.67)	
Birmingham CrossCity	11,130	5.39	3.99 (3.37 to 4.89)	3.61	2.47 (1.87 to 3.34)	8.98	6.51 (5.81 to 8.26)	
Birmingham South and Central	2,908	6.19	3.98 (3.40 to 4.94)	3.11	2.08 (1.46 to 3.14)	9.28	6.06 (5.53 to 7.69)	
Blackburn with Darwen	2,133	7.50	4.04 (3.34 to 5.15)	1.42	1.69 (1.07 to 2.91)	8.91	5.72 (4.94 to 7.39)	
Blackpool	1,670	2.40	3.80 (2.88 to 4.39)	3.00	1.86 (1.19 to 2.78)	5.39	5.69 (4.86 to 6.87)	
Bolton	3,805	5.52	3.99 (3.32 to 5.11)	2.11	1.82 (1.39 to 2.55)	7.62	5.81 (5.24 to 7.82)	
Bracknell and Ascot	1,611	2.48	3.83 (3.39 to 4.34)	3.11	1.97 (1.26 to 3.26)	5.59	5.84 (5.01 to 7.33)	
Bradford City	1,609	*	3.94 (3.36 to 4.84)	*	1.60 (1.07 to 2.50)	8.70	5.53 (4.80 to 7.06)	
Bradford Districts	5,026	6.57	4.13 (3.36 to 5.38)	2.60	1.98 (1.30 to 2.71)	9.15	6.10 (5.27 to 7.86)	
Brent	5,234	3.82	3.74 (3.31 to 4.44)	1.15	1.47 (0.94 to 2.14)	4.97	5.21 (4.74 to 6.19)	
Brighton and Hove	2,959	3.38	3.86 (3.09 to 4.34)	2.03	1.89 (1.24 to 2.97)	5.41	5.74 (4.88 to 7.13)	
Bristol	6,295	5.08	4.06 (3.21 to 5.02)	1.28	1.59 (1.08 to 2.23)	6.35	5.64 (4.70 to 6.71)	
Bromley	4,114	3.65	3.86 (3.19 to 4.48)	1.71	1.77 (1.12 to 2.53)	5.35	5.63 (5.12 to 6.95)	
Bury	2,365	2.11	3.77 (3.06 to 4.51)	1.27	1.70 (1.10 to 2.94)	3.38	5.46 (4.71 to 6.95)	
Calderdale	2,452	6.12	4.03 (3.53 to 5.04)	1.64	1.73 (1.20 to 2.58)	7.75	5.74 (5.02 to 7.27)	
Cambridgeshire and Peterborough	11,047	2.99	3.74 (3.29 to 4.32)	0.82	1.43 (0.97 to 2.32)	3.80	5.18 (4.55 to 6.46)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Camden	2,721	*	3.91 (3.30 to 4.73)	*	1.55 (1.05 to 2.31)	5.51	5.46 (4.73 to 6.68)	
Cannock Chase	1,443	5.54	3.96 (3.28 to 4.94)	4.18	2.10 (1.23 to 3.31)	9.70	6.14 (5.09 to 7.89)	
Canterbury and Coastal	1,793	3.90	3.89 (3.42 to 4.88)	1.68	1.80 (1.19 to 2.82)	5.58	5.68 (5.00 to 7.32)	
Castle Point and Rochford	1,609	*	3.93 (3.14 to 4.91)	*	1.60 (1.10 to 2.55)	4.97	5.50 (4.66 to 6.71)	
Central London (Westminster)	1,878	*	3.90 (3.49 to 4.83)	*	1.49 (0.91 to 2.36)	5.32	5.35 (4.92 to 6.76)	
Central Manchester	3,001	5.00	3.83 (3.23 to 4.56)	1.00	1.54 (1.00 to 2.37)	6.00	5.40 (4.67 to 6.65)	
Chiltern	3,705	2.97	3.81 (3.33 to 4.37)	2.44	2.02 (1.40 to 3.21)	5.40	5.83 (5.01 to 7.76)	
Chorley and South Ribble	1,998	3.00	3.86 (3.38 to 4.74)	2.51	1.88 (1.22 to 2.77)	5.51	5.76 (5.08 to 7.18)	
City and Hackney	4,590	3.92	3.75 (3.08 to 4.38)	1.97	1.79 (1.25 to 2.77)	5.88	5.53 (5.02 to 6.98)	
Coastal West Sussex	4,901	3.06	3.85 (3.24 to 4.61)	1.43	1.73 (1.23 to 3.04)	4.49	5.57 (4.94 to 7.29)	
Corby	1,012	5.93	3.95 (3.37 to 4.80)	2.98	1.87 (1.06 to 2.76)	8.89	5.83 (4.70 to 7.21)	
Coventry and Rugby	5,806	3.96	3.85 (3.27 to 4.44)	1.56	1.59 (0.99 to 2.50)	5.51	5.41 (4.69 to 6.90)	
Crawley	1,675	*	3.92 (3.37 to 5.01)	*	1.63 (0.97 to 2.51)	5.97	5.52 (4.78 to 6.97)	
Croydon	5,861	4.09	3.77 (3.09 to 4.58)	1.03	1.42 (0.97 to 2.12)	5.12	5.20 (4.65 to 6.33)	
Cumbria	4,847	*	3.77 (3.26 to 4.49)	*	1.31 (0.83 to 1.92)	2.89	5.02 (4.28 to 6.44)	
Darlington	1,218	*	3.81 (3.10 to 4.73)	*	1.80 (0.93 to 3.09)	3.28	5.59 (5.05 to 7.09)	
Dartford, Gravesham and Swanley	3,449	5.80	4.07 (3.49 to 5.19)	2.04	1.81 (1.26 to 2.76)	7.83	5.87 (5.16 to 7.73)	
Doncaster	3,569	3.08	3.80 (3.04 to 4.46)	2.81	1.92 (1.35 to 3.39)	5.88	5.77 (4.77 to 7.51)	
Dorset	7,328	3.28	3.87 (3.38 to 4.36)	1.78	1.85 (1.23 to 2.65)	5.05	5.72 (5.13 to 6.88)	
Dudley	3,694	4.87	3.96 (3.56 to 4.72)	4.35	2.48 (1.74 to 3.74)	9.20	6.55 (5.70 to 8.73)	
Durham Dales, Easington and Sedgefield	2,886	3.12	3.83 (3.24 to 4.69)	2.09	1.80 (1.23 to 2.53)	5.20	5.63 (4.99 to 6.96)	
Ealing	5,250	5.71	4.01 (3.31 to 4.72)	1.34	1.57 (0.89 to 2.50)	7.05	5.57 (4.94 to 6.91)	
East Lancashire	4,654	4.51	3.92 (3.34 to 4.90)	3.24	2.32 (1.48 to 3.25)	7.74	6.25 (5.34 to 7.71)	
East Leicestershire and Rutland	3,230	3.72	3.92 (3.30 to 4.86)	1.55	1.73 (1.26 to 2.75)	5.26	5.63 (4.94 to 7.29)	
East Riding of Yorkshire	2,754	3.63	3.90 (3.29 to 4.75)	1.46	1.71 (1.08 to 2.74)	5.08	5.60 (4.71 to 7.21)	
East Staffordshire	1,518	2.64	3.82 (3.21 to 4.96)	1.98	1.83 (1.04 to 3.08)	4.61	5.64 (5.02 to 7.44)	
East Surrey	2,261	*	3.84 (3.28 to 4.47)	*	1.57 (1.02 to 2.69)	3.10	5.41 (4.77 to 6.87)	
East and North Hertfordshire	6,760	5.18	4.18 (3.44 to 5.21)	1.49	1.72 (1.11 to 2.87)	6.66	5.88 (4.93 to 7.32)	
Eastbourne, Hailsham and Seaford	1,811	3.87	3.89 (3.34 to 4.89)	2.77	1.91 (1.17 to 3.43)	6.63	5.82 (5.03 to 8.01)	
Eastern Cheshire	1,985	1.51	3.78 (3.09 to 4.40)	1.51	1.85 (1.13 to 3.25)	3.02	5.60 (4.90 to 7.03)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Enfield	5,053	4.75	3.85 (3.06 to 4.71)	1.19	1.51 (0.99 to 2.66)	5.94	5.37 (4.71 to 6.56)	
Erewash	1,151	*	3.90 (3.47 to 5.14)	*	1.81 (1.15 to 2.83)	6.08	5.71 (5.03 to 7.25)	
Fareham and Gosport	2,084	*	4.09 (3.35 to 5.27)	*	1.62 (0.98 to 2.79)	7.68	5.67 (4.86 to 6.99)	
Fylde & Wyre	1,468	4.09	3.90 (3.47 to 4.82)	2.74	1.88 (1.31 to 3.25)	6.81	5.81 (5.02 to 7.75)	
Gloucestershire	6,733	3.56	3.92 (3.33 to 4.80)	1.64	1.72 (1.26 to 2.53)	5.20	5.62 (4.93 to 7.47)	
Great Yarmouth and Waveney	2,212	*	3.95 (3.18 to 5.13)	*	1.45 (0.91 to 2.04)	4.97	5.40 (4.66 to 6.82)	
Greater Huddersfield	2,817	2.48	3.75 (3.12 to 4.57)	3.56	2.33 (1.34 to 3.80)	6.03	6.04 (5.32 to 8.23)	
Greater Preston	2,480	*	4.08 (3.42 to 5.04)	*	1.50 (1.04 to 2.22)	7.66	5.48 (4.65 to 6.74)	
Greenwich	4,668	4.07	3.77 (3.15 to 4.30)	1.08	1.55 (0.97 to 2.26)	5.14	5.34 (4.55 to 6.24)	
Guildford and Waverley	2,089	2.87	3.85 (3.43 to 4.56)	1.92	1.87 (1.14 to 3.05)	4.79	5.72 (4.98 to 7.75)	
Halton	1,498	5.34	3.95 (3.37 to 4.72)	3.36	1.99 (1.31 to 3.09)	8.68	5.95 (5.22 to 7.83)	
Hambleton, Richmondshire and Whitby	1,382	*	3.89 (3.42 to 4.84)	*	1.58 (1.07 to 2.65)	3.62	5.48 (4.89 to 6.84)	
Hammersmith and Fulham	2,358	*	3.79 (3.17 to 4.37)	*	1.51 (1.01 to 2.30)	3.39	5.31 (4.76 to 6.53)	
Hardwick	1,284	*	3.83 (3.19 to 4.56)	*	1.65 (1.11 to 2.63)	3.12	5.47 (4.84 to 6.68)	
Haringey	4,137	4.11	3.82 (3.06 to 4.46)	2.67	2.01 (1.56 to 3.11)	6.77	5.83 (5.34 to 7.17)	
Harrogate and Rural District	1,494	2.01	3.83 (3.06 to 4.56)	2.68	1.98 (1.05 to 2.79)	4.69	5.81 (4.83 to 7.54)	
Harrow	3,612	4.71	3.90 (3.11 to 4.63)	1.11	1.49 (0.96 to 2.12)	5.81	5.36 (4.82 to 6.66)	
Hartlepool and Stockton-on-Tees	3,362	3.87	3.88 (3.30 to 4.51)	1.49	1.72 (1.13 to 2.69)	5.35	5.59 (4.94 to 7.02)	
Hastings and Rother	1,784	3.36	3.86 (3.04 to 4.47)	2.25	1.86 (1.09 to 2.74)	5.61	5.71 (4.65 to 7.07)	
Havering	3,295	3.95	3.87 (3.11 to 4.71)	0.91	1.64 (1.02 to 2.40)	4.86	5.52 (4.77 to 6.84)	
Herefordshire	1,741	2.30	3.83 (3.11 to 4.34)	4.61	2.25 (1.26 to 3.76)	6.89	6.17 (5.01 to 8.24)	
Herts Valleys	7,768	3.86	3.95 (3.32 to 4.75)	1.29	1.64 (1.17 to 2.34)	5.15	5.57 (4.92 to 7.01)	
Heywood, Middleton and Rochdale	2,898	2.76	3.75 (3.00 to 4.46)	1.73	1.74 (1.09 to 2.65)	4.49	5.48 (4.65 to 6.63)	
High Weald Lewes Havens	1,471	*	3.85 (3.44 to 4.46)	*	1.77 (1.15 to 2.88)	4.08	5.61 (5.09 to 6.89)	
Hillingdon	4,415	4.53	3.86 (3.25 to 4.67)	1.14	1.56 (1.11 to 2.43)	5.66	5.43 (4.99 to 6.67)	
Horsham and Mid Sussex	2,496	*	3.91 (3.28 to 5.13)	*	1.63 (1.06 to 2.51)	4.41	5.53 (4.65 to 7.18)	
Hounslow	4,475	3.80	3.78 (3.27 to 4.59)	0.90	1.49 (0.93 to 2.12)	4.69	5.28 (4.84 to 6.61)	
Hull	3,600	6.39	4.12 (3.50 to 5.25)	2.80	2.08 (1.36 to 2.84)	9.17	6.20 (5.09 to 7.70)	
Ipswich and East Suffolk	4,292	3.26	3.85 (3.32 to 4.45)	1.64	1.88 (1.22 to 3.25)	4.89	5.72 (5.10 to 7.18)	
Isle of Wight	1,299	*	3.86 (3.02 to 4.48)	*	1.77 (0.95 to 2.82)	4.62	5.62 (4.88 to 7.18)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Islington	2,958	*	3.76 (3.06 to 4.62)	*	1.54 (0.95 to 2.41)	4.06	5.33 (4.56 to 6.43)	
Kernow	5,426	3.50	3.90 (3.39 to 4.87)	1.85	1.91 (1.29 to 2.82)	5.34	5.81 (5.08 to 7.30)	
Kingston	2,355	2.55	3.81 (3.10 to 4.63)	1.28	1.72 (1.05 to 2.48)	3.82	5.52 (4.79 to 6.71)	
Knowsley	1,936	4.65	3.92 (3.23 to 4.92)	3.11	1.95 (1.39 to 3.18)	7.75	5.90 (5.25 to 7.48)	
Lambeth	4,634	3.24	3.67 (3.00 to 4.40)	1.52	1.66 (1.16 to 2.27)	4.75	5.33 (4.61 to 6.43)	
Lancashire North	1,589	*	3.89 (3.12 to 4.57)	*	1.48 (0.90 to 2.37)	3.78	5.32 (4.61 to 6.50)	
Leeds North	2,483	2.42	3.78 (2.94 to 4.43)	1.61	1.68 (1.10 to 2.75)	4.03	5.45 (4.62 to 6.97)	
Leeds South and East	3,716	3.77	3.78 (3.20 to 4.46)	3.78	2.29 (1.51 to 3.52)	7.53	6.09 (5.54 to 7.80)	
Leeds West	4,015	1.49	3.64 (2.96 to 4.63)	1.25	1.66 (1.03 to 2.38)	2.74	5.29 (4.23 to 6.64)	
Leicester City	5,183	4.63	3.84 (3.30 to 4.53)	2.33	1.91 (1.40 to 2.84)	6.95	5.73 (5.12 to 6.94)	
Lewisham	4,823	5.81	3.98 (3.44 to 5.27)	1.04	1.48 (0.99 to 2.06)	6.84	5.45 (4.92 to 7.02)	
Lincolnshire East	2,251	*	3.94 (3.27 to 4.86)	*	1.54 (0.92 to 2.40)	5.33	5.42 (4.70 to 6.87)	
Lincolnshire West	2,674	4.86	3.98 (3.02 to 4.89)	1.88	1.76 (1.12 to 2.68)	6.73	5.73 (4.76 to 7.25)	
Liverpool	5,904	4.40	3.94 (3.39 to 4.99)	1.19	1.50 (0.94 to 2.10)	5.59	5.41 (4.70 to 6.79)	
Luton	3,559	3.93	3.77 (3.30 to 4.48)	2.54	1.99 (1.22 to 2.79)	6.46	5.72 (5.07 to 7.16)	
Mansfield and Ashfield	2,355	5.10	3.97 (3.38 to 4.80)	3.41	2.22 (1.45 to 3.75)	8.49	6.19 (5.28 to 8.32)	
Medway	3,615	3.04	3.80 (3.08 to 4.49)	1.11	1.55 (0.97 to 2.48)	4.15	5.32 (4.56 to 6.68)	
Merton	3,431	*	3.97 (3.38 to 4.95)	*	1.49 (1.00 to 2.14)	5.54	5.45 (4.96 to 7.06)	
Mid Essex	4,081	3.19	3.87 (3.27 to 4.41)	2.21	2.07 (1.35 to 3.26)	5.39	5.93 (5.28 to 7.74)	
Milton Keynes	3,938	2.54	3.71 (2.93 to 4.53)	1.02	1.61 (1.12 to 2.53)	3.56	5.32 (4.45 to 6.63)	
Nene	7,966	4.27	4.01 (3.47 to 4.72)	2.02	1.92 (1.38 to 2.80)	6.28	5.93 (5.28 to 7.19)	
Newark & Sherwood	1,245	*	3.87 (3.27 to 4.88)	*	1.70 (0.96 to 2.70)	4.02	5.56 (4.84 to 6.80)	
Newbury and District	1,170	*	3.94 (3.33 to 5.02)	*	1.77 (1.20 to 2.66)	6.84	5.71 (4.85 to 7.27)	
Newcastle Gateshead	5,562	3.06	3.74 (3.24 to 4.45)	1.08	1.51 (0.98 to 2.22)	4.14	5.23 (4.68 to 6.30)	
Newham	6,268	4.95	3.78 (3.07 to 4.29)	1.92	1.62 (1.17 to 2.38)	6.86	5.39 (4.64 to 6.48)	
North & West Reading	1,243	*	3.95 (3.31 to 4.75)	*	1.63 (1.12 to 2.65)	6.44	5.56 (5.06 to 6.91)	
North Derbyshire	2,459	*	3.87 (3.30 to 4.49)	*	1.70 (1.08 to 2.62)	4.07	5.57 (4.88 to 6.82)	
North Durham	2,490	3.21	3.85 (3.25 to 4.57)	2.42	1.96 (1.36 to 2.91)	5.62	5.82 (5.18 to 7.34)	
North East Essex	3,598	3.89	3.90 (3.12 to 4.84)	1.40	1.69 (1.13 to 2.42)	5.28	5.58 (4.90 to 6.95)	
North East Hampshire and Farnham	2,552	3.13	3.87 (3.26 to 4.62)	1.18	1.71 (1.07 to 2.69)	4.31	5.57 (4.82 to 6.69)	
North East Lincolnshire	1,929	*	3.92 (3.29 to 4.79)	*	1.58 (0.83 to 2.53)	5.70	5.45 (4.60 to 7.02)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
North Hampshire	2,597	3.08	3.86 (3.08 to 4.65)	1.54	1.76 (1.18 to 2.53)	4.62	5.62 (4.80 to 6.79)	
North Kirklees	2,582	3.49	3.81 (3.21 to 4.54)	2.72	1.93 (1.23 to 3.16)	6.20	5.74 (4.81 to 7.62)	
North Lincolnshire	1,882	5.31	3.97 (3.47 to 4.96)	2.14	1.86 (1.24 to 2.72)	7.44	5.83 (5.20 to 7.36)	
North Manchester	2,745	5.46	3.90 (3.12 to 4.95)	2.56	1.95 (1.42 to 3.17)	8.01	5.82 (5.08 to 7.59)	
North Norfolk	1,410	*	3.80 (3.10 to 4.32)	*	1.75 (1.21 to 2.64)	2.84	5.55 (4.87 to 6.94)	
North Somerset	2,243	3.12	3.86 (3.23 to 4.43)	3.58	2.24 (1.57 to 3.79)	6.69	6.12 (5.53 to 8.24)	
North Staffordshire	2,003	2.50	3.82 (3.05 to 4.72)	2.50	1.93 (1.10 to 3.11)	4.99	5.76 (4.97 to 7.37)	
North Tyneside	2,212	*	3.80 (3.06 to 4.64)	*	1.55 (0.96 to 2.39)	3.16	5.30 (4.58 to 6.66)	
North West Surrey	4,498	2.45	3.76 (2.95 to 4.24)	1.78	1.78 (1.14 to 2.68)	4.22	5.53 (4.69 to 6.84)	
Northern, Eastern and West Devon	9,021	2.22	3.63 (2.95 to 4.36)	1.33	1.67 (1.19 to 2.52)	3.55	5.29 (4.71 to 6.38)	
Northumberland	2,843	4.22	3.93 (3.40 to 4.75)	2.12	1.98 (1.17 to 3.41)	6.33	5.90 (5.28 to 7.28)	
Norwich	2,226	*	3.84 (3.24 to 4.96)	*	1.61 (1.01 to 2.44)	4.04	5.44 (4.72 to 6.80)	
Nottingham City	4,318	4.40	3.84 (3.19 to 4.67)	2.56	1.95 (1.26 to 2.94)	6.95	5.78 (5.23 to 7.21)	
Nottingham North and East	1,723	2.90	3.85 (3.24 to 4.94)	1.75	1.77 (1.14 to 2.81)	4.64	5.61 (4.68 to 7.37)	
Nottingham West	1,198	*	3.82 (2.95 to 4.51)	*	1.88 (1.19 to 3.03)	4.17	5.70 (4.63 to 7.46)	
Oldham	3,355	5.07	3.91 (3.37 to 4.64)	1.20	1.63 (1.18 to 2.48)	6.26	5.55 (4.93 to 6.64)	
Oxfordshire	7,728	2.98	3.80 (3.33 to 4.28)	0.78	1.41 (0.94 to 2.10)	3.75	5.20 (4.77 to 6.42)	
Portsmouth	2,687	*	3.70 (2.99 to 4.26)	*	1.46 (0.96 to 2.28)	1.86	5.16 (4.53 to 6.67)	
Redbridge	4,826	3.73	3.74 (3.04 to 4.66)	1.46	1.61 (1.12 to 2.59)	5.18	5.34 (4.68 to 6.68)	
Redditch and Bromsgrove	1,985	3.53	3.88 (3.22 to 4.38)	2.02	1.84 (1.18 to 2.85)	5.54	5.72 (4.97 to 6.90)	
Richmond	2,620	*	4.06 (3.41 to 5.06)	*	1.64 (1.00 to 2.45)	6.49	5.70 (4.85 to 7.00)	
Rotherham	3,072	2.28	3.75 (2.97 to 4.29)	2.28	1.85 (1.14 to 3.13)	4.56	5.61 (4.69 to 7.22)	
Rushcliffe	1,071	*	3.84 (3.11 to 4.58)	*	1.64 (1.06 to 2.62)	*	5.49 (4.52 to 6.74)	
Salford	3,582	6.14	4.09 (3.51 to 4.99)	1.69	1.73 (1.21 to 2.48)	7.82	5.80 (5.13 to 7.33)	
Sandwell and West Birmingham	7,675	6.78	4.14 (3.53 to 5.19)	2.75	2.02 (1.31 to 3.00)	9.51	6.15 (5.40 to 7.50)	
Scarborough and Ryedale	1,088	*	3.82 (3.14 to 4.64)	*	1.66 (1.10 to 2.66)	2.76	5.47 (4.72 to 7.02)	
Sheffield	6,617	4.68	3.96 (3.53 to 4.50)	2.58	2.06 (1.57 to 3.17)	7.25	6.03 (5.33 to 7.38)	
Shropshire	2,801	2.86	3.84 (3.26 to 4.58)	1.79	1.85 (1.32 to 2.75)	4.64	5.68 (4.99 to 7.27)	
Slough	2,609	*	3.96 (3.32 to 4.71)	*	1.52 (0.99 to 2.65)	6.52	5.48 (5.00 to 7.10)	
Solihull	2,276	4.83	3.95 (3.44 to 4.60)	1.32	1.67 (1.03 to 2.78)	6.15	5.60 (4.86 to 7.13)	
Somerset	5,637	2.84	3.81 (3.13 to 4.32)	1.60	1.70 (1.12 to 2.51)	4.43	5.50 (4.71 to 6.70)	

Organisation	Total births§	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 Cheshire	1,867	3.21	3.87 (3.28 to 4.65)	1.61	1.76 (1.10 to 2.83)	4.82	5.62 (4.86 to 7.46)	
South Devon and Torbay	2,634	1.52	3.73 (2.86 to 5.07)	2.28	1.91 (1.29 to 3.19)	3.80	5.66 (4.72 to 7.78)	
South East Staffordshire and Seisdon Peninsular	2,154	2.79	3.84 (3.11 to 4.54)	2.33	1.98 (1.31 to 3.53)	5.11	5.83 (5.00 to 7.79)	
South Eastern Hampshire	2,156	3.25	3.86 (3.32 to 4.72)	1.86	1.82 (1.10 to 2.87)	5.10	5.68 (4.89 to 7.09)	
South Gloucestershire	3,167	*	3.84 (3.25 to 4.57)	*	1.53 (1.02 to 2.40)	3.47	5.35 (4.58 to 6.63)	
South Kent Coast	2,066	1.94	3.77 (3.01 to 4.43)	1.45	1.65 (1.03 to 2.42)	3.39	5.40 (4.54 to 6.57)	
South Lincolnshire	1,558	*	3.84 (3.13 to 4.63)	*	1.74 (1.11 to 2.62)	3.85	5.57 (4.88 to 6.80)	
South Manchester	2,341	*	3.94 (3.33 to 4.56)	*	1.60 (0.97 to 2.67)	5.98	5.53 (4.79 to 6.87)	
South Norfolk	2,521	5.55	4.05 (3.47 to 5.18)	1.99	1.85 (1.18 to 2.81)	7.54	5.89 (5.22 to 7.28)	
South Reading	1,864	8.58	4.11 (3.39 to 5.53)	1.62	1.82 (1.08 to 2.98)	10.19	5.92 (5.15 to 8.10)	
South Sefton	1,792	4.46	3.92 (3.36 to 4.67)	2.24	1.89 (0.84 to 3.07)	6.70	5.80 (4.75 to 7.50)	
South Tees	3,376	5.04	3.97 (3.43 to 4.84)	2.08	1.86 (1.28 to 2.98)	7.11	5.82 (5.22 to 7.53)	
South Tyneside	1,652	*	3.83 (2.92 to 4.58)	*	1.48 (0.98 to 2.34)	3.03	5.30 (4.67 to 6.65)	
South Warwickshire	2,576	2.72	3.84 (3.18 to 4.48)	1.17	1.72 (1.12 to 2.60)	3.88	5.56 (4.74 to 6.93)	
South West Lincolnshire	1,336	*	3.89 (3.23 to 4.96)	*	1.80 (1.10 to 2.91)	5.24	5.68 (4.87 to 7.35)	
South Worcestershire	2,963	5.06	4.01 (3.43 to 5.17)	2.37	1.97 (1.28 to 2.99)	7.42	5.99 (5.27 to 7.40)	
Southampton	3,315	3.92	3.88 (3.18 to 4.31)	1.21	1.57 (0.98 to 2.48)	5.13	5.42 (4.68 to 6.74)	
Southend	2,244	5.35	3.98 (3.31 to 4.75)	1.34	1.71 (1.12 to 2.83)	6.68	5.67 (4.84 to 6.98)	
Southern Derbyshire	6,060	2.97	3.75 (3.14 to 4.41)	3.14	2.32 (1.61 to 3.36)	6.11	6.12 (5.37 to 7.74)	
Southport and Formby	998	*	3.87 (3.20 to 4.56)	*	1.80 (1.21 to 2.77)	5.01	5.66 (4.82 to 6.95)	
Southwark	4,614	6.07	3.96 (3.50 to 4.67)	1.74	1.70 (1.06 to 2.48)	7.80	5.66 (5.01 to 7.16)	
St Helens	1,980	1.52	3.75 (3.13 to 4.39)	3.03	2.03 (1.29 to 3.07)	4.55	5.78 (4.97 to 7.23)	
Stafford and Surrounds	1,376	3.63	3.89 (3.35 to 4.79)	4.38	2.11 (1.34 to 2.75)	7.99	6.07 (5.12 to 7.36)	
Stockport	3,393	4.72	3.99 (3.45 to 4.92)	2.67	2.10 (1.31 to 3.38)	7.37	6.10 (5.30 to 7.81)	
Stoke on Trent	3,432	3.50	3.81 (3.23 to 4.70)	2.63	2.02 (1.22 to 3.11)	6.12	5.84 (4.92 to 7.33)	
Sunderland	2,903	3.44	3.84 (3.27 to 4.54)	1.73	1.67 (1.11 to 2.43)	5.17	5.49 (4.88 to 6.83)	
Surrey Downs	3,114	2.89	3.85 (3.30 to 4.59)	1.61	1.76 (1.23 to 2.54)	4.50	5.61 (5.17 to 6.95)	
Surrey Heath	1,110	*	3.86 (3.17 to 4.84)	*	1.61 (0.97 to 2.42)	2.70	5.47 (4.87 to 6.72)	
Sutton	2,771	2.17	3.76 (3.20 to 4.16)	1.81	1.73 (1.24 to 2.64)	3.97	5.48 (4.68 to 7.05)	
Swale	1,429	*	3.87 (3.25 to 4.55)	*	1.69 (1.02 to 2.56)	4.90	5.53 (4.67 to 6.77)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Swindon	2,951	1.69	3.72 (3.09 to 4.34)	2.72	2.14 (1.42 to 3.22)	4.41	5.83 (5.08 to 7.15)	
Tameside and Glossop	3,204	2.18	3.73 (3.11 to 4.62)	1.25	1.55 (1.03 to 2.30)	3.43	5.25 (4.46 to 6.62)	
Telford and Wrekin	2,080	3.37	3.84 (3.35 to 5.07)	4.82	2.30 (1.46 to 3.67)	8.17	6.24 (5.14 to 8.08)	
Thanet	1,685	3.56	3.86 (3.28 to 4.35)	2.38	1.89 (1.19 to 2.72)	5.93	5.74 (5.13 to 6.88)	
Thurrock	2,538	3.94	3.87 (3.31 to 4.51)	2.37	1.94 (1.32 to 3.05)	6.30	5.80 (5.06 to 7.51)	
Tower Hamlets	4,596	5.22	3.84 (3.15 to 4.42)	2.41	1.89 (1.33 to 3.34)	7.62	5.71 (5.01 to 7.69)	
Trafford	2,837	*	3.81 (3.29 to 4.64)	*	1.41 (0.88 to 2.05)	3.17	5.17 (4.63 to 6.53)	
Vale Royal	1,101	*	3.86 (3.23 to 4.63)	*	1.57 (0.92 to 2.47)	2.72	5.40 (4.51 to 6.38)	
Vale of York	3,411	2.64	3.83 (3.20 to 4.54)	2.06	2.02 (1.43 to 3.26)	4.69	5.83 (5.23 to 7.39)	
Wakefield	4,001	4.00	3.91 (3.29 to 4.62)	1.25	1.63 (1.09 to 2.47)	5.25	5.53 (4.77 to 6.97)	
Walsall	3,771	5.04	3.93 (3.43 to 4.87)	2.67	1.95 (1.31 to 2.99)	7.69	5.88 (5.10 to 7.44)	
Waltham Forest	4,687	5.97	4.03 (3.40 to 4.97)	1.07	1.60 (1.03 to 2.39)	7.04	5.65 (4.76 to 6.99)	
Wandsworth	5,065	4.34	3.92 (3.33 to 4.72)	0.79	1.46 (0.85 to 2.36)	5.13	5.38 (4.73 to 6.75)	
Warrington	2,400	2.92	3.85 (3.37 to 4.76)	1.25	1.64 (1.01 to 2.69)	4.17	5.45 (4.67 to 6.70)	
Warwickshire North	2,249	2.67	3.82 (3.33 to 4.73)	3.12	2.01 (1.28 to 2.99)	5.78	5.88 (4.99 to 7.30)	
West Cheshire	2,475	3.23	3.87 (3.39 to 4.72)	2.43	1.97 (1.35 to 3.17)	5.66	5.84 (5.31 to 7.41)	
West Essex	3,753	1.87	3.72 (3.02 to 4.58)	0.80	1.58 (1.05 to 2.47)	2.66	5.30 (4.50 to 6.72)	
West Hampshire	5,483	4.38	4.06 (3.43 to 5.19)	0.92	1.54 (0.98 to 2.35)	5.29	5.57 (4.89 to 7.01)	
West Kent	5,419	4.06	3.99 (3.36 to 4.99)	1.11	1.62 (1.19 to 2.32)	5.17	5.59 (4.81 to 7.04)	
West Lancashire	1,078	*	3.80 (2.97 to 4.79)	*	1.90 (1.28 to 3.17)	3.71	5.70 (4.88 to 7.62)	
West Leicestershire	4,107	4.63	4.02 (3.47 to 5.30)	3.18	2.32 (1.56 to 3.49)	7.79	6.39 (5.76 to 8.70)	
West London	2,705	2.22	3.73 (3.16 to 4.44)	1.48	1.70 (1.23 to 2.55)	3.70	5.42 (4.84 to 6.70)	
West Norfolk	1,888	3.18	3.86 (3.37 to 4.60)	2.13	1.90 (1.24 to 3.02)	5.30	5.75 (4.90 to 7.09)	
West Suffolk	2,653	3.02	3.86 (3.17 to 4.50)	1.13	1.64 (1.01 to 2.25)	4.15	5.48 (4.69 to 6.44)	
Wigan Borough	3,587	2.79	3.80 (3.20 to 4.48)	1.40	1.60 (1.02 to 2.22)	4.18	5.38 (4.61 to 6.38)	
Wiltshire	5,070	4.73	4.08 (3.30 to 5.18)	0.99	1.58 (1.10 to 2.52)	5.72	5.65 (4.96 to 7.37)	
Windsor, Ascot and Maidenhead	1,580	*	3.84 (3.27 to 4.94)	*	1.67 (1.10 to 2.97)	3.16	5.51 (4.83 to 7.39)	
Wirral	3,583	3.63	3.87 (3.24 to 4.50)	1.96	1.82 (1.19 to 2.82)	5.58	5.69 (4.78 to 7.05)	
Wokingham	1,797	5.56	4.00 (3.49 to 4.91)	2.24	1.92 (1.23 to 2.96)	7.79	5.91 (5.28 to 7.24)	
Wolverhampton	3,396	3.24	3.75 (3.04 to 4.66)	2.36	1.76 (1.17 to 2.94)	5.59	5.51 (4.60 to 6.86)	
Wyre Forest	1,089	*	3.82 (3.31 to 4.68)	*	1.83 (0.98 to 3.08)	4.59	5.67 (4.65 to 7.17)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
SCOTLAND								
Ayrshire & Arran	3,597	4.17	3.93 (3.32 to 4.65)	1.12	1.58 (1.04 to 2.48)	5.28	5.49 (4.78 to 6.59)	
Borders	1,048	*	3.95 (3.45 to 4.81)	*	1.60 (1.04 to 2.54)	5.73	5.54 (4.81 to 6.84)	
Dumfries & Galloway	1,305	*	3.89 (3.33 to 4.85)	*	1.75 (1.19 to 3.01)	5.36	5.63 (4.98 to 7.70)	
Fife	3,773	2.92	3.81 (3.02 to 4.72)	1.33	1.68 (1.11 to 2.80)	4.24	5.48 (4.88 to 7.11)	
Forth Valley	2,959	2.70	3.82 (3.15 to 4.56)	1.69	1.83 (1.24 to 2.64)	4.39	5.64 (4.95 to 6.83)	
Grampian	6,442	3.88	3.99 (3.43 to 4.90)	0.62	1.40 (0.94 to 2.14)	4.50	5.36 (4.79 to 6.52)	
Greater Glasgow & Clyde	12,297	3.09	3.69 (3.25 to 4.43)	1.06	1.34 (0.97 to 1.81)	4.15	5.00 (4.52 to 6.35)	
Highland	2,935	2.04	3.78 (3.09 to 4.44)	2.39	2.04 (1.46 to 3.08)	4.43	5.81 (5.16 to 7.18)	
Lanarkshire	6,944	3.02	3.80 (3.09 to 4.52)	2.02	1.94 (1.39 to 2.61)	5.04	5.76 (5.19 to 6.85)	
Lothian	9,387	4.26	4.05 (3.48 to 5.00)	0.75	1.32 (0.86 to 1.89)	5.01	5.34 (4.82 to 6.85)	
Orkney	192	*	3.86 (3.18 to 4.48)	*	1.81 (1.02 to 2.70)	*	5.69 (4.49 to 7.53)	
Shetland	232	*	3.85 (3.04 to 4.54)	*	1.72 (1.08 to 2.92)	*	5.57 (4.74 to 7.05)	
Tayside	3,995	3.50	3.88 (3.27 to 4.63)	1.76	1.75 (1.16 to 2.89)	5.26	5.63 (4.70 to 6.98)	
Western Isles	228	*	3.91 (3.23 to 4.84)	*	1.81 (1.19 to 3.29)	13.16	5.73 (4.92 to 8.01)	
WALES								
Abertawe Bro Morgannwg University	5,535	3.61	3.87 (3.43 to 4.42)	1.81	1.77 (1.36 to 2.72)	5.42	5.63 (5.16 to 6.85)	
Aneurin Bevan	6,601	4.09	3.93 (3.39 to 4.91)	2.59	2.17 (1.52 to 3.08)	6.67	6.12 (5.71 to 7.85)	
Betsi Cadwaladr University	7,115	3.51	3.88 (3.39 to 4.36)	2.40	2.05 (1.42 to 2.94)	5.90	5.96 (5.29 to 7.39)	
Cardiff and Vale University	5,921	6.42	4.27 (3.53 to 5.71)	1.53	1.69 (1.13 to 2.68)	7.94	5.94 (5.29 to 8.02)	
Cwm Taf	3,450	1.45	3.67 (2.94 to 4.39)	3.48	2.26 (1.53 to 3.68)	4.93	5.98 (4.98 to 7.83)	
Hywel Dda	3,691	4.61	3.99 (3.44 to 4.82)	1.09	1.58 (1.08 to 2.58)	5.69	5.54 (4.99 to 6.78)	
Powys Teaching	1,129	*	3.91 (3.32 to 4.96)	*	1.73 (1.12 to 2.76)	5.31	5.65 (4.76 to 7.45)	
NORTHERN IRELAND°								
Belfast°	4,639	3.45	3.82 (3.12 to 4.74)	3.46	2.49 (1.65 to 4.14)	6.90	6.28 (5.41 to 7.67)	
Northern°	5,770	2.95	3.81 (3.27 to 4.52)	3.48	2.60 (1.84 to 3.77)	6.41	6.49 (5.65 to 8.27)	
South Eastern°	4,372	2.52	3.77 (2.96 to 4.29)	2.29	2.22 (1.53 to 4.14)	4.80	5.93 (5.02 to 7.89)	
Southern°	5,567	4.49	4.03 (3.52 to 4.92)	3.61	2.66 (1.83 to 3.82)	8.08	6.75 (5.85 to 8.55)	
Western°	4,032	2.48	3.74 (3.12 to 4.51)	2.98	2.36 (1.62 to 3.92)	5.46	6.05 (5.22 to 7.88)	
CROWN DEPENDENCIES								
Bailiwick of Guernsey	587	*	3.85 (3.09 to 4.64)	*	1.67 (1.15 to 2.79)	*	5.50 (4.78 to 7.35)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Bailiwick of Jersey	1,021	*	3.78 (3.18 to 4.52)	*	1.72 (1.03 to 2.88)	*	5.50 (4.66 to 6.74)	○
Isle of Man	780	*	3.89 (3.37 to 4.86)	*	1.87 (1.10 to 3.01)	6.41	5.74 (4.96 to 7.59)	○

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
† per 1,000 total births
‡ per 1,000 live births
# colours represent variation from UK average extended perinatal mortality rate
* entry suppressed because of small number of deaths
○ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

4.2 Mortality rates by Sustainability and Transformation Plan (STP) footprint (England), or country of residence

Although we have produced data in each of our surveillance reports which reflects the outcomes for populations covered by individual organisations responsible for commissioning heath care and maintaining its quality (Clinical Commissioning Groups in England and Boards elsewhere) and the outcomes for populations covered by individual organisations responsible for public health (Local Authorities), currently a major review and revision of services is underway. In England this is being led and delivered through Sustainability and Transformation Plans (STPs) while elsewhere it is the national governments which are leading this work. In relation to STPs in particular, the populations covered are somewhat different to those previously reported, representing a combination of Clinical Commissioning Groups. The relevant maps and tables are presented in Figures 9 to 14 and Table 7.

From the data it is clear that at the start of this process, which will see major changes to some services, these early life mortality rates show major variation across the UK, particularly neonatal mortality. The previously noted North-South divide in these rates in England is again starkly evident.

MBRRACE-UK Recommendation

Sustainability and Transformation Plans (STPs) in England need to address existing inequalities, particularly in relation to neonatal mortality.

Figure 9: Crude stillbirth rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

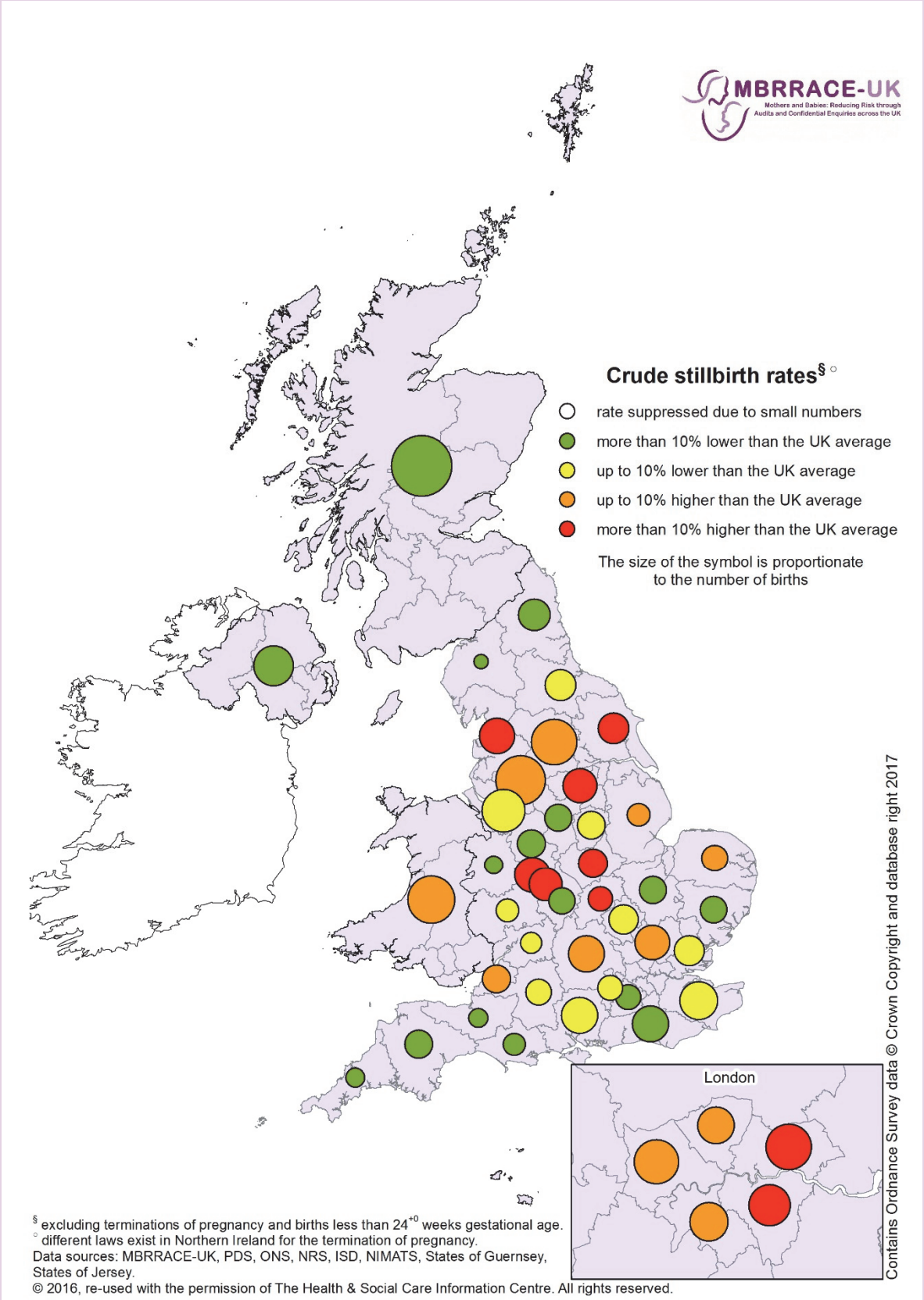


Figure 10: Stabilised & adjusted stillbirth rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

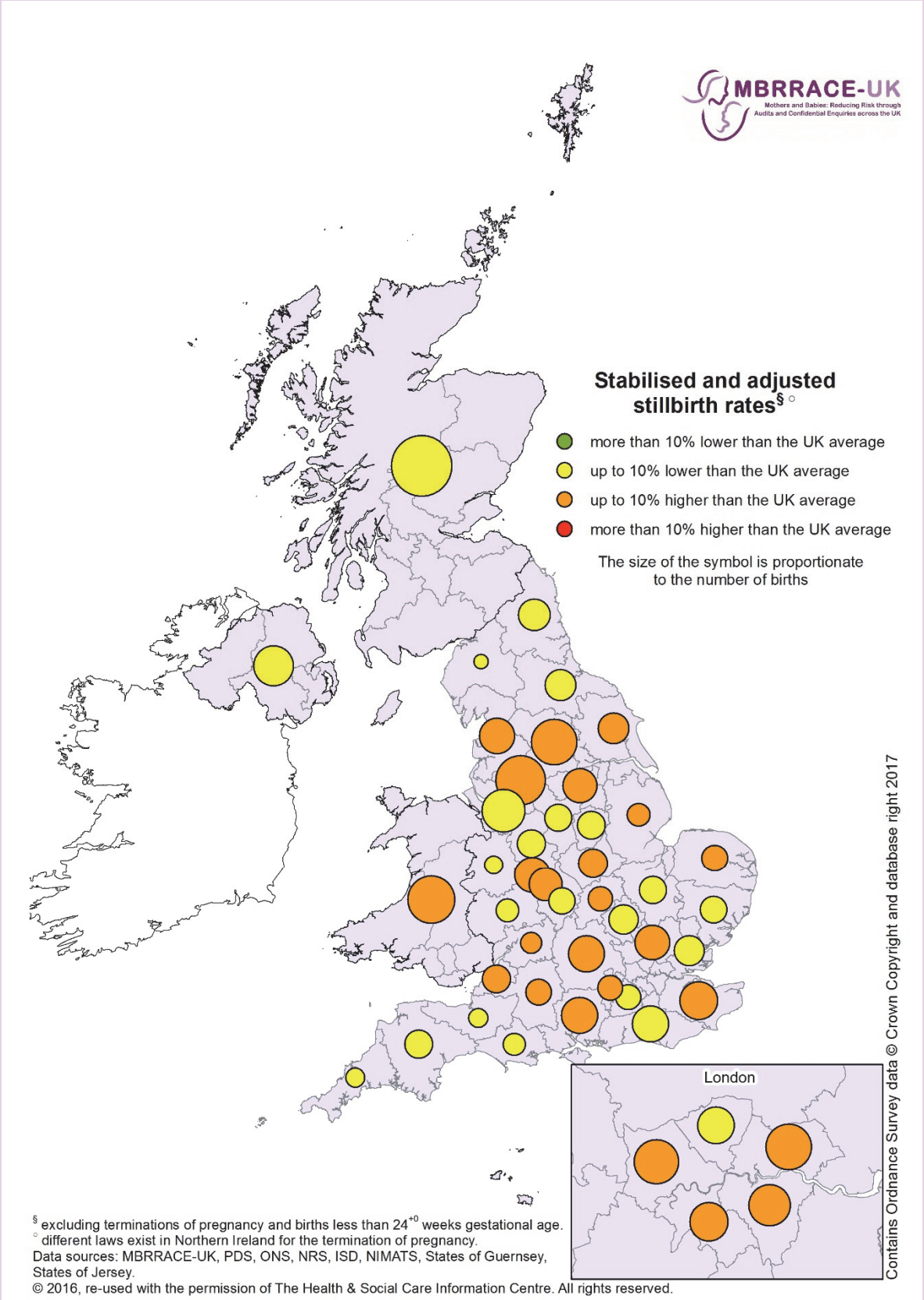


Figure 11: Crude neonatal mortality rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

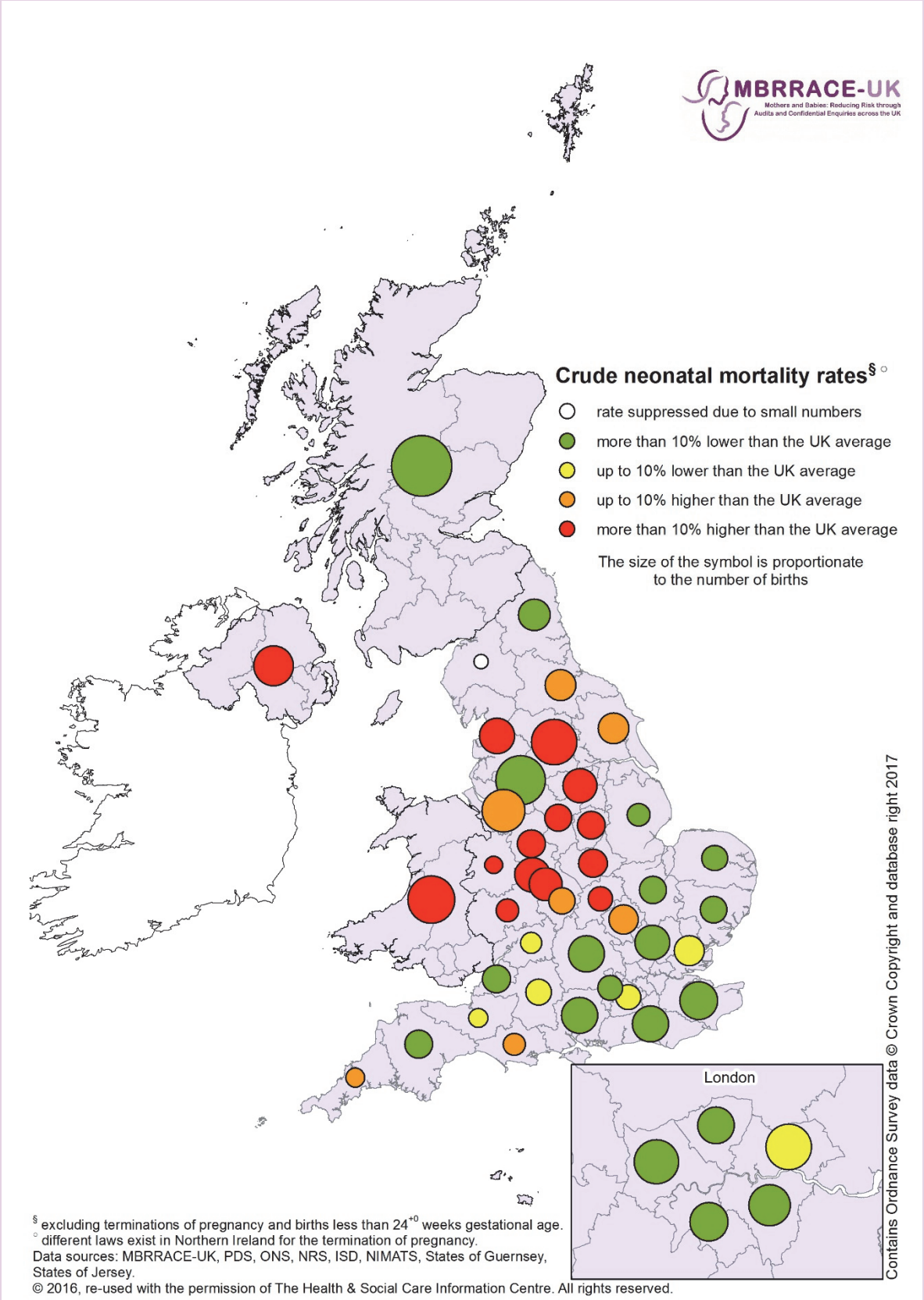


Figure 12: Stabilised & adjusted neonatal mortality rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

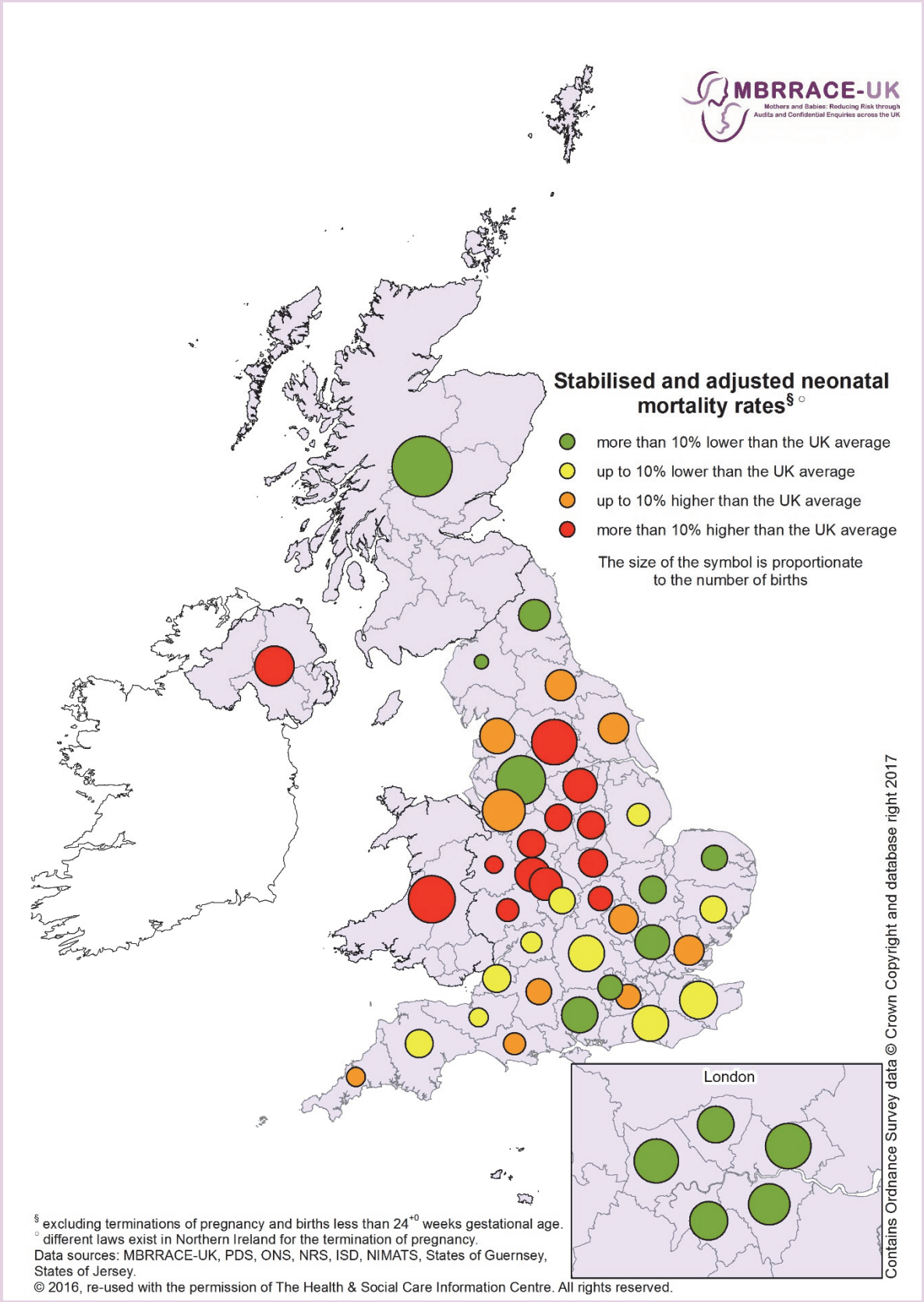


Figure 13: Crude extended perinatal mortality rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

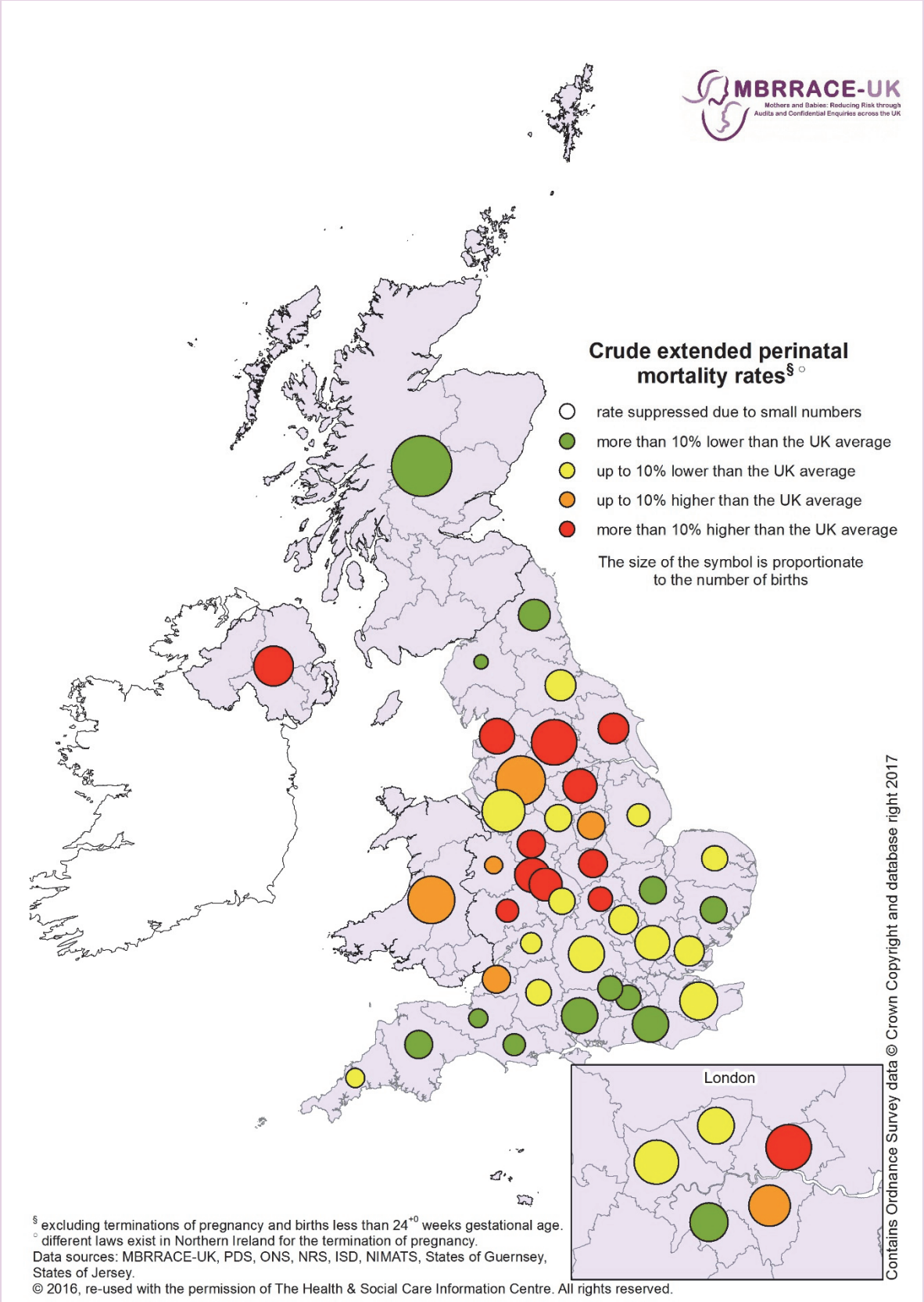


Figure 14: Stabilised & adjusted extended perinatal mortality rates by STP footprint (England) and country of residence (Scotland, Wales and Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

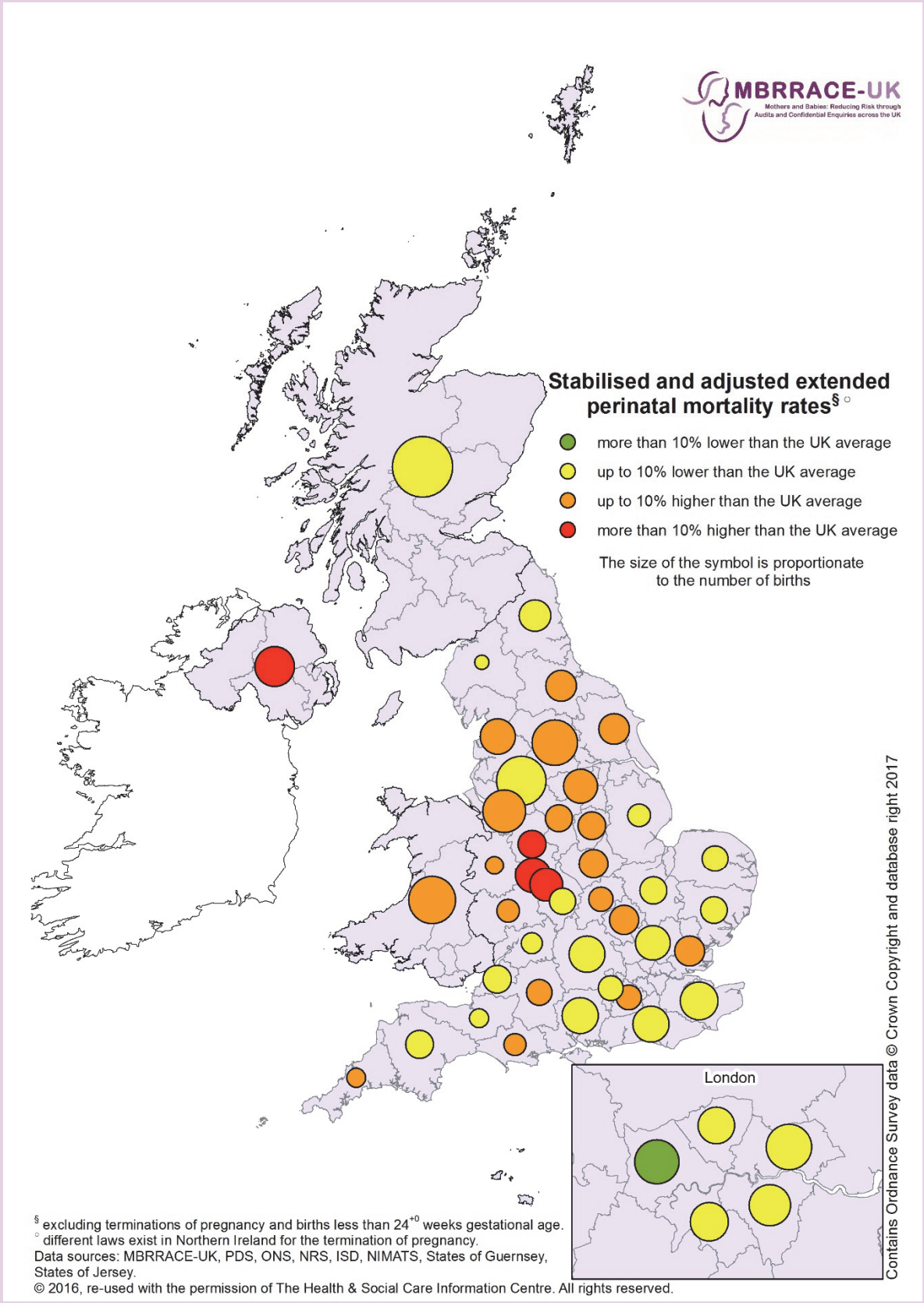


Table 7: Crude and stabilised & adjusted stillbirth, neonatal, extended perinatal mortality rates by STP footprint (England) and country of residence (Scotland, Wales, Northern Ireland) based on postcode of mother's residence at time of delivery: United Kingdom, for births in 2015

Organisation	Total births§	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								
Bath, Swindon and Wiltshire	9,837	3.86	3.89 (3.55 to 4.44)	1.63	1.88 (1.27 to 2.92)	5.49	5.76 (5.35 to 7.03)	
Birmingham and Solihull	16,314	5.46	3.94 (3.56 to 4.82)	3.20	2.35 (1.78 to 3.11)	8.64	6.37 (5.72 to 7.86)	
Bristol, North Somerset and South Gloucestershire	11,705	4.10	3.89 (3.56 to 4.40)	1.54	1.71 (1.27 to 2.32)	5.64	5.60 (5.23 to 7.09)	
Buckinghamshire, Oxfordshire and Berkshire West	20,002	4.15	3.93 (3.38 to 4.66)	1.46	1.67 (1.25 to 2.41)	5.60	5.59 (5.15 to 6.84)	
Cambridgeshire and Peterborough	11,047	2.99	3.85 (3.29 to 4.26)	0.82	1.43 (0.93 to 2.11)	3.80	5.29 (4.71 to 6.11)	
Cheshire and Merseyside	27,519	3.52	3.83 (3.29 to 4.34)	1.90	1.87 (1.50 to 2.42)	5.41	5.70 (5.30 to 6.51)	
Cornwall and the Isles of Scilly	5,426	3.50	3.87 (3.35 to 4.34)	1.85	1.89 (1.37 to 2.88)	5.34	5.75 (5.28 to 6.93)	
Coventry and Warwickshire	10,631	3.39	3.86 (3.42 to 4.14)	1.79	1.72 (1.27 to 2.36)	5.17	5.57 (5.03 to 6.51)	
Derbyshire	10,954	3.10	3.84 (3.28 to 4.18)	2.20	2.09 (1.49 to 2.70)	5.29	5.92 (5.35 to 7.01)	
Devon	11,655	2.06	3.80 (3.10 to 4.33)	1.55	1.76 (1.26 to 2.63)	3.60	5.55 (5.00 to 6.64)	
Dorset	7,328	3.28	3.87 (3.38 to 4.32)	1.78	1.83 (1.34 to 2.58)	5.05	5.69 (5.23 to 6.67)	
Durham, Darlington, Tees, Hambleton, Richmondshire and Whitby	14,714	3.67	3.85 (3.51 to 4.17)	1.77	1.83 (1.18 to 2.65)	5.44	5.67 (5.12 to 6.85)	
Frimley Health	9,462	3.59	3.88 (3.63 to 4.37)	1.17	1.55 (1.04 to 2.22)	4.76	5.41 (5.04 to 6.40)	
Gloucestershire	6,733	3.56	3.87 (3.55 to 4.35)	1.64	1.71 (1.12 to 2.38)	5.20	5.57 (4.91 to 6.64)	
Greater Manchester	37,113	4.20	3.89 (3.54 to 4.34)	1.54	1.53 (1.20 to 2.04)	5.74	5.40 (5.00 to 6.22)	
Hampshire and the Isle of Wight	19,621	3.77	3.89 (3.59 to 4.41)	1.13	1.41 (1.04 to 1.89)	4.89	5.27 (4.99 to 6.12)	
Herefordshire and Worcestershire	7,778	3.60	3.87 (3.42 to 4.31)	2.84	2.27 (1.56 to 3.28)	6.43	6.18 (5.56 to 7.41)	
Hertfordshire and West Essex	18,281	3.94	3.91 (3.60 to 4.57)	1.26	1.56 (1.08 to 2.00)	5.20	5.44 (5.05 to 6.49)	
Humber, Coast and Vale	14,664	4.30	3.90 (3.63 to 4.52)	1.92	1.91 (1.44 to 2.56)	6.21	5.80 (5.39 to 6.76)	
Kent and Medway	20,984	3.86	3.88 (3.64 to 4.29)	1.53	1.61 (1.20 to 2.12)	5.39	5.47 (5.18 to 6.47)	
Lancashire and South Cumbria	18,695	4.33	3.90 (3.54 to 4.54)	2.04	1.81 (1.47 to 2.35)	6.37	5.71 (5.33 to 6.50)	
Leicester, Leicestershire and Rutland	12,520	4.39	3.90 (3.62 to 4.57)	2.41	2.10 (1.46 to 2.98)	6.79	6.02 (5.44 to 7.23)	
Lincolnshire	7,819	4.09	3.89 (3.47 to 4.43)	1.41	1.61 (1.14 to 2.38)	5.50	5.48 (5.03 to 6.73)	
Mid and South Essex	13,862	3.61	3.87 (3.51 to 4.34)	1.74	1.88 (1.36 to 2.49)	5.34	5.75 (5.31 to 6.71)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Milton Keynes, Bedfordshire and Luton	12,989	3.70	3.87 (3.42 to 4.40)	1.78	1.90 (1.44 to 2.70)	5.47	5.76 (5.30 to 6.63)	
Norfolk and Waveney	10,257	3.90	3.88 (3.44 to 4.56)	1.27	1.60 (1.15 to 2.09)	5.17	5.47 (4.92 to 6.45)	
North Central London	20,156	4.07	3.86 (3.48 to 4.27)	1.25	1.40 (1.05 to 1.92)	5.31	5.25 (4.95 to 6.09)	
North East London	32,134	4.67	3.92 (3.55 to 4.78)	1.66	1.54 (1.11 to 2.02)	6.32	5.44 (5.08 to 6.56)	
North West London	29,927	4.21	3.90 (3.58 to 4.48)	1.07	1.17 (0.82 to 1.74)	5.28	5.00 (4.55 to 5.93)	
Northamptonshire	8,978	4.46	3.90 (3.58 to 4.56)	2.13	1.94 (1.42 to 2.70)	6.57	5.85 (5.34 to 7.15)	
Northumberland, Tyne and Wear	15,172	3.23	3.83 (3.14 to 4.48)	1.26	1.44 (1.06 to 1.97)	4.48	5.24 (4.71 to 6.32)	
Nottinghamshire	11,910	3.69	3.86 (3.46 to 4.47)	2.19	2.06 (1.37 to 2.82)	5.88	5.91 (5.40 to 7.07)	
Shropshire and Telford and Wrekin	4,881	3.07	3.86 (3.40 to 4.31)	3.08	2.22 (1.50 to 3.16)	6.15	6.10 (5.35 to 7.40)	
Somerset	5,637	2.84	3.86 (3.48 to 4.18)	1.60	1.70 (1.14 to 2.63)	4.43	5.54 (5.08 to 6.91)	
South East London	26,026	4.34	3.89 (3.54 to 4.38)	1.43	1.47 (1.15 to 1.94)	5.76	5.34 (5.01 to 6.23)	
South West London	22,103	4.07	3.90 (3.64 to 4.39)	1.00	1.26 (0.87 to 1.67)	5.07	5.13 (4.89 to 6.06)	
South Yorkshire and Bassetlaw	17,322	4.33	3.89 (3.51 to 4.28)	2.38	2.00 (1.58 to 2.67)	6.70	5.91 (5.55 to 6.98)	
Staffordshire	11,926	3.35	3.85 (3.51 to 4.38)	2.86	2.45 (1.85 to 3.46)	6.20	6.34 (5.90 to 7.70)	
Suffolk and North East Essex	10,543	3.41	3.86 (3.41 to 4.16)	1.43	1.70 (1.22 to 2.59)	4.84	5.56 (5.10 to 6.40)	
Surrey Heartlands	9,701	2.68	3.85 (3.36 to 4.19)	1.76	1.81 (1.37 to 2.69)	4.43	5.66 (5.24 to 6.88)	
Sussex and East Surrey	19,358	3.36	3.86 (3.51 to 4.19)	1.50	1.70 (1.21 to 2.22)	4.86	5.55 (5.05 to 6.37)	
The Black Country	18,536	5.39	3.94 (3.43 to 4.75)	2.98	2.20 (1.73 to 2.92)	8.36	6.20 (5.90 to 7.57)	
West Yorkshire	31,956	4.04	3.88 (3.66 to 4.24)	2.20	2.00 (1.61 to 2.50)	6.23	5.89 (5.46 to 6.84)	
West, North and East Cumbria	3,222	*	3.86 (3.47 to 4.22)	*	1.46 (0.83 to 2.18)	2.79	5.32 (4.90 to 6.31)	
SCOTLAND								
Scotland	55,334	3.45	3.82 (3.36 to 4.45)	1.27	1.41 (1.11 to 1.83)	4.72	5.21 (4.97 to 6.24)	
WALES								
Wales	33,442	4.10	3.88 (3.68 to 4.36)	2.10	2.04 (1.60 to 2.71)	6.19	5.92 (5.64 to 6.94)	
NORTHERN IRELAND◦								
Northern Ireland◦	24,380	3.24	3.80 (3.23 to 4.32)	3.21	3.16 (2.46 to 4.27)	6.44	6.87 (6.27 to 8.17)	

§ excluding terminations of pregnancy and births <24+0 weeks gestational age
† per 1,000 total births
‡ per 1,000 live births
# colours represent variation from UK average extended perinatal mortality rate
* entry suppressed because of small number of deaths
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

4.3 How local organisations should respond to this information

This information is 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: 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).

For any commissioning organisation, Trust or Health Board whose performance falls in the red band ● a more detailed local review of individual deaths 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 the proportion of mothers who for legal, cultural or religious reasons choose to carry babies affected by severe congenital anomalies to term. This will clearly involve the co-operation of a range of clinical disciplines and, almost inevitably, a number of provider organisations in order to explore the whole care pathway for all babies that were included as part of the analysis. In some cases this will be limited to a small number of units but in other parts of the UK it will involve multiple delivery sites.

For those in the amber band ● similar reviews should be carried out. However, the decision to carry out more detailed local review should also reflect local aspiration in terms of performance when local socio-demographic factors have been taken into account, i.e. whether simply avoiding a rate 10% higher than the national average is good enough.

Those carrying out reviews should also consider the findings of the new analysis included in Chapter 6, which explores the impact of congenital anomalies and the deaths of babies born before 24 weeks of gestation on the various mortality rates. It seems clear that these births are responsible for significant variation in the rates of death observed and, therefore, local factors and policies affecting the number of births in these categories should also be considered as part of any review.

For those who choose to wait for further data before carrying out a review, in order to gain a better perspective over time, encouraging local delivery sites to fully engage with the MBRRACE-UK data collection will ensure that, going forward, we are able to provide the best possible insight into why their rates are different to the national average.

Recommendations from the Kirkup report [1] state that rigorous clinical review should be carried out for all stillbirths and neonatal deaths and, therefore, such reviews should also be carried out for those who are in the yellow ● and green ● bands. Additional justification for this approach would be 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.

MBRRACE-UK Recommendation

There is a continuing need for Trusts and Health Boards with a stabilised & adjusted extended perinatal mortality rate that falls in the red or amber band to conduct a local review in order to develop an action plan to improve the quality of their care provision. However, all Trusts and Health Boards, irrespective of their extended perinatal mortality rate, should investigate individual stillbirths and neonatal deaths using a standardised process and independent multidisciplinary peer review as recommended in the Report of the Morecambe Bay Investigation [1] as well as by the Perinatal Mortality Review Task and Finish Group convened by Sands and the Department of Health. The information within the MBRRACE-UK Perinatal Surveillance Reports (including the reports for individual Trusts and Health Boards) and recommendations from MBRRACE-UK Confidential Enquiries can facilitate this process [2,3].

References

1. Kirkup B. The Report of the Morecambe Bay Investigation: An independent investigation into the management, delivery and outcomes of care provided by the maternity and neonatal services at the University Hospitals of Morecambe Bay NHS Foundation Trust from January 2004 to June 2013. Available online at www.gov.uk/government/publications, 2015.

2. Draper ES, Kurinczuk JJ, Kenyon S, on behalf of MBRRACE-UK. MBRRACE-UK 2015 Perinatal Confidential Enquiry: Term, singleton, normally-formed, antepartum stillbirth. Available online at www.npeu.ox.ac.uk/downloads/files/mbrrace-uk/reports/MBRRACE-UK%20Perinatal%20Report%202015.pdf The Infant Mortality and Morbidity Studies, Department of Health Sciences, University of Leicester: Leicester, 2015.

3. Field DJ, Hyman-Taylor P, Bacon C, Draper ES, on behalf of MBRRACE-UK. Perinatal confidential Enquiry - Congenital Diaphragmatic Hernia. The Infant Mortality and Morbidity Studies Department of Health Sciences University of Leicester: Leicester, 2014.

5. Mortality rates for individual Trusts and Health Boards

In this chapter the stillbirth, neonatal death, and extended perinatal mortality rates for individual Trusts and Health Boards are summarised. Babies have been allocated based on the Trust or Health Board in which they were born irrespective of where they died. These mortality rates are presented in two different ways: as a 'crude' mortality rate and as a 'stabilised & adjusted' mortality rate (see Section 2.6).

In addition, to account for the wide variation in case-mix, Trusts and Health Boards have been classified hierarchically into five mutually exclusive comparator groups, based on their level of service provision:

1. Level 3 Neonatal Intensive Care Unit (NICU) and Neonatal Surgery
2. Level 3 NICU
3. 4,000 or more births per annum at 24 weeks or later
4. 2,000-3,999 births per annum at 24 weeks or later
5. Under 2,000 births per annum at 24 weeks or later

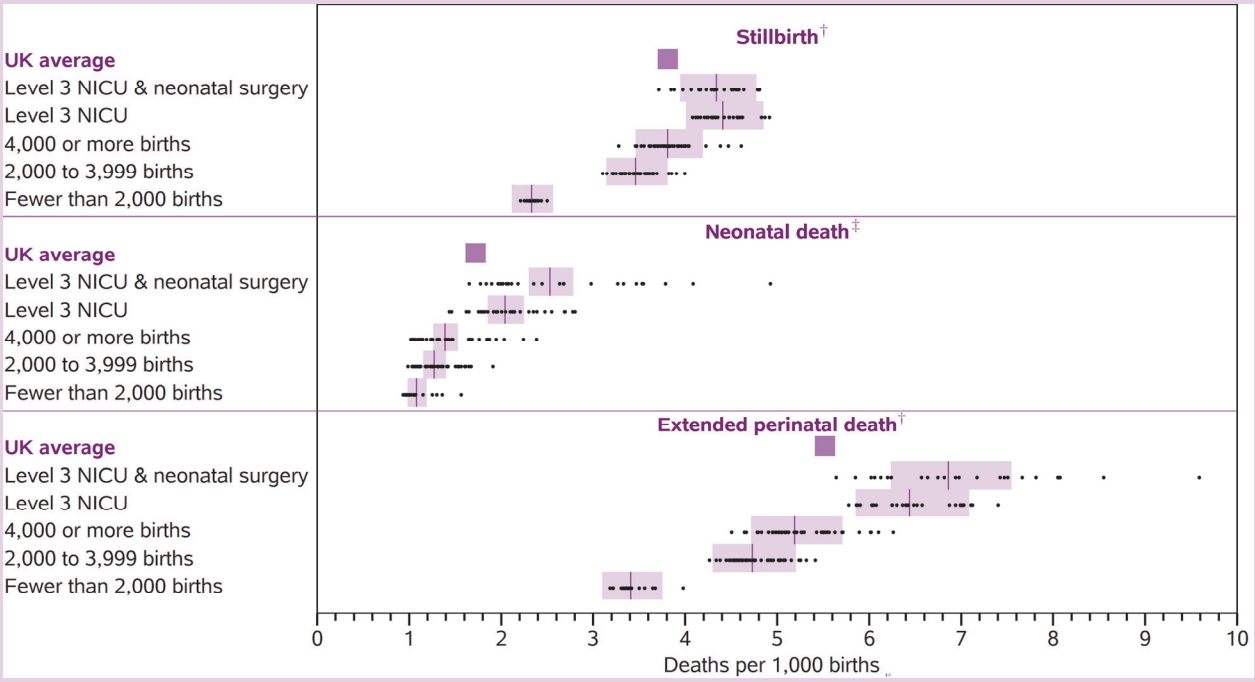
In Figure 15 the extent to which this classification reflects the risk profiles of the different types of unit is demonstrated. The average mortality rate for each comparator group is shown as a vertical purple line, with a shaded box representing ±10% from the average.

We believe that this categorisation is useful in permitting units to consider their performance in relation to a comparator group of broadly similar units. However, we recognise that there are some limitations in the approach we have taken. This particularly affects units that happen to fall on the boundary between categories and, within the group that provides Level 3 neonatal intensive care and have neonatal surgical provision, those units which provide intensive care to the most high risk cases. This includes units that are the focus for delivery of babies known to have a major cardiac anomaly and those units with a particularly high number of births with major congenital anomalies (e.g. Belfast). Such units will inevitably have higher rates of mortality when compared to otherwise similar services who do not provide intensive care for these types of cases.

MBRRACE-UK Recommendation

Those Trusts and Health Boards providing the most complex care to particularly high-risk mothers and babies should ensure that the data provided to MBRRACE-UK is of the highest quality. This will permit more appropriate sub-analyses and comparisons.

Figure 15: Stabilised & adjusted mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015



† per 1,000 total births
‡ per 1,000 live births
§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey
Note: different laws exist in Northern Ireland for the termination of pregnancy

The crude and the stabilised & adjusted stillbirth, neonatal mortality and extended perinatal mortality rates for UK Trusts and Health Boards are presented in Figures 16, 17, 18, 19, 20 and 21 and Tables 8, 9, 10, 11 and 12. Each of the tables contains data for a single comparator group. The average mortality rate used in each of the five tables is that of the relevant comparator group; for example, the reported mortality rates for Trusts and Health Boards with neonatal surgical provision and Level 3 NICUs have been compared to the average mortality rate derived from all of the Trusts and Health Boards providing this level of care. It is important to note that this is in contrast to the stabilised & adjusted data presented in the rest of the report relating to commissioning organisations, local authorities and neonatal networks, where the comparison is in relation to the UK average for births in 2015.

Figure 16: Crude stillbirth mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

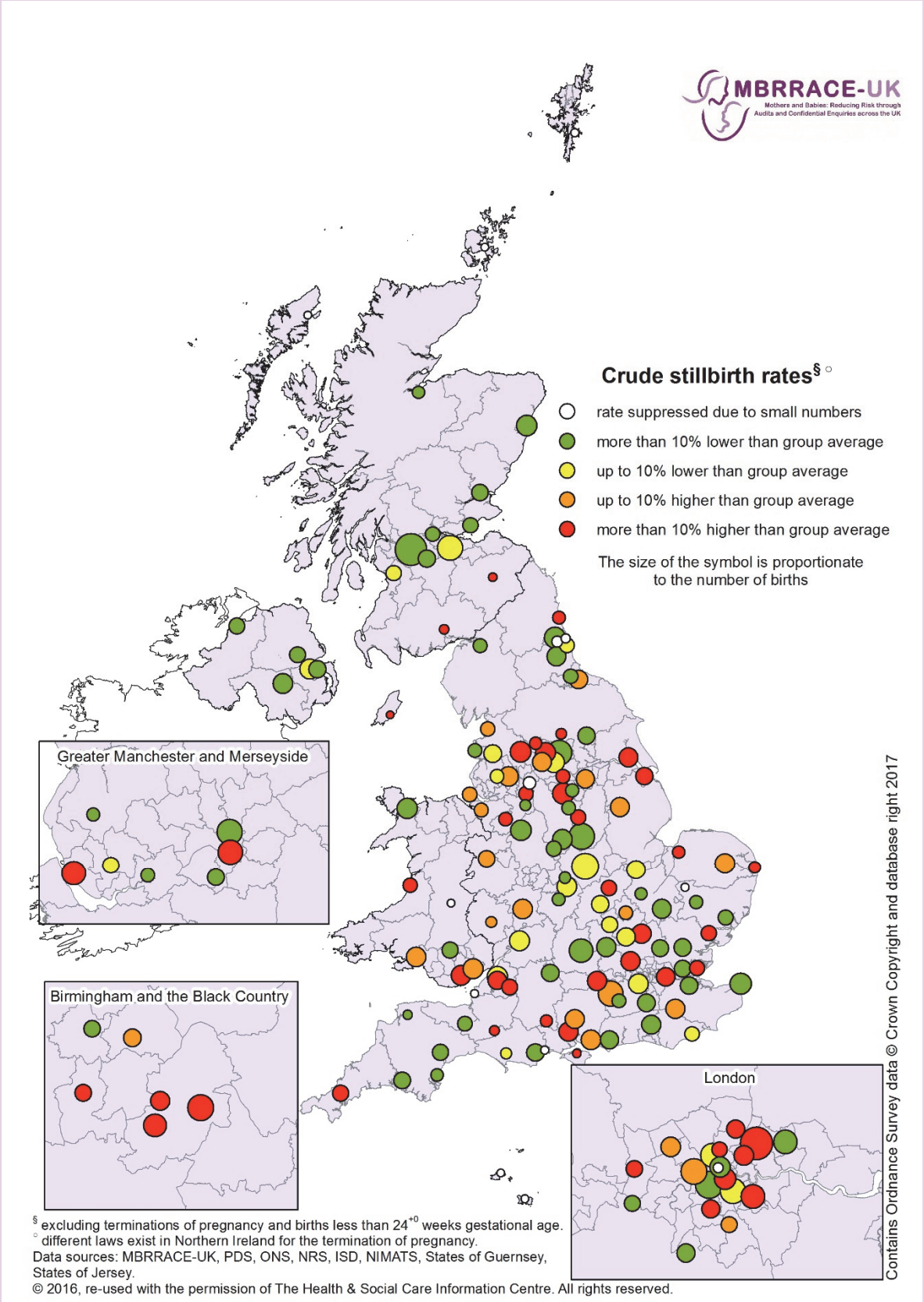


Figure 17: Stabilised & adjusted stillbirth mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

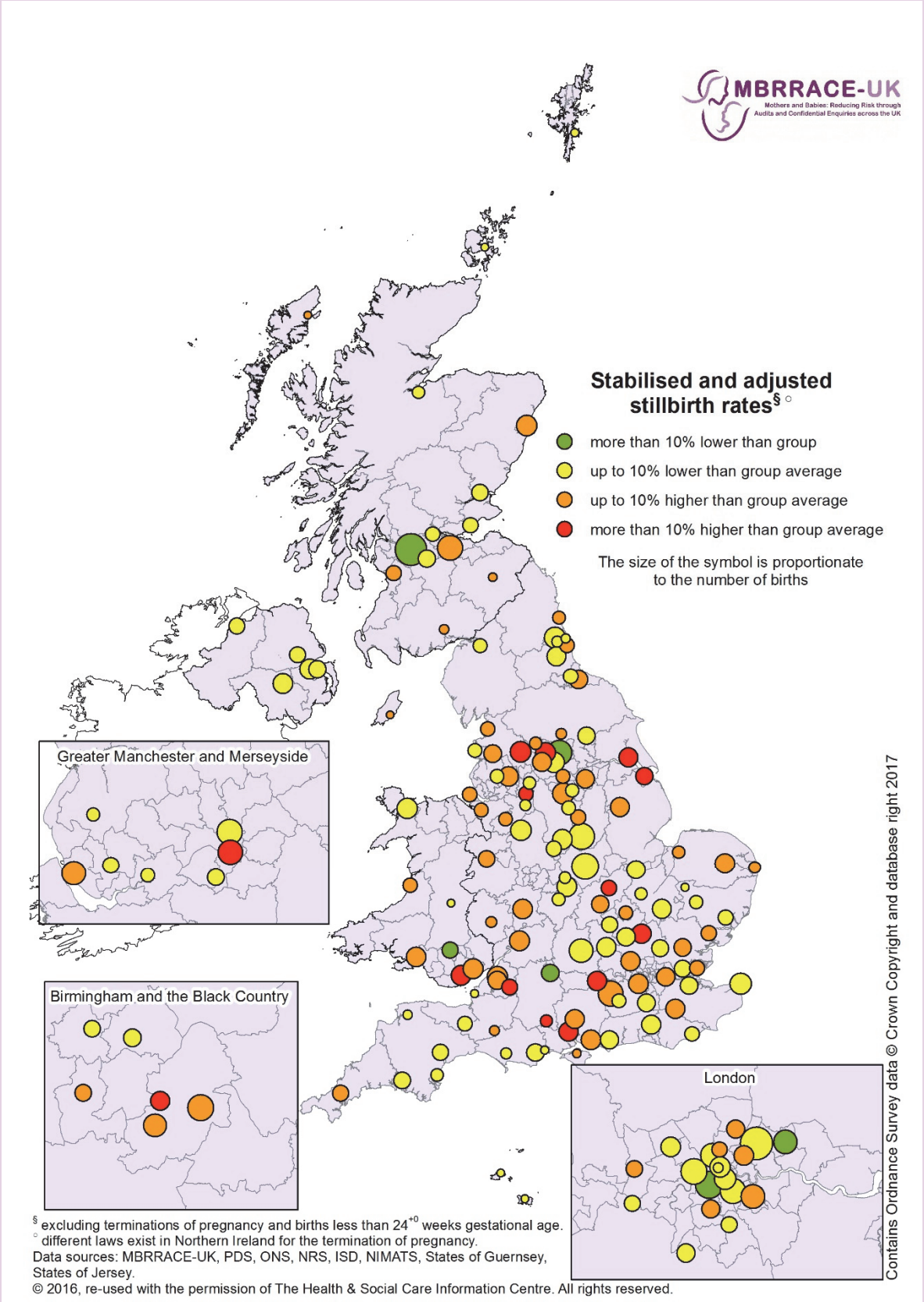


Figure 18: Crude neonatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

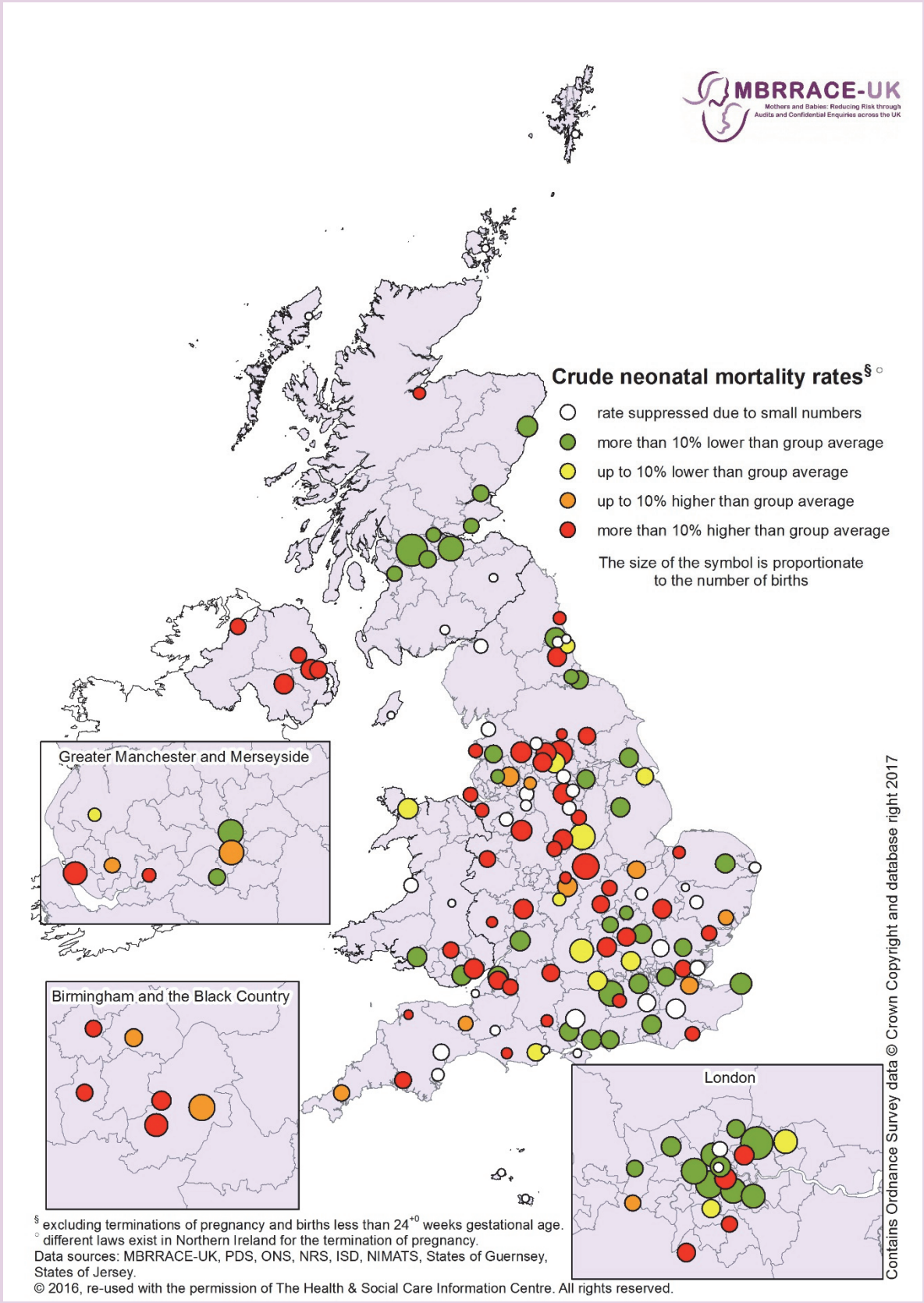


Figure 19: Stabilised & adjusted neonatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

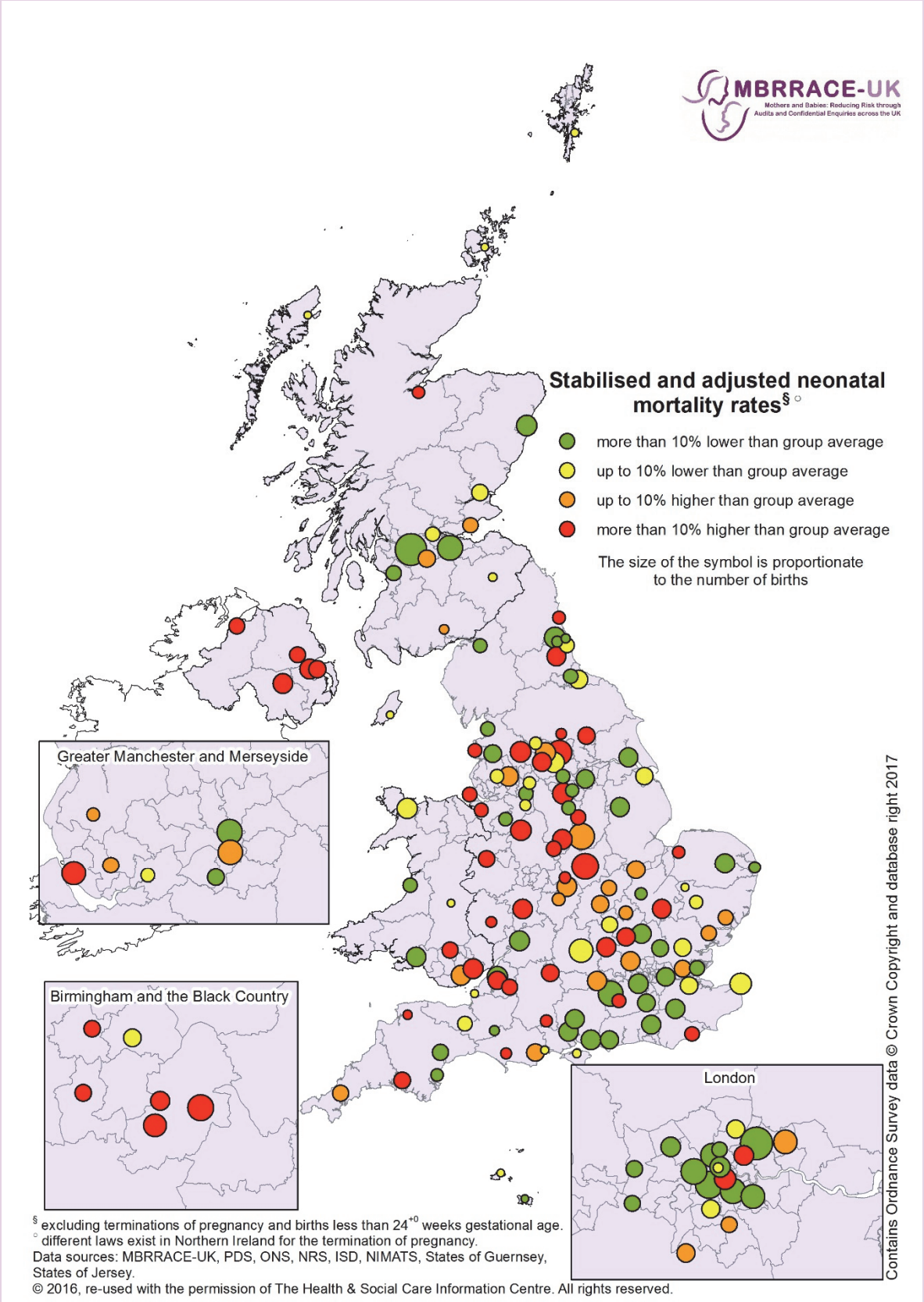


Figure 20: Crude extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

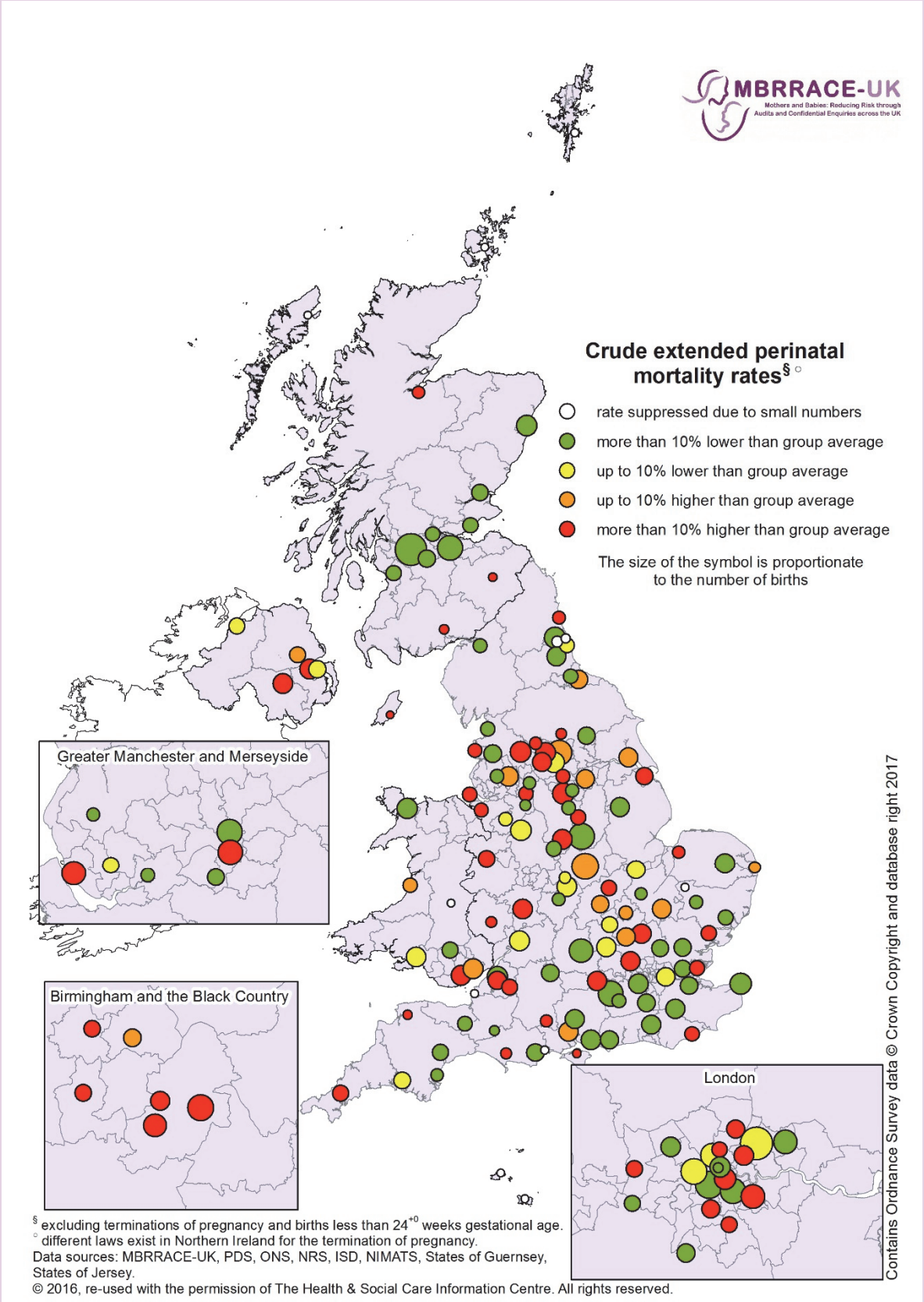


Figure 21: Stabilised & adjusted extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015

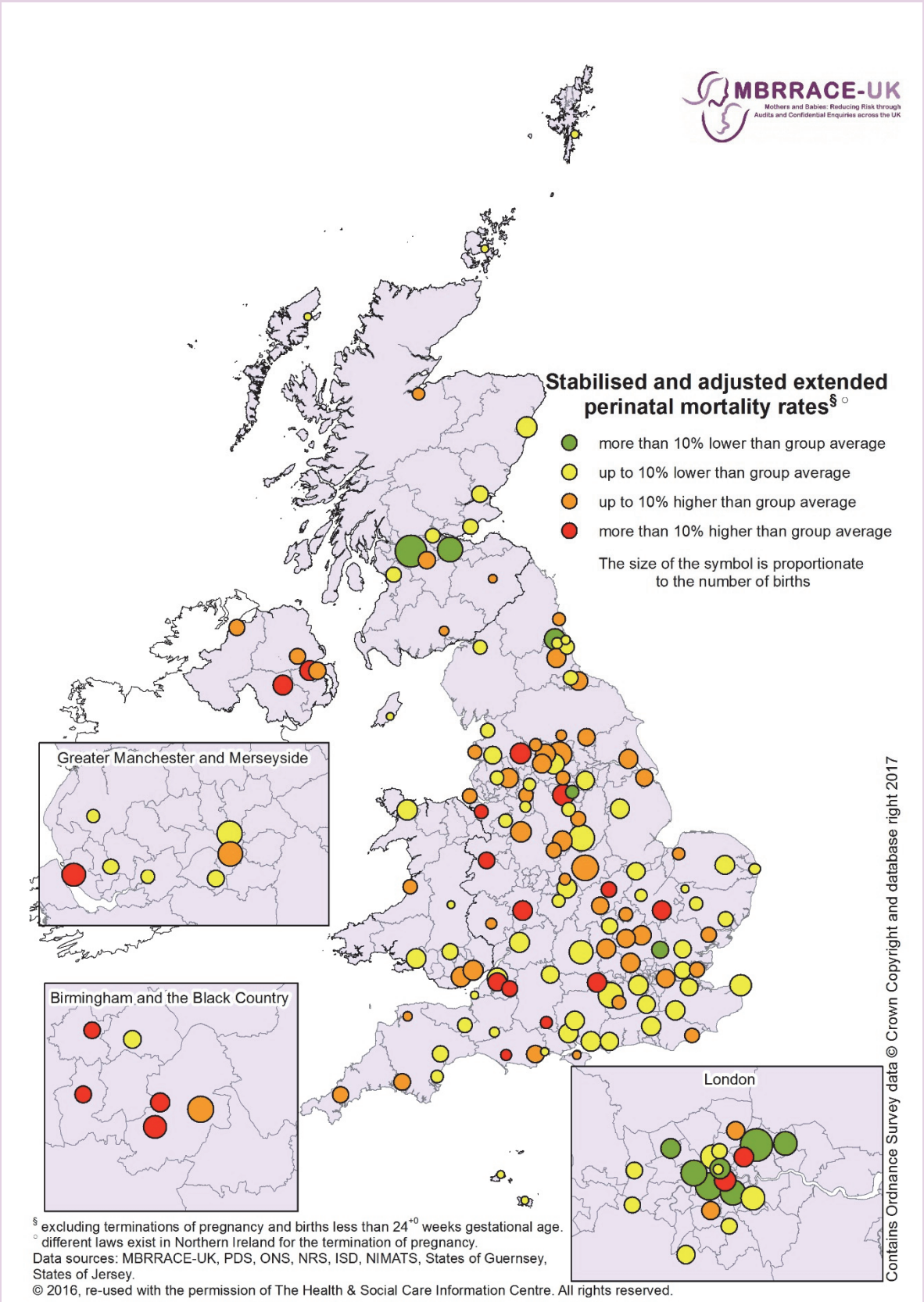


Table 8: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015.
FOR TRUSTS AND HEALTH BOARDS WITH NEONATAL SURGICAL PROVISION AND A LEVEL 3 NICU

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Average for comparator group			4.34		2.53		6.86	
Barts Health NHS Trust	16,134	5.21	4.17 (3.41 to 5.25)	1.62	1.90 (1.34 to 2.67)	6.82	6.13 (5.43 to 7.99)	
Belfast Health & Social Care Trust°	5,955	4.03	4.31 (3.34 to 5.39)	5.06	4.09 (2.52 to 5.98)	9.07	8.55 (6.80 to 11.27)	
Birmingham Women's NHS Foundation Trust	8,089	5.56	4.55 (3.74 to 5.52)	6.46	4.93 (3.67 to 6.67)	11.99	9.59 (8.15 to 12.35)	
Brighton and Sussex University Hospitals NHS Trust	5,678	3.52	4.28 (3.24 to 5.52)	1.41	1.99 (1.29 to 3.10)	4.93	6.24 (5.33 to 8.33)	
Cambridge University Hospitals NHS Foundation Trust	5,680	3.52	4.33 (3.42 to 6.09)	3.36	3.27 (1.87 to 4.51)	6.87	7.67 (6.22 to 9.58)	
Cardiff and Vale University Health Board	6,062	5.61	4.79 (3.60 to 5.78)	2.16	2.68 (1.68 to 3.84)	7.75	7.47 (6.12 to 9.38)	
Central Manchester University Hospitals NHS Foundation Trust	9,167	6.22	4.81 (3.77 to 6.09)	2.74	2.64 (1.78 to 3.67)	8.95	7.43 (6.29 to 9.51)	
Chelsea and Westminster Hospital NHS Foundation Trust	11,058	3.26	3.85 (2.99 to 4.96)	1.27	1.97 (1.30 to 2.80)	4.52	5.85 (4.87 to 7.46)	
Guy's and St Thomas' NHS Foundation Trust	6,794	5.45	4.34 (3.37 to 5.82)	4.29	3.54 (2.37 to 5.04)	9.71	7.82 (6.79 to 10.13)	
Hull and East Yorkshire Hospitals NHS Trust	5,416	5.54	4.79 (3.77 to 6.03)	1.67	2.18 (1.32 to 3.20)	7.20	6.94 (5.56 to 8.81)	
King's College Hospital NHS Foundation Trust	9,726	4.32	4.15 (3.41 to 5.07)	1.24	2.02 (1.33 to 2.81)	5.55	6.24 (5.34 to 7.75)	
Liverpool Women's NHS Foundation Trust	8,391	5.01	4.64 (3.69 to 5.93)	4.31	3.33 (2.40 to 4.99)	9.30	8.06 (7.09 to 10.68)	
NHS Grampian	6,383	3.76	4.42 (3.52 to 5.40)	0.94	1.84 (1.20 to 2.80)	4.70	6.24 (5.06 to 8.17)	
NHS Greater Glasgow & Clyde	15,200	3.09	3.88 (3.00 to 4.79)	1.39	1.78 (1.26 to 2.61)	4.47	5.64 (4.75 to 7.11)	
NHS Lothian	9,464	4.33	4.57 (3.78 to 5.51)	0.96	1.65 (1.11 to 2.44)	5.28	6.20 (5.26 to 7.92)	
Norfolk and Norwich University Hospitals NHS Foundation Trust	5,769	4.51	4.58 (3.80 to 5.79)	1.57	2.06 (1.22 to 3.00)	6.07	6.57 (5.64 to 8.22)	
Nottingham University Hospitals NHS Trust	9,796	3.78	4.15 (3.30 to 5.01)	2.46	2.68 (1.67 to 3.65)	6.23	6.82 (5.69 to 8.40)	
Oxford University Hospitals NHS Trust	8,479	3.66	4.32 (3.40 to 5.45)	2.37	2.35 (1.47 to 3.48)	6.01	6.64 (5.75 to 7.95)	
Sheffield Teaching Hospitals NHS Foundation Trust	6,992	5.01	4.52 (3.77 to 5.84)	4.46	3.47 (2.50 to 4.98)	9.44	8.08 (7.07 to 10.80)	
St George's University Hospital NHS Foundation Trust	5,104	5.49	4.55 (3.74 to 5.71)	2.36	2.45 (1.60 to 3.89)	7.84	6.98 (6.17 to 8.75)	

Organisation	Total births[§]	Rate per 1,000 births[§]						
		Stillbirth[†]		Neonatal[‡]		Extended perinatal[†]		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)[#]	
The Leeds Teaching Hospitals NHS Trust	9,646	2.80	3.71 (2.99 to 5.12)	4.16	3.79 (2.59 to 5.49)	6.95	7.51 (6.51 to 9.40)	
The Newcastle upon Tyne Hospitals NHS Foundation Trust	6,989	3.29	4.06 (3.31 to 5.14)	1.44	1.97 (1.39 to 3.38)	4.72	6.02 (5.15 to 8.19)	
University College London Hospitals NHS Foundation Trust	6,611	3.48	3.97 (3.17 to 5.43)	2.28	2.11 (1.45 to 2.96)	5.75	6.06 (5.11 to 8.30)	
University Hospital Southampton NHS Foundation Trust	5,646	5.31	4.79 (3.75 to 6.12)	1.78	2.08 (1.43 to 3.06)	7.08	6.75 (5.75 to 8.99)	
University Hospitals Bristol NHS Foundation Trust	5,015	4.79	4.51 (3.53 to 5.63)	4.01	3.53 (2.05 to 5.78)	8.77	8.05 (6.47 to 10.74)	
University Hospitals of Leicester NHS Trust	10,386	4.14	4.23 (3.42 to 5.23)	2.80	2.98 (2.07 to 4.46)	6.93	7.17 (6.02 to 9.15)	

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[†] per 1,000 total births
[‡] per 1,000 live births
[#] colours represent variation from comparator group average extended perinatal mortality rate
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 9: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015.
FOR TRUSTS AND HEALTH BOARDS WITH A LEVEL 3 NICU

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Average for comparator group			4.41		2.04		6.44	
Abertawe Bro Morgannwg University Health Board	5,786	4.67	4.61 (3.85 to 6.06)	1.56	1.85 (1.27 to 3.18)	6.22	6.43 (5.69 to 8.61)	○
Aneurin Bevan Health Board	5,852	4.61	4.56 (3.76 to 5.28)	2.40	2.48 (1.65 to 3.87)	7.01	7.03 (6.05 to 9.05)	○
Ashford & St Peter's Hospitals NHS Foundation Trust	4,082	2.45	4.12 (3.15 to 5.22)	2.21	1.80 (1.17 to 2.96)	4.65	5.87 (4.68 to 7.48)	○
Bolton NHS Foundation Trust	5,828	4.46	4.43 (3.33 to 5.55)	2.24	2.10 (1.33 to 3.15)	6.69	6.52 (5.45 to 8.60)	○
Bradford Teaching Hospitals NHS Foundation Trust	5,758	7.29	4.92 (3.82 to 6.30)	2.45	2.12 (1.39 to 3.44)	9.73	7.01 (5.74 to 9.12)	○
City Hospitals Sunderland NHS Foundation Trust	3,108	4.18	4.42 (3.47 to 5.41)	1.94	1.96 (1.24 to 3.13)	6.11	6.36 (5.57 to 8.06)	○
East Kent Hospitals University NHS Foundation Trust	6,832	3.66	4.31 (3.50 to 5.13)	1.62	2.01 (1.38 to 3.33)	5.27	6.30 (5.27 to 8.57)	○
East Lancashire Hospitals NHS Trust	6,347	6.14	4.87 (3.74 to 6.06)	2.69	2.55 (1.66 to 4.51)	8.82	7.40 (6.15 to 9.18)	○
Heart of England NHS Foundation Trust	9,757	5.43	4.62 (3.71 to 5.89)	2.06	2.35 (1.59 to 3.40)	7.48	6.94 (6.00 to 8.92)	○
Homerton University Hospital NHS Foundation Trust	5,844	7.02	4.83 (3.79 to 6.02)	3.10	2.30 (1.51 to 3.39)	10.10	7.13 (5.82 to 9.03)	○
Imperial College Healthcare NHS Trust	10,096	4.75	4.34 (3.45 to 5.07)	1.19	1.46 (0.99 to 2.45)	5.94	5.78 (4.97 to 7.27)	○
Lancashire Teaching Hospitals NHS Foundation Trust	4,545	4.40	4.52 (3.70 to 5.89)	1.33	1.65 (1.00 to 2.62)	5.72	6.08 (5.23 to 7.97)	○
Luton and Dunstable Hospital NHS Foundation Trust	5,232	4.20	4.25 (3.48 to 5.18)	2.88	2.69 (1.66 to 4.42)	7.07	6.87 (5.88 to 8.85)	○
Medway NHS Foundation Trust	4,784	3.76	4.33 (3.36 to 5.35)	2.10	1.95 (1.28 to 2.91)	5.85	6.25 (5.25 to 7.63)	○
NHS Ayrshire & Arran	3,536	4.24	4.48 (3.61 to 5.73)	1.14	1.78 (1.01 to 3.16)	5.37	6.25 (5.10 to 8.02)	○
NHS Fife	3,417	3.22	4.29 (3.50 to 5.58)	1.76	2.14 (1.29 to 3.42)	4.98	6.41 (5.45 to 8.27)	○
NHS Lanarkshire	4,541	3.30	4.30 (3.50 to 5.40)	1.77	2.21 (1.39 to 3.82)	5.06	6.48 (5.41 to 8.70)	○
NHS Tayside	4,274	2.57	4.14 (3.21 to 5.38)	1.41	1.92 (1.14 to 3.01)	3.98	6.05 (5.14 to 8.00)	○

Organisation	Total births[§]	Rate per 1,000 births[§]						
		Stillbirth[†]		Neonatal[‡]		Extended perinatal[†]		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)[#]	
North Bristol NHS Trust	6,418	4.05	4.48 (3.36 to 5.94)	1.25	1.62 (0.91 to 2.71)	5.30	6.04 (4.92 to 7.79)	○
North Tees & Hartlepool NHS Foundation Trust	3,083	3.57	4.29 (3.25 to 5.37)	1.30	1.76 (1.06 to 2.93)	4.87	6.03 (5.18 to 7.72)	○
Plymouth Hospitals NHS Trust	4,381	2.97	4.21 (3.04 to 5.39)	3.43	2.69 (1.81 to 4.12)	6.39	7.02 (5.72 to 9.45)	○
Portsmouth Hospitals NHS Trust	5,865	4.43	4.58 (3.79 to 5.45)	1.03	1.44 (0.93 to 2.30)	5.46	5.86 (5.05 to 7.25)	○
South Tees Hospitals NHS Foundation Trust	5,054	4.75	4.59 (3.80 to 5.76)	1.79	2.00 (1.28 to 3.14)	6.53	6.58 (5.67 to 9.08)	○
The Pennine Acute Hospitals NHS Trust	9,394	3.94	4.08 (3.31 to 4.88)	1.50	1.82 (1.08 to 2.82)	5.43	5.90 (5.02 to 7.32)	○
The Royal Wolverhampton NHS Trust	4,382	3.88	4.24 (3.28 to 5.30)	3.89	2.78 (1.68 to 4.13)	7.76	7.11 (5.74 to 9.51)	○
University Hospitals Coventry & Warwickshire NHS Trust	6,154	4.22	4.36 (3.73 to 5.12)	2.12	2.05 (1.39 to 3.12)	6.34	6.40 (5.59 to 8.26)	○
University Hospitals of North Midlands NHS Trust	6,384	3.29	4.17 (3.30 to 5.29)	2.99	2.81 (1.97 to 4.03)	6.27	6.99 (5.88 to 8.82)	○
Wirral University Teaching Hospital NHS Foundation Trust	3,366	4.75	4.58 (3.72 to 5.70)	2.99	2.39 (1.55 to 3.47)	7.72	7.00 (5.83 to 8.99)	○

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[†] per 1,000 total births
[‡] per 1,000 live births
[#] colours represent variation from comparator group average extended perinatal mortality rate
[◦] different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 10: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015.
FOR TRUSTS AND HEALTH BOARDS WITH 4,000 OR MORE BIRTHS ≥24+0 WEEKS GESTATIONAL AGE PER ANNUM

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Average for comparator group			3.81		1.39		5.19	
Barking Havering & Redbridge University Hospitals NHS Trust	8,321	2.88	3.28 (2.57 to 4.29)	1.33	1.40 (0.88 to 2.38)	4.21	4.64 (3.83 to 6.01)	
Basildon and Thurrock University Hospitals NHS Foundation Trust	4,456	2.92	3.62 (2.86 to 4.44)	1.58	1.48 (0.85 to 2.34)	4.49	5.09 (4.29 to 6.35)	
Betsi Cadwaladr University Health Board	6,572	3.20	3.73 (2.87 to 4.59)	1.37	1.33 (0.77 to 2.17)	4.56	5.05 (4.17 to 6.42)	
Buckinghamshire Healthcare NHS Trust	5,430	2.76	3.61 (2.89 to 4.38)	2.22	1.85 (1.33 to 3.27)	4.97	5.48 (4.66 to 6.92)	
Calderdale & Huddersfield NHS Foundation Trust	5,430	4.05	3.84 (3.11 to 4.81)	1.85	1.67 (1.07 to 2.67)	5.89	5.50 (4.66 to 7.36)	
County Durham & Darlington NHS Foundation Trust	5,315	2.82	3.62 (2.85 to 4.68)	1.70	1.65 (0.91 to 2.79)	4.52	5.26 (4.26 to 6.91)	
Dartford & Gravesham NHS Trust	5,031	4.37	3.93 (3.24 to 4.84)	0.80	1.25 (0.71 to 2.03)	5.17	5.20 (4.50 to 6.49)	
Derby Teaching Hospitals NHS Foundation Trust	5,996	3.17	3.66 (2.93 to 4.88)	2.68	1.87 (1.08 to 2.77)	5.84	5.63 (4.62 to 7.56)	
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	5,049	4.16	3.92 (3.17 to 5.24)	1.19	1.23 (0.77 to 2.07)	5.35	5.10 (4.34 to 6.72)	
East and North Hertfordshire NHS Trust	5,545	5.59	4.38 (3.20 to 5.54)	0.73	1.12 (0.65 to 1.87)	6.31	5.43 (4.66 to 7.36)	
Epsom and St Helier University Hospitals NHS Trust	4,948	3.03	3.68 (3.02 to 4.66)	1.62	1.42 (0.86 to 2.24)	4.65	5.10 (4.40 to 6.50)	
Frimley Health NHS Foundation Trust	9,687	3.92	3.92 (3.01 to 4.59)	0.73	1.06 (0.63 to 1.61)	4.65	4.95 (4.24 to 5.88)	
Gloucestershire Hospitals NHS Foundation Trust	6,092	3.78	3.92 (3.11 to 5.09)	1.15	1.25 (0.75 to 1.94)	4.92	5.12 (4.18 to 6.50)	
Great Western Hospitals NHS Foundation Trust	4,873	1.85	3.46 (2.74 to 4.46)	1.64	1.68 (0.86 to 2.70)	3.49	5.10 (4.26 to 6.42)	
Hampshire Hospitals NHS Foundation Trust	5,372	*	3.99 (3.17 to 5.14)	*	1.05 (0.56 to 1.87)	4.28	5.01 (4.15 to 6.57)	
Kingston Hospital NHS Trust	5,836	3.77	3.88 (3.10 to 4.85)	0.52	1.09 (0.70 to 2.00)	4.28	4.99 (4.01 to 6.47)	
Lewisham and Greenwich NHS trust	8,338	4.92	3.83 (3.14 to 4.48)	1.08	1.19 (0.76 to 2.06)	6.00	5.02 (4.19 to 6.29)	
London North West Healthcare NHS Trust	6,016	3.82	3.61 (2.89 to 4.49)	0.83	1.06 (0.59 to 1.58)	4.65	4.67 (4.11 to 5.93)	
Maidstone and Tunbridge Wells NHS Trust	5,700	*	3.96 (3.02 to 4.90)	*	1.02 (0.62 to 1.78)	4.21	4.95 (4.12 to 6.29)	
Mid Essex Hospital Services NHS Trust	4,518	3.32	3.82 (3.14 to 4.94)	0.89	1.30 (0.77 to 2.06)	4.21	5.12 (4.33 to 7.08)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
North Middlesex University Hospital NHS Trust	5,171	5.61	3.96 (3.22 to 5.07)	1.17	1.33 (0.75 to 2.25)	6.77	5.29 (4.53 to 7.27)	
Northampton General Hospital NHS Trust	4,574	3.72	3.81 (3.04 to 4.88)	1.54	1.46 (0.81 to 2.64)	5.25	5.27 (4.32 to 7.01)	
Northern Health & Social Care Trust°	4,068	3.20	3.77 (3.05 to 4.95)	2.22	1.76 (1.01 to 2.86)	5.41	5.56 (4.74 to 7.13)	
Northern Lincolnshire and Goole Hospitals NHS Foundation Trust	4,533	5.52	4.22 (3.21 to 5.60)	1.33	1.32 (0.85 to 2.33)	6.84	5.50 (4.32 to 7.37)	
Peterborough & Stamford Hospitals NHS Foundation Trust	4,962	3.63	3.77 (3.12 to 4.66)	1.42	1.41 (0.69 to 2.69)	5.04	5.18 (4.17 to 6.64)	
Poole Hospital NHS Foundation Trust	4,495	3.34	3.80 (2.99 to 4.63)	1.34	1.42 (0.95 to 2.15)	4.67	5.21 (4.43 to 6.49)	
Royal Berkshire NHS Foundation Trust	5,372	6.70	4.61 (3.44 to 6.14)	1.31	1.43 (0.85 to 2.39)	8.00	6.02 (4.79 to 8.78)	
Royal Devon & Exeter NHS Foundation Trust	4,010	*	3.66 (2.92 to 4.66)	*	1.14 (0.65 to 2.01)	2.99	4.79 (4.13 to 6.35)	
Royal Free London NHS Foundation Trust	8,396	3.69	3.70 (3.11 to 4.62)	1.08	1.26 (0.80 to 2.19)	4.76	4.95 (4.33 to 6.77)	
Sandwell & West Birmingham Hospitals NHS Trust	5,530	8.14	4.47 (3.52 to 5.80)	2.19	1.65 (0.99 to 2.53)	10.31	6.10 (5.14 to 7.80)	
South Eastern Health & Social Care Trust°	4,495	2.89	3.71 (3.09 to 4.77)	2.01	1.86 (1.21 to 3.22)	4.89	5.52 (4.71 to 7.94)	
Southern Health & Social Care Trust°	5,930	3.37	3.79 (3.10 to 4.56)	3.21	2.38 (1.40 to 3.79)	6.58	6.26 (5.24 to 8.11)	
Surrey & Sussex Healthcare NHS Trust	4,496	*	3.79 (3.03 to 4.66)	*	1.07 (0.55 to 2.24)	3.78	4.83 (3.98 to 6.55)	
The Dudley Group NHS Foundation Trust	4,341	5.07	4.03 (3.20 to 5.17)	2.32	1.66 (1.10 to 2.64)	7.37	5.72 (4.62 to 7.48)	
The Hillingdon Hospitals NHS Foundation Trust	4,465	4.93	3.83 (3.16 to 4.66)	0.90	1.15 (0.71 to 1.96)	5.82	4.98 (4.10 to 6.32)	
The Mid Yorkshire Hospitals NHS Trust	6,220	3.70	3.75 (2.95 to 4.52)	1.29	1.32 (0.88 to 1.93)	4.98	5.06 (4.28 to 6.23)	
The Princess Alexandra Hospital NHS Trust	4,144	*	3.48 (2.56 to 4.40)	*	1.04 (0.51 to 1.91)	1.93	4.51 (3.56 to 5.86)	
The Shrewsbury and Telford Hospital NHS Trust	4,423	3.84	3.86 (3.11 to 5.27)	3.18	2.03 (1.18 to 3.33)	7.01	6.01 (5.13 to 7.68)	
United Lincolnshire Hospitals NHS Trust	5,364	3.91	3.93 (3.04 to 4.86)	0.75	1.11 (0.61 to 1.63)	4.66	4.99 (4.02 to 6.15)	
University Hospital of South Manchester NHS Foundation Trust	4,377	2.28	3.55 (2.76 to 4.60)	0.92	1.25 (0.75 to 2.23)	3.20	4.79 (3.98 to 6.33)	
Walsall Healthcare NHS Trust	4,865	4.11	3.77 (3.08 to 4.61)	1.44	1.32 (0.73 to 2.29)	5.55	5.09 (4.39 to 6.87)	
West Hertfordshire Hospitals NHS Trust	5,342	4.49	4.04 (3.20 to 5.06)	1.32	1.47 (0.89 to 3.16)	5.80	5.51 (4.66 to 7.03)	
Western Health & Social Care Trust°	4,086	2.20	3.52 (2.84 to 4.64)	2.94	2.24 (1.42 to 3.56)	5.14	5.70 (4.67 to 7.61)	
Western Sussex Hospitals NHS Foundation Trust	5,112	2.74	3.67 (2.81 to 4.68)	0.78	1.24 (0.78 to 2.04)	3.52	4.91 (4.14 to 6.31)	
Worcestershire Acute Hospitals NHS Trust	5,737	4.18	4.00 (3.07 to 5.03)	2.28	1.85 (1.20 to 3.48)	6.45	5.89 (4.86 to 7.79)	
York Teaching Hospital NHS Foundation Trust	4,834	2.48	3.63 (2.88 to 4.33)	2.07	1.95 (1.06 to 3.16)	4.55	5.55 (4.51 to 7.02)	

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
† per 1,000 total births
‡ per 1,000 live births
# colours represent variation from comparator group average extended perinatal mortality rate
* entry suppressed because of small number of deaths
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 11: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015.
FOR TRUSTS AND HEALTH BOARDS WITH 2,000 TO 3,999 BIRTHS ≥24+0 WEEKS GESTATIONAL AGE PER ANNUM

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Average for comparator group			3.46		1.27		4.73	
Airedale NHS Foundation Trust	2,208	*	3.57 (2.80 to 4.40)	*	1.20 (0.71 to 2.22)	5.43	4.76 (3.93 to 6.19)	
Barnsley Hospital NHS Foundation Trust	2,940	*	3.65 (2.84 to 4.82)	*	1.11 (0.66 to 2.05)	5.44	4.74 (4.07 to 6.47)	
Bedford Hospital NHS Trust	2,953	3.73	3.48 (2.83 to 4.56)	1.02	1.28 (0.67 to 2.31)	4.74	4.75 (4.05 to 6.13)	
Blackpool Teaching Hospitals NHS Foundation Trust	2,937	3.06	3.40 (2.70 to 4.22)	2.73	1.53 (0.97 to 2.37)	5.79	5.01 (4.28 to 6.47)	
Burton Hospitals NHS Foundation Trust	3,475	1.73	3.21 (2.44 to 4.12)	2.31	1.67 (0.98 to 3.20)	4.03	4.90 (3.90 to 6.88)	
Chesterfield Royal Hospital NHS Foundation Trust	2,840	*	3.39 (2.45 to 4.36)	*	1.07 (0.57 to 1.86)	3.17	4.48 (3.54 to 5.67)	
Colchester Hospital University NHS Foundation Trust	3,486	4.59	3.64 (2.85 to 4.52)	1.44	1.32 (0.69 to 2.53)	6.02	4.96 (3.99 to 6.66)	
Countess of Chester Hospital NHS Foundation Trust	3,047	3.61	3.51 (2.72 to 4.64)	2.96	1.91 (0.87 to 3.71)	6.56	5.42 (4.28 to 7.45)	
Croydon Health Services NHS Trust	3,801	3.68	3.29 (2.63 to 4.06)	1.58	1.27 (0.74 to 2.18)	5.26	4.56 (3.78 to 5.72)	
Cwm Taf University Health Board	3,762	1.33	3.10 (2.51 to 3.83)	2.13	1.54 (0.94 to 2.66)	3.46	4.67 (3.82 to 6.48)	
East Sussex Healthcare NHS Trust	3,180	3.46	3.45 (2.68 to 4.22)	2.21	1.62 (0.88 to 2.87)	5.66	5.07 (4.18 to 6.69)	
George Eliot Hospital NHS Trust	2,044	1.96	3.32 (2.48 to 4.22)	2.45	1.57 (0.84 to 2.44)	4.40	4.91 (3.84 to 6.08)	
Hinchingbrooke Health Care NHS Trust	2,318	*	3.45 (2.77 to 4.32)	*	1.06 (0.58 to 2.13)	3.02	4.53 (3.84 to 5.74)	
Hywel Dda Health Board	3,361	*	3.64 (2.88 to 4.65)	*	1.12 (0.71 to 2.07)	5.06	4.76 (3.97 to 6.22)	
James Paget University Hospitals NHS Foundation Trust	2,016	*	3.60 (2.85 to 4.60)	*	1.05 (0.51 to 2.25)	4.96	4.68 (3.91 to 6.07)	
Kettering General Hospital NHS Foundation Trust	3,519	6.54	4.00 (3.10 to 5.52)	1.72	1.35 (0.82 to 2.34)	8.24	5.32 (4.50 to 7.08)	
Mid Cheshire Hospitals NHS Foundation Trust	2,767	*	3.57 (2.88 to 4.67)	*	1.10 (0.65 to 1.89)	4.70	4.62 (3.73 to 6.67)	
Milton Keynes University Hospital NHS Foundation Trust	3,915	3.32	3.36 (2.69 to 4.26)	1.03	1.26 (0.70 to 2.07)	4.34	4.61 (3.78 to 5.85)	
NHS Forth Valley	3,137	2.23	3.31 (2.72 to 3.87)	0.96	1.25 (0.80 to 2.39)	3.19	4.56 (3.81 to 5.94)	
NHS Highland	2,271	3.08	3.45 (2.79 to 4.59)	2.21	1.60 (0.77 to 3.39)	5.28	5.04 (4.05 to 7.08)	
North Cumbria University Hospitals NHS Trust	2,975	*	3.39 (2.73 to 3.91)	*	1.06 (0.55 to 1.96)	3.03	4.45 (3.67 to 5.60)	

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Northumbria Healthcare NHS Foundation Trust	2,760	4.35	3.58 (2.86 to 4.72)	1.82	1.54 (0.75 to 2.65)	6.16	5.09 (4.29 to 6.54)	
Royal Cornwall Hospitals NHS Trust	3,875	4.13	3.61 (2.88 to 4.73)	1.30	1.31 (0.71 to 2.17)	5.42	4.92 (4.11 to 6.52)	
Royal Surrey County Hospital NHS Foundation Trust	2,962	1.35	3.22 (2.39 to 4.16)	2.03	1.65 (0.94 to 2.83)	3.38	4.83 (4.03 to 6.82)	
Royal United Hospitals Bath NHS Foundation Trust	3,986	5.02	3.82 (2.83 to 4.92)	1.51	1.42 (0.90 to 2.08)	6.52	5.24 (4.16 to 6.75)	
Salisbury NHS Foundation Trust	2,304	6.51	3.85 (2.84 to 5.06)	1.75	1.41 (0.82 to 2.43)	8.25	5.26 (4.00 to 7.02)	
Sherwood Forest Hospitals NHS Foundation Trust	3,410	4.69	3.66 (2.82 to 4.60)	1.77	1.50 (0.89 to 2.58)	6.45	5.16 (4.22 to 6.62)	
South Warwickshire NHS Foundation Trust	2,599	1.92	3.32 (2.59 to 4.31)	1.16	1.37 (0.66 to 2.43)	3.08	4.65 (3.61 to 6.04)	
Southend University Hospital NHS Foundation Trust	3,543	*	3.69 (2.80 to 4.72)	*	1.09 (0.57 to 1.93)	5.36	4.77 (3.79 to 6.33)	
Southport & Ormskirk Hospital NHS Trust	2,573	1.94	3.30 (2.55 to 4.39)	1.17	1.28 (0.78 to 1.94)	3.11	4.57 (3.79 to 5.72)	
St Helens & Knowsley Teaching Hospitals NHS Trust	3,813	3.15	3.40 (2.56 to 4.17)	1.32	1.32 (0.75 to 2.35)	4.46	4.71 (3.77 to 6.25)	
Stockport NHS Foundation Trust	3,286	*	3.91 (2.90 to 4.97)	*	1.13 (0.62 to 2.02)	6.70	5.03 (3.96 to 6.43)	
Tameside and Glossop Integrated Care NHS Foundation Trust	2,355	*	3.15 (2.42 to 3.90)	*	1.19 (0.65 to 2.08)	2.12	4.34 (3.56 to 5.69)	
Taunton & Somerset NHS Foundation Trust	3,147	2.22	3.32 (2.60 to 4.10)	1.27	1.23 (0.75 to 1.97)	3.50	4.55 (3.82 to 6.09)	
The Ipswich Hospital NHS Trust	3,715	2.42	3.31 (2.65 to 4.09)	1.35	1.32 (0.67 to 2.07)	3.77	4.63 (3.70 to 5.93)	
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	2,311	3.89	3.52 (2.74 to 4.34)	1.74	1.41 (0.72 to 2.60)	5.63	4.93 (3.94 to 6.54)	
The Rotherham NHS Foundation Trust	2,616	*	3.34 (2.68 to 4.07)	*	0.99 (0.53 to 1.54)	3.06	4.27 (3.26 to 5.47)	
Torbay and South Devon NHS Foundation Trust	2,238	*	3.25 (2.48 to 4.11)	*	1.13 (0.65 to 1.93)	1.79	4.38 (3.30 to 5.75)	
University Hospitals of Morecambe Bay NHS Foundation Trust	3,157	*	3.50 (2.58 to 4.53)	*	1.03 (0.50 to 1.96)	3.80	4.52 (3.83 to 5.81)	
Warrington & Halton Hospitals NHS Foundation Trust	2,856	2.10	3.30 (2.48 to 4.38)	1.40	1.25 (0.71 to 2.23)	3.50	4.56 (3.58 to 5.76)	
West Suffolk NHS Foundation Trust	2,525	*	3.32 (2.62 to 4.37)	*	1.18 (0.74 to 2.45)	2.77	4.50 (3.91 to 5.94)	
Whittington Health	3,672	*	3.56 (2.73 to 4.89)	*	1.05 (0.59 to 1.82)	5.45	4.62 (3.78 to 6.34)	
Wrightington, Wigan & Leigh NHS Foundation Trust	2,808	3.21	3.43 (2.72 to 4.37)	1.07	1.17 (0.66 to 1.98)	4.27	4.59 (3.72 to 5.71)	

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
† per 1,000 total births
‡ per 1,000 live births
# colours represent variation from comparator group average extended perinatal mortality rate
* entry suppressed because of small number of deaths

° different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 12: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency based on place of birth: United Kingdom and Crown Dependencies, for births in 2015.
FOR TRUSTS AND HEALTH BOARDS WITH FEWER THAN 2,000 BIRTHS ≥24^{+0} WEEKS GESTATIONAL AGE PER ANNUM

Organisation	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Average for comparator group			2.33		1.08		3.41	
Dorset County Hospital NHS Foundation Trust	1,876	2.13	2.32 (1.60 to 3.27)	3.74	1.57 (0.75 to 3.27)	5.86	3.98 (3.08 to 5.62)	●
East Cheshire NHS Trust	1,760	*	2.30 (1.59 to 3.31)	*	1.03 (0.35 to 2.33)	2.27	3.33 (2.42 to 5.20)	○
Gateshead Health NHS Foundation Trust	1,800	*	2.21 (1.37 to 3.00)	*	0.98 (0.25 to 2.11)	*	3.19 (2.01 to 4.60)	○
Harrogate and District NHS Foundation Trust	1,906	3.67	2.44 (1.61 to 3.45)	1.58	1.25 (0.57 to 2.66)	5.25	3.67 (2.55 to 5.39)	●
Isle of Man Department of Health and Social Care	778	*	2.38 (1.60 to 3.55)	*	1.00 (0.34 to 1.88)	3.86	3.38 (2.16 to 5.02)	○
Isle of Wight NHS Trust	1,233	*	2.37 (1.65 to 3.32)	*	1.05 (0.36 to 2.23)	4.06	3.42 (2.33 to 4.86)	●
NHS Borders	1,069	*	2.50 (1.96 to 3.57)	*	0.99 (0.30 to 2.26)	6.55	3.50 (2.61 to 5.09)	●
NHS Dumfries & Galloway	1,271	*	2.41 (1.62 to 3.52)	*	1.15 (0.30 to 2.06)	5.51	3.56 (2.26 to 5.32)	●
NHS Orkney	137	*	2.32 (1.48 to 3.17)	*	1.07 (0.28 to 2.30)	*	3.39 (2.06 to 4.89)	○
NHS Shetland	140	*	2.32 (1.54 to 3.21)	*	1.07 (0.29 to 2.51)	*	3.39 (2.17 to 5.28)	○
NHS Western Isles	186	*	2.39 (1.60 to 3.72)	*	1.05 (0.31 to 2.50)	*	3.41 (2.33 to 5.70)	○
Northern Devon Healthcare NHS Trust	1,422	2.11	2.32 (1.59 to 3.04)	2.82	1.36 (0.55 to 2.81)	4.92	3.68 (2.30 to 5.56)	●
Powys Teaching Health Board	142	*	2.32 (1.38 to 3.35)	*	1.07 (0.28 to 2.60)	*	3.39 (2.07 to 4.89)	○
RAF Lakenheath (48th Medical Group)	430	*	2.30 (1.59 to 3.22)	*	1.05 (0.47 to 2.17)	*	3.35 (2.32 to 4.70)	○
South Tyneside NHS Foundation Trust	1,322	*	2.28 (1.24 to 3.03)	*	0.93 (0.21 to 1.78)	*	3.22 (1.79 to 4.25)	○
States of Guernsey Health & Social Services	587	*	2.32 (1.49 to 3.46)	*	1.00 (0.25 to 2.45)	*	3.31 (1.99 to 5.62)	○
States of Jersey Health & Social Services	1,020	*	2.25 (1.33 to 2.90)	*	0.97 (0.24 to 1.84)	*	3.21 (2.00 to 4.61)	○
The Portland Hospital for Women and Children	1,513	*	2.28 (1.39 to 3.07)	*	1.07 (0.26 to 2.10)	1.98	3.34 (2.22 to 4.54)	○
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	314	*	2.31 (1.53 to 3.50)	*	1.06 (0.30 to 2.23)	*	3.37 (1.98 to 5.07)	○
Weston Area Health NHS Trust	198	*	2.32 (1.44 to 3.23)	*	1.07 (0.27 to 2.05)	*	3.38 (2.08 to 4.74)	○
Wye Valley NHS Trust	1,687	2.37	2.34 (1.62 to 3.13)	2.38	1.30 (0.55 to 2.88)	4.74	3.65 (2.73 to 5.51)	●
Yeovil District Hospital NHS Foundation Trust	1,492	*	2.36 (1.56 to 3.28)	*	0.95 (0.23 to 1.91)	2.68	3.32 (1.93 to 4.71)	○

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
† per 1,000 total births
‡ per 1,000 live births
# colours represent variation from comparator group average extended perinatal mortality rate
* entry suppressed because of small number of deaths
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

6. High risk births and their contribution towards the variations in mortality rates

In previous MBRRACE-UK perinatal mortality surveillance reports, and in Chapters 3, 4 and 5 of this report, stabilised & adjusted rates for stillbirth, neonatal death, and extended perinatal mortality have been provided in order to facilitate comparisons between health care providers and between populations. These analyses have excluded all late fetal losses and deaths of babies born alive at less than 24^{+0} weeks gestational age and included deaths due to congenital anomalies. This has been done in order to avoid the influence of the wide variation in the classification of babies born before 24^{+0} weeks gestational age as a neonatal death or fetal loss, as well as the known variation in the rate of termination of pregnancy for congenital anomaly across the UK. This chapter builds on this work and shows the impact of inclusion and exclusion of these two high risk groups of deaths.

6.1 Mortality among babies born at less than 24 weeks gestational age

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 late fetal losses (i.e. those without signs of life at birth) born before 24^{+0} weeks gestational age. The data reported directly to MBRRACE-UK includes fetal losses at 22^{+0} to 23^{+6} weeks gestational age in addition to all officially registered neonatal deaths and stillbirths in order to allow, ultimately, the presentation of data for all deaths from 22^{+0} weeks gestational age onwards.

In Table 13, the number of births, stillbirths, neonatal deaths, and extended perinatal deaths for babies born at 22^{+0} to 23^{+6} weeks gestational age are shown together with the associated mortality rates for the UK and Crown Dependencies. In the UK for 2015 we were notified of 100.01 births at 22^{+0} to 23^{+6} weeks gestational age (excluding terminations of pregnancy). Rates of mortality were extremely high with 866 of these births ending in a stillbirth or neonatal death, an extended perinatal mortality rate of 865.1 deaths per 1,000 births, which is extremely similar to the rate of 866.3 per 1,000 births in 2014. Less than 15% of the total births at this gestational age survived the neonatal period.

Using a cut-off of 24^{+0} weeks gestational age instead of 22^{+0} weeks reduces the number of neonatal deaths reported nationally by 342 deaths, which equates to a decrease in the overall neonatal and extended perinatal mortality rates of approximately 0.44 deaths per 1,000 total births. Similarly, the number of babies born showing no signs of life is reduced by 524 if only births from 24^{+0} weeks gestational age are included, an additional reduction of 0.67 deaths per 1,000 total births. This must be borne in mind not only when interpreting the results presented in this report compared with other national and international mortality rates with different gestational age cut-offs but also when assessing the burden of perinatal mortality on parents and families across the UK.

Table 13: Stillbirth, neonatal, and extended perinatal mortality rates for births at 22^{+0} to 23^{+6} weeks gestational age: United Kingdom and Crown Dependencies for births in 2015

	Births at 22^{+0}-23^{+6} weeks gestational age*	
	Number of births	Rate per 1,000 births
Total births	**1,001**	
Live births	**477**	
Late fetal losses	**524**	**523.5†**
Antepartum	*278*	*277.7†*
Intrapartum	*166*	*165.8†*
Unknown timing	*80*	*79.9†*
Neonatal deaths	**342**	**717‡**
Early neonatal death	*302*	*633.1‡*
Late neonatal death	*40*	*83.9‡*
Perinatal deaths	**826**	**825.2†**
Extended perinatal deaths	**866**	**865.1†**

* excluding terminations of pregnancy
† per 1,000 total births
‡ per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Using this data MBRRACE-UK aims to report all deaths from 22^{+0} weeks gestational age onwards, as recommended by the World Health Organization (WHO) [1], which would allow direct comparisons to be made with other European countries and the mortality statistics reported by the Statistical Office of the European Union (EUROSTAT) [2]. However, it has previously been shown that there is wide variation in the birth certification practice for babies born before 24^{+0} weeks gestational age in terms of whether a clinician considers a baby born before 24^{+0} weeks as a late fetal loss, and therefore not to be statutorily registered as either a birth or a death, or as a live birth ending in a neonatal death which is then registered both as a birth and as a death. This is highlighted by the high percentage of late fetal losses reported as occurring in the intrapartum period at this gestation (32%), compared to the percentage of stillbirths occurring intrapartum at 24^{+0} to 27^{+6} weeks gestational age (14%). If MBBRACE-UK were to include these deaths at 22^{+0} to 23^{+6} weeks gestational age in mortality rates in the future extended perinatal mortality rates would not be affected by this clinical variation, since both late fetal losses and neonatal deaths are included. It is likely that artefactual variation will impact on rates of stillbirth and neonatal mortality.

In Table 14 the variation is highlighted in the percentage of births reported as live births at 22^{+0} to 23^{+6} weeks gestational age for neonatal networks across the UK in 2015. While most neonatal networks had rates near the average of 48.0% of births, there is wide variation ranging from 29.4% to 57.7% reported as liveborn. In section 6.3 the impact of this variation on stillbirths and neonatal mortality rates is assessed alongside the impact of deaths due to congenital anomalies.

It is possible that some of this variation between neonatal networks in the percentage of births reported as live births at 22^{+0} to 23^{+6} weeks gestational age may also arise from differences in the reporting of late fetal losses to MBRRACE-UK. There are no easily accessible routine data sources for late fetal losses delivered at 22^{+0} to 23^{+6} weeks gestational age and therefore, unlike all other stillbirths and neonatal deaths, it is not possible to systematically ensure that all of these deaths have been reported to MBRRACE-UK. It is vital that all Trusts and Health Boards responsible for maternity services should have systematic processes in place to ensure that all births between 22^{+0} and 23^{+6} weeks gestational age who are not alive at birth, or who do not survive the neonatal period, are reported. The number of reported late fetal losses is extremely similar to 2014 showing consistent reporting levels. We will continue to monitor the reporting of this group.

Table 14: Fetal losses, live births and percentage of births reported liveborn at 22^{+0} to 23^{+6} weeks gestational age by neonatal network based on place of birth: United Kingdom, for births in 2015

Neonatal network	Number of late fetal losses at 22^{+0}-23^{+6} weeks gestational age§	Number of live births at 22^{+0}-23^{+6} weeks gestational age§	% of births reported liveborn at 22^{+0}-23^{+6} weeks gestational age§
ENGLAND			
Central	26	21	44.7
East of England	29	28	49.1
North Central and East London	56	28	33.3
North West (Cheshire and Merseyside)	11	15	57.7
North West (Greater Manchester)	32	29	47.5
North West (Lancashire and South Cumbria)	11	5	31.3
North West London	25	26	51.0
Northern	21	23	52.3
South East Coast	36	30	45.5
South London	38	36	48.6
South West	32	33	50.8
Southern West Midlands	25	27	51.9
Staffordshire, Shropshire and Black Country	25	24	49.0
Thames Valley and Wessex	30	37	55.2
Trent	18	13	41.9
Yorkshire and Humber	41	36	46.8
SCOTLAND			
North of Scotland	4	4	50.0
South East Scotland and Tayside	11	11	50.0
West of Scotland	24	10	29.4
WALES			
Wales	19	17	47.2
NORTHERN IRELAND◦			
Northern Ireland◦	9	10	52.6

§ excluding terminations of pregnancy
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

6.2 Investigating the impact of deaths due to congenital anomalies on mortality rates for neonatal networks

In the last MBRRACE-UK perinatal surveillance report we demonstrated the wide variation in death rates due to congenital anomalies between Trusts and Health Boards across the UK. Detailed investigation of the CODAC coding of the classification of death has shown that, for almost all deaths where a congenital anomaly is given as the recorded primary cause or an associated cause of death, this was a true indication of the underlying cause of death. As such, all deaths with a primary or associated cause of death coded as a congenital anomaly are included in this report as 'deaths due to congenital anomalies'.

Much of the variation in the rates of death due to congenital anomalies is due to differences in the approach to the management of pregnancies affected by a congenital anomaly. The main factors influencing their management relate to differences within the UK in legislation concerning termination of pregnancy and to the differences in cultural and religious sensitivities to termination of pregnancy. This is a particular issue for Northern Ireland where termination of pregnancy is not legal in most circumstances and, therefore, the rates of perinatal death associated with congenital anomalies would be expected to be higher than in the rest of the UK where the law allows for the termination of a pregnancy in specific circumstances and, particularly, in the presence of a congenital anomaly. Thus, this will have a major impact on overall mortality rates observed in Northern Ireland and is clearly reflected in their high rate of neonatal mortality in 2015: 3.21 per 1,000 live births in Northern Ireland compared with 1.74 for the UK as a whole (Table 5, Chapter 3). Similarly, in areas where there is a high proportion of births from groups with religious and cultural sensitivities that discourage termination of pregnancy, higher rates of death associated with congenital anomalies would also be anticipated.

Table 15: Numbers and rates of congenital anomalies for stillbirths, neonatal deaths and extended perinatal mortality by neonatal network based on place of birth: United Kingdom, for births in 2015

Neonatal network	Total births[§]	Deaths due to congenital anomalies[§]					
		Stillbirths[†]		Neonatal deaths[‡]		Extended perinatal deaths[†]	
		Number	Rate per 1,000 births	Number	Rate per 1,000 births	Number	Rate per 1,000 births
ENGLAND							
Central	32,751	16	0.5	16	0.5	32	1.0
East of England	68,515	23	0.3	24	0.4	47	0.7
North Central and East London	54,149	15	0.3	39	0.7	54	1.0
North West (Cheshire and Merseyside)	28,573	9	0.3	24	0.8	33	1.2
North West (Greater Manchester)	37,215	11	0.3	19	0.5	30	0.8
North West (Lancashire and South Cumbria)	16,986	5	0.3	10	0.6	15	0.9
North West London	31,635	11	0.3	15	0.5	26	0.8
Northern	32,406	10	0.3	15	0.5	25	0.8
South East Coast	47,857	9	0.2	15	0.3	24	0.5
South London	44,547	18	0.4	35	0.8	53	1.2
South West	47,147	13	0.3	26	0.6	39	0.8
Southern West Midlands	30,800	16	0.5	41	1.3	57	1.9
Staffordshire, Shropshire and Black Country	24,395	5	0.2	12	0.5	17	0.7
Thames Valley and Wessex	59,988	22	0.4	18	0.3	40	0.7
Trent	24,566	13	0.5	7	0.3	20	0.8
Yorkshire and Humber	66,388	23	0.3	54	0.8	77	1.2
SCOTLAND							
North of Scotland	9,117	4	0.4	4	0.4	8	0.9
South East Scotland and Tayside	21,361	12	0.6	7	0.3	19	0.9
West of Scotland	24,548	7	0.3	7	0.3	14	0.6
WALES							
Wales	31,537	10	0.3	14	0.4	24	0.8
NORTHERN IRELAND[◦]							
Northern Ireland[◦]	24,534	16	0.7	52	2.1	68	2.8

[§] excluding terminations of pregnancy and births <24+0 weeks gestational age
[†] per 1,000 total births
[‡] per 1,000 live births
[◦] different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

The numbers and rates of stillbirths, neonatal deaths and extended perinatal deaths due to congenital anomalies are shown in Table 15 by neonatal network, based on place of birth for UK births in 2015. As in the earlier sections of this report, these figures exclude births at less than 24^{+0} weeks gestational age and all terminations of pregnancy. Although the rate of stillbirths due to congenital anomalies was highest for Northern Ireland (0.7 per 1,000 total births), a similar rate was also found for South East Scotland and Tayside neonatal network. The variation across all neonatal networks was only 0.5 stillbirths per 1,000 total births; ranging from 0.2 to 0.7 per 1,000 total births. This indicates that there is only a small impact on the rate of stillbirth due to congenital anomalies when terminations of pregnancy are not included. A different picture is seen for neonatal mortality where rates within neonatal networks ranged from 0.3 deaths per 1,000 live births in two of the Scottish and three of the English neonatal networks to 2.1 deaths per 1,000 live births in Northern Ireland. Two thirds (52 out of 78, 67%) of all neonatal deaths in Northern Ireland were due to congenital anomalies compared to just less than a third (402 out of 1,279, 31.4%) of neonatal deaths for the rest of the UK. This reflects the major impact of congenital anomalies on neonatal mortality rates when termination of pregnancy for affected pregnancies is not undertaken in most circumstances. Higher rates of neonatal mortality associated with congenital anomalies (0.8 to 1.3 per 1,000 livebirths) are also seen in neonatal networks including geographical areas with high proportions of births from ethnic minorities where cultural and religious sensitivities restrict the number of terminations of pregnancy: Southern West Midlands (1.3), South London (0.8), North West (Cheshire & Merseyside) (0.8) and Yorkshire & Humber (0.8).

6.3 Investigating the impact of inclusion and exclusion of babies born before 24 weeks gestational age and deaths due to congenital anomalies on the variation in mortality rates for neonatal networks

In MBRRACE-UK perinatal mortality surveillance reports, to minimise the effect of different registration practices between Trusts and Health Boards, we present mortality rates that exclude births before 24^{+0} weeks gestational age. However, deaths due to congenital anomalies have been included in order to allow time for reporters to become familiar with the CODAC classification of death. In order to investigate the impact on mortality rates of the exclusion and inclusion of these two groups of babies, respectively, mortality rates for neonatal networks will be shown both with and without births at 22^{+0} to 23^{+6} weeks gestational age and deaths due to congenital anomalies.

In Table 16 four different values for the stabilised & adjusted stillbirth rates are shown for each neonatal network in order to quantify the impact of including and excluding in the calculation those babies born before 24^{+0} weeks gestational age and all stillbirths due to congenital anomalies. The first column contains the stillbirth rates as they have been presented to date in MBRRACE-UK perinatal mortality surveillance reports, i.e. excluding births before 24^{+0} weeks gestational age but including stillbirths due to congenital anomalies, with the stabilised & adjusted rates varying between 3.81 and 3.99 stillbirths per 1,000 total births. The stillbirth rates in the second column in Table 16 were obtained after excluding all births before 24^{+0} weeks gestational age and also excluding all stillbirths due to congenital anomalies. This reduced the stabilised & adjusted stillbirth rate across the neonatal networks to between 3.45 and 3.65 stillbirths per 1,000 total births. As expected, the highest stabilised & adjusted stillbirth rates were found when births from 22^{+0} weeks gestational age were included, as well as deaths due to congenital anomaly (third column in Table 16), with rates of between 4.39 and 4.76 stillbirths per 1,000 total births obtained. Finally, including births from 22^{+0} weeks gestational age but excluding deaths due to congenital anomaly produced stabilised & adjusted stillbirth rates that ranged from 4.07 to 4.25 stillbirths per 1,000 total births. Despite Northern Ireland having the highest rate of stillbirth due to congenital anomaly their overall unadjusted stillbirth rate is the lowest for all countries of the UK (see Chapter 3) and, in the analysis in this section, it remained the lowest for three out of four versions of the stabilised & adjusted stillbirth rate. Similarly, the stabilised & adjusted stillbirth rates for Southern West Midlands Neonatal Network are the highest for three out of four versions. This information is presented graphically in Figure 22 and shows that, for stillbirths, including both deaths from 22^{+0} to 23^{+6} weeks gestational age and deaths due to congenital anomalies has the largest effect on the variation between neonatal networks. This is potentially due to registration differences

within the Trusts and Health Boards whose deaths feed into each network and cultural differences with respect to the management of pregnancies affected by a congenital anomaly.

Table 17 follows the same format as Table 16, presenting values for the four stabilised & adjusted neonatal mortality rates based on the four different cohorts by neonatal network. Stabilised & adjusted neonatal mortality rates excluding births before 24^{+0} weeks gestational age but including deaths due to congenital anomalies vary between 1.15 and 3.21 deaths per 1,000 live births. Excluding both births before 24^{+0} weeks gestational age and deaths due to congenital anomalies reduced the values of the stabilised & adjusted neonatal mortality rate to between 0.81 and 1.70 deaths per 1,000 live births across the neonatal networks. Inclusion of both high risk groups of deaths increased the neonatal mortality rates to between 1.60 and 3.53 deaths per 1,000 live births. Including births from 22^{+0} weeks gestational age but excluding deaths due to congenital anomaly produced stabilised & adjusted neonatal mortality rates varying from 1.22 to 2.36 deaths per 1,000 live births. Stabilised & adjusted neonatal mortality rates were highest in Northern Ireland when deaths due to congenital anomalies were included but this reduced significantly when congenital anomalies were excluded, irrespective of the inclusion or exclusion of births at 22^{+0} to 23^{+6} weeks gestational age. North West London Neonatal Network had the lowest rates of neonatal mortality across the four versions of the stabilised & adjusted neonatal mortality rate with North Central and East London Neonatal Network sharing the lowest neonatal mortality rates when births at 22^{+0} to 23^{+6} weeks gestational age were included and congenital anomalies were excluded. The neonatal mortality rates are presented graphically in Figure 22 together with those for stillbirths. Deaths due to congenital anomalies have a major effect on the variation in neonatal mortality rates between neonatal networks, as, on average, they constitute around one third of these deaths, whereas inclusion of births at 22^{+0} to 23^{+0} weeks gestational age has less impact.

In the final table in this section, Table 18, the values for the extended perinatal mortality rate are shown for the same four cohorts in order to examine the effect of these high risk deaths on this summary measure of mortality. Excluding the births before 24^{+0} weeks gestational age but including deaths due to congenital anomalies produced values for the stabilised & adjusted extended perinatal mortality rate which varied from 4.95 to 7.04 deaths per 1,000 total births; whereas excluding both of these high risk groups reduced the value of the stabilised & adjusted extended perinatal mortality rate to between 4.30 and 5.36 deaths per 1,000 total births. When both groups are included the stabilised & adjusted extended perinatal mortality rates showed the highest rates and variation of mortality of between 6.06 and 8.05 deaths per 1,000 total births, a difference of 1.94 deaths per 1,000 total births. Including births from 22^{+0} weeks gestational age but excluding deaths due to congenital anomalies led to stabilised & adjusted extended perinatal mortality rates varying between 5.33 and 6.43 deaths per 1,000 total births across the neonatal networks. Investigating the variation across neonatal networks using the extended perinatal mortality rate showed a reduction in the variation seen for 22^{+0} to 23^{+6} week gestation death, as the bias due to registration differences has no effect on the rates (Figure 22), although some variation is still observed. However, despite their smaller number, deaths from congenital anomalies have a major effect on the variation in extended perinatal mortality rates across neonatal networks.

Given the effect of births at 22^{+0} to 23^{+6} weeks gestational age and deaths due to congenital anomalies on the variation in mortality rates between neonatal networks, analyses including or excluding these groups as appropriate will be considered for future MBRRACE-UK perinatal mortality surveillance reports.

Table 16: Stabilised & adjusted stillbirth rates by neonatal network for births ≥ 24^{+0} and ≥ 22^{+0} weeks gestational age, including and excluding deaths due to congenital anomalies: United Kingdom, for births in 2015

Neonatal network	Stabilised & adjusted stillbirth rates§			
	Including births at 24^{+0} weeks gestational age or later		Including births at 22^{+0} weeks gestational age or later	
	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly
ENGLAND				
Central	3.86	3.49	4.55	4.13
East of England	3.90	3.56	4.50	4.14
North Central and East London	3.82	3.52	4.58	4.17
North West (Cheshire and Merseyside)	3.87	3.54	4.46	4.13
North West (Greater Manchester)	3.88	3.56	4.60	4.20
North West (Lancashire and South Cumbria)	3.92	3.60	4.63	4.21
North West London	3.81	3.48	4.51	4.11
Northern	3.81	3.47	4.41	4.11
South East Coast	3.83	3.51	4.48	4.16
South London	3.86	3.52	4.52	4.14
South West	3.84	3.50	4.47	4.15
Southern West Midlands	3.98	3.65	4.76	4.25
Staffordshire, Shropshire and Black Country	3.86	3.54	4.57	4.19
Thames Valley and Wessex	3.99	3.65	4.67	4.22
Trent	3.87	3.50	4.52	4.14
Yorkshire and Humber	3.93	3.60	4.61	4.20
SCOTLAND				
North of Scotland	3.89	3.54	4.54	4.16
South East Scotland and Tayside	3.88	3.51	4.51	4.13
West of Scotland	3.84	3.50	4.50	4.15
WALES				
Wales	3.91	3.58	4.55	4.19
NORTHERN IRELAND◦				
Northern Ireland◦	3.83	3.45	4.39	4.07

§ excluding terminations of pregnancy
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

Table 17: Stabilised & adjusted neonatal mortality rates by neonatal network for births ≥24^{+0} and ≥22^{+0} weeks gestational age, including and excluding deaths due to congenital anomalies: United Kingdom, for births in 2015

Neonatal network	Stabilised & adjusted neonatal mortality rates[§]			
	Including births at 24^{+0} weeks gestational age or later		Including births at 22^{+0} weeks gestational age or later	
	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly
ENGLAND				
Central	2.09	1.53	2.66	2.09
East of England	1.62	1.18	1.96	1.51
North Central and East London	1.48	0.92	1.77	1.22
North West (Cheshire and Merseyside)	2.19	1.36	2.62	1.80
North West (Greater Manchester)	1.58	1.11	2.07	1.59
North West (Lancashire and South Cumbria)	1.66	1.13	1.99	1.48
North West London	1.15	0.81	1.60	1.22
Northern	1.47	1.00	1.82	1.36
South East Coast	1.40	1.02	1.78	1.41
South London	1.74	1.05	2.20	1.51
South West	1.80	1.16	2.42	1.76
Southern West Midlands	2.79	1.70	3.24	2.18
Staffordshire, Shropshire and Black Country	2.26	1.70	2.92	2.36
Thames Valley and Wessex	1.52	1.15	2.04	1.66
Trent	2.00	1.56	2.44	2.02
Yorkshire and Humber	2.06	1.30	2.52	1.76
SCOTLAND				
North of Scotland	1.61	1.08	2.05	1.51
South East Scotland and Tayside	1.37	0.99	1.80	1.41
West of Scotland	1.47	1.10	1.83	1.47
WALES				
Wales	1.77	1.23	2.15	1.62
NORTHERN IRELAND[◦]				
Northern Ireland[◦]	3.21	1.22	3.53	1.60

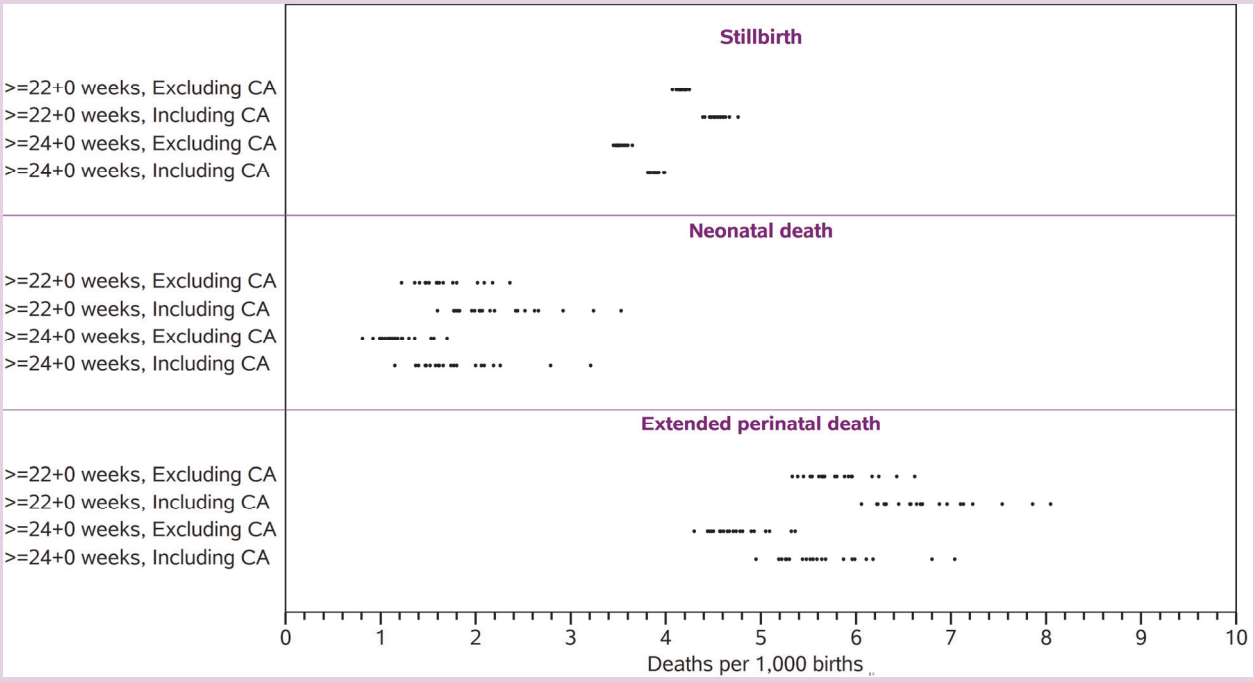
[§] excluding terminations of pregnancy
[◦] different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

Table 18: Stabilised & adjusted extended perinatal mortality rates by neonatal network for births ≥24^{+0} and ≥22^{+0} weeks gestational age, including and excluding deaths due to congenital anomalies: United Kingdom, for births in 2015

Neonatal network	Stabilised & adjusted extended perinatal mortality rates§			
	Including births at 24^{+0} weeks gestational age or later		Including births at 22^{+0} weeks gestational age or later	
	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly	Including deaths due to congenital anomaly	Excluding deaths due to congenital anomaly
ENGLAND				
Central	5.96	5.05	7.23	6.24
East of England	5.52	4.74	6.45	5.64
North Central and East London	5.30	4.44	6.32	5.39
North West (Cheshire and Merseyside)	6.11	4.93	7.10	5.95
North West (Greater Manchester)	5.44	4.65	6.64	5.78
North West (Lancashire and South Cumbria)	5.55	4.71	6.57	5.66
North West London	4.95	4.30	6.06	5.33
Northern	5.26	4.46	6.22	5.45
South East Coast	5.19	4.50	6.23	5.54
South London	5.59	4.57	6.70	5.65
South West	5.64	4.65	6.88	5.92
Southern West Midlands	6.80	5.36	8.05	6.43
Staffordshire, Shropshire and Black Country	6.18	5.32	7.54	6.62
Thames Valley and Wessex	5.48	4.78	6.68	5.88
Trent	5.87	5.09	6.96	6.17
Yorkshire and Humber	5.99	4.90	7.13	5.96
SCOTLAND				
North of Scotland	5.48	4.61	6.58	5.66
South East Scotland and Tayside	5.22	4.48	6.30	5.52
West of Scotland	5.27	4.58	6.31	5.61
WALES				
Wales	5.68	4.81	6.69	5.80
NORTHERN IRELAND◦				
Northern Ireland◦	7.04	4.67	7.86	5.67

§ excluding terminations of pregnancy
◦ different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

Figure 22: Stabilised & adjusted stillbirth rates, neonatal mortality and extended perinatal mortality rates by neonatal network for births ≥24^{+0} and ≥22^{+0} weeks gestational age, including and excluding deaths due to congenital anomalies (CA): United Kingdom, for births in 2015



Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

MBRRACE-UK Recommendation

A national forum should be established by NHS England, NHS Scotland, NHS Wales, and Health and Social Care in Northern Ireland, in conjunction with professional bodies and national healthcare advisors responsible for clinical standards in relevant specialties, to agree the appropriate approach to reporting the influence on overall mortality rates of neonatal deaths and late fetal losses amongst babies born before 24 weeks gestational age and of deaths due to congenital anomalies.

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7. Causes of death

7.1 Reported causes of death

The causes of death reported to MBRRACE-UK using the Cause of Death & Associated Conditions (CODAC) classification system [1] are presented in this chapter. The CODAC system has a three level hierarchical tree of coded causes of death, a full description of which can be found in the paper published by the authors of the CODAC system. The reported CODAC level 1 classification is presented in Table 19 for all stillbirths, neonatal deaths, and extended perinatal deaths for babies born at 24 weeks gestational age or later in 2015.

In the MBRRACE-UK reporting system reporters are asked to complete both a primary cause of death and up to two associated conditions which are coded using the CODAC system. In last year's report there was a focus on the reporting of deaths due to congenital anomalies, reviewing all cases coded as a congenital anomaly being the primary cause of death or one of the associated conditions. Further review of the coding has indicated that where a congenital anomaly is coded as either the primary cause of death or an associated condition the actual cause of death is, in almost all circumstances, due to the congenital anomaly. All cause of death data in this report is therefore presented using congenital anomaly for the cause of death for all cases where a congenital anomaly is coded as either the primary cause of death or an associated condition.

Table 19: Stillbirths, neonatal deaths, and extended perinatal deaths by CODAC level 1 cause of death: United Kingdom and Crown Dependencies, for births in 2015

CODAC cause of death: level 1	Stillbirths§		Neonatal deaths§		Extended perinatal deaths§	
	Number	(%)	Number	(%)	Number	(%)
Infection	116	(3.8)	97	(7.1)	213	(4.8)
Neonatal	45	(1.5)	603	(43.9)	648	(14.7)
Intrapartum	84	(2.8)	34	(2.5)	118	(2.7)
Congenital anomaly	268	(8.8)	454	(33.1)	722	(16.4)
Fetal	150	(4.9)	35	(2.5)	185	(4.2)
Cord	140	(4.6)	5	(0.4)	145	(3.3)
Placenta	822	(27.1)	40	(2.9)	862	(19.6)
Maternal	129	(4.3)	2	(0.1)	131	(3.0)
Unknown	1197	(39.5)	55	(4.0)	1252	(28.4)
Missing	83	(2.7)	48	(3.5)	131	(3.0)

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

The reported level 1 CODAC cause of death for all stillbirths, neonatal deaths and extended perinatal deaths is presented in Table 19. Revision of the cause of death classification for congenital anomalies has resulted in an increase in the percentage for stillbirths and neonatal deaths for this cause when compared to the MBRRACE-UK perinatal mortality surveillance report for births in 2014: 8.8% of stillbirths and 33.1% of neonatal deaths compared with 6.4% and 27.9% respectively in 2014. There has been a halving in the number of deaths attributed to intrapartum causes since the last report: 2.8% of stillbirths and 2.5% of neonatal deaths compared with 5.8% and 4.8%, respectively in 2014. This reduction in deaths due to intrapartum events partly reflects a continued improvement in both the expertise and quality of the coding using the CODAC system, with additional guidance being provided to reporters for this type of death during 2015, but may also show an improvement in perinatal care provision. A random sample of these cases from 2015 are the subject of the current MBRRACE-UK confidential enquiry which will report later in 2017 when we will be able to identify those areas that require further improvement in order to reduce these deaths to an absolute minimum.

For births in 2015, the percentage of stillbirths and neonatal deaths attributed to a placental cause is 27.1% and 2.9% respectively. This is an increase from 21.9% and 1.7% for stillbirths and neonatal deaths in 2014. Although there is still a large percentage of stillbirths of unknown or missing causes of death, the data for 2015 showed a reduction to 42.2%, from 49.4% in 2014. Similarly the proportion of neonatal deaths attributed with an unknown or missing cause of death has reduced to 7.5% in 2015 from 8.9% in 2014.

The CODAC classification system does not have fetal growth restriction as a potential primary cause of death. Using data for all live births and stillbirths known to be alive at the onset of labour in England and Wales during 2013 and 2014, birthweight centile charts have been constructed (and validated using 2015 data) to facilitate the identification of growth restricted babies using recent national data. Using these charts, stillbirths with an unknown primary cause of death were categorised according to whether or not they were potentially growth restricted (<10th centile birthweight for gestational age and sex), recognising the limitation of using these charts for all stillbirths where some will have died a few days prior to delivery thus affecting their birthweight. In addition, for all stillbirths with an unknown primary cause of death, the CODAC system allows for the inclusion of detailed information about the investigations carried out to try to determine the cause of death. Details of the tests carried out for stillbirths with an unknown primary cause of death and whether they were growth restricted are provided in Table 20. Around two thirds of both normally grown and growth restricted stillbirths with an unknown primary cause of death were recorded as having no further information available and thus determined as being unknown, unspecified or unclassifiable. However, data collected separately about placental histology and consent for post-mortem examination on the MBRRACE-UK system provides evidence that users are limiting their coding of primary cause of death to level 1 of CODAC, and failing to take into account tests that have been carried out. This is demonstrated by the fact that only 111 stillbirths had a reported primary CODAC code of 'Unknown despite post-mortem and placenta histology', whereas the full MBRRACE-UK records show that both post-mortem examination and placental histology were actually undertaken for 497 stillbirths with an unknown cause of death. It is important to be able to determine whether the allocation of an unknown cause of death for a stillbirth has been concluded following appropriate testing by accurate use of all three CODAC levels.

Almost one third of stillbirths with an unknown primary cause of death were potentially growth restricted (360 out of 1,190, 30.2%), highlighting the importance of close monitoring of growth during pregnancy [2].

MBRRACE-UK Recommendation

Trusts and Health Boards should ensure that systems are in place to implement appropriate national guidance related to monitoring fetal growth.

Table 20: Number of stillbirths where the primary cause of death was unknown: United Kingdom and Crown Dependencies, for births in 2015

Stillbirths where the CODAC primary cause of death was unknown§	Birthweight < 10th centile ˣ				Placental histology requested		Consent for post-mortem	
	No		Yes					
	N	(%)	N	(%)	N	(%)*	N	(%)*
Unknown / unspecified / unclassifiable	546	(65.8)	252	(70.0)	673	(84.3)	409	(51.1)
Unknown - limited investigation	158	(19.0)	70	(19.4)	205	(88.4)	19	(8.2)
Unknown despite post-mortem and placenta histology	82	(9.9)	29	(8.1)	104	(92.9)	110	(98.2)
Unexplained despite full investigation	44	(5.3)	9	(2.5)	52	(98.1)	43	(81.1)
Total	**830**	**(100.0)**	**360**	**(100.0)**	**1034**	**(86.5)**	**581**	**(48.5)**

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
ˣ birthweight for sex and gestational age at birth
*percentage of CODAC group
Data sources: MBRRACE-UK

As in 2014, approximately 44% of the neonatal deaths in 2015 were attributed to a neonatal cause. In Table 21 a breakdown of level 2 of the CODAC classification is shown for these neonatal deaths. Once again, the vast majority of neonatal deaths were categorised to clearly defined CODAC level 2 categories (unspecified or other, n=36). The classification for causes of death with the largest numbers of neonatal deaths were extreme prematurity, neurological and cardio-respiratory; thus providing additional information for the targeting of interventions to reduce such deaths in the future.

Table 21: Neonatal deaths by CODAC level 1 and level 2 cause of death: United Kingdom and Crown Dependencies, for births in 2015

CODAC cause of death	Neonatal deaths[§]	
	Number	(%)
Infection	**97**	**(7.1)**
Neonatal	**603**	**(43.9)**
Unspecified or other	*36*	*(2.6)*
Extreme prematurity	*194*	*(14.1)*
Neurological	*177*	*(12.9)*
Cardio-respiratory	*148*	*(10.8)*
Gastrointestinal	*62*	*(4.5)*
Multi-organ failure	*33*	*(2.4)*
Trauma or suffocation	*2*	*(0.1)*
Inadequate care	*1*	*(0.1)*
Intrapartum	**34**	**(2.5)**
Congenital anomaly	**454**	**(33.1)**
Fetal	**35**	**(2.5)**
Cord	**5**	**(0.4)**
Placenta	**40**	**(2.9)**
Maternal	**2**	**(0.1)**
Unknown	**55**	**(4.0)**
Missing	**48**	**(3.5)**

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

All reporters using the MBRRACE-UK perinatal surveillance system are encouraged to make use of the additional guidance on the use of CODAC provided and to ensure that they are using the correct CODAC code at all three levels. Reporters are also invited to share their problems and experience of using CODAC with MBRRACE-UK to ensure that solutions and advice can be shared via the frequently asked questions (FAQs) on the MBRRACE-UK online reporting system.

7.2 Post-mortem examination

Information about the offer of post-mortem and whether consent was obtained is collected by MBRRACE-UK. Rates for consent to post-mortem for births in 2015 are presented in Table 22. As in previous years, fewer than half of the parents of stillborn babies and around one quarter of the parents of neonates who died provided consent for full post-mortem. However, the offer of a post-mortem to parents was reported in over 96% of all stillbirths and just under 80% of neonatal deaths.

Whilst the difference between the proportion of deaths where post-mortem was offered and the uptake of the offer by parents is a personal choice, unless a post-mortem is requested by the coroner, the manner in which a post-mortem is offered has a direct effect on the uptake. Post-mortem following stillbirth may not provide a definitive diagnosis of the cause of death but may exclude some of the potential causes and provide valuable information for the counselling of parents for future pregnancies. In the case of neonatal death where the cause

is felt to be known by the clinical team and that a post-mortem is not required, a post-mortem may identify additional conditions or congenital anomalies that would contribute important information for parental counselling.

Placental histology is the single most important component of the investigation of stillbirths and in 2015 this was carried out for 88.8% of stillbirths (2677 out of 3034), a slight improvement from 2014 (88.4%). As indicated in our previous reports placental histology should, if possible, be undertaken for all stillbirths by a specialist pathologist.

Table 22: Number and percentage of post-mortems offered and consented to by type of death (stillbirth, neonatal death, extended perinatal death): United Kingdom and Crown Dependencies, for births in 2015

Post-mortem status	Stillbirths§		Neonatal deaths§		Extended perinatal deaths§	
	Number	(%)	Number	(%)	Number	(%)
Not offered	58	(1.9)	147	(10.7)	205	(4.7)
Not known if offered	42	(1.4)	135	(9.8)	177	(4.0)
Offered but no consent	1416	(46.7)	688	(50.1)	2104	(47.7)
Offered but unknown consent	60	(2.0)	41	(3.0)	101	(2.3)
Offered and limited consent	117	(3.9)	33	(2.4)	150	(3.4)
Offered and full consent	1341	(44.2)	329	(24.0)	1670	(37.9)

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

MBRRACE-UK Recommendation

Placental histology should be undertaken (if possible) for all stillbirths, preferably by a perinatal pathologist.

References

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8. Factors affecting perinatal mortality

Information concerning the main known maternal and baby risk factors for stillbirth and neonatal death is reported through the MBRRACE-UK online reporting system. This chapter focusses on the trends in these factors for stillbirths and neonatal deaths over the first three years of data collection for MBRRACE-UK, i.e. births in 2013 to 2015. For risk factors where denominator data is available for all births, a crude population mortality rate is presented for stillbirths and neonatal deaths, together with an estimate of the relative risk associated with the factor in the form of a ratio of mortality rates (Tables 23 to 30). Some of these factors have been used in order to calculate the stabilised & adjusted mortality rates presented in Chapters 4 and 5. For factors where there is no routine denominator data for all births, the prevalence of the factor for stillbirths and neonatal deaths is presented.

8.1 Mortality rates and ratios of mortality rates: mothers' characteristics

The overall reduction in the stillbirth and neonatal mortality rates from 2013 to 2015, and investigation of the trends in mortality rates for individual characteristics, can help identify whether this reduction occurred primarily within particular groups of mothers or equally across the population. In Tables 23 and 24 it is shown that whilst there has been a reduction in the rate of stillbirth for the youngest mothers (<20 years of age) over the period 2013 to 2015 (from 5.28 to 4.65 stillbirths per 1,000 total births) a similar sized increase in the neonatal mortality rate occurred over the same period (2.35 to 2.95 per 1,000 live births). For older mothers (>40 years age) the stillbirth rate has remained static over this period, whereas the neonatal mortality rate has shown a small reduction (from 2.66 to 2.52 per 1,000 live births). Similar results are also seen for the associated mortality rate ratios by maternal age (Tables 27 and 28).

The direct relationship between higher levels of socio-economic deprivation (based on the mother's postcode of residence at time of delivery, using the Children in Low-Income Families Local Measure [1]) and higher stillbirth and neonatal mortality rates can be seen for all years. A small but steady decline in mortality rates can be observed for all levels of deprivation, with the exception of the stillbirth and neonatal mortality rates for the most deprived mothers which has remained static. Mortality rate ratios for quintiles of socio-economic deprivation have remained fairly constant over time with the exception of the two groups of mothers with the highest levels of socio-economic deprivation, where the neonatal mortality rate ratios have shown a small increase over time (Table 26).

Table 23: Stillbirth rates by mother's age and socio-economic deprivation quintile of residence by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mother's characteristic	Number (%)§						Rate per 1,000 births§		
	Stillbirths						Stillbirths†		
	2013		2014		2015		2013	2014	2015
Mother's age (years)									
<20	160	(5.3)	150	(4.6)	122	(4.0)	5.28	5.11	4.65
20-24	505	(17)	590	(18.1)	500	(16.5)	4.11	4.67	4.22
25-29	794	(26)	833	(25.6)	804	(26.5)	3.93	3.81	3.73
30-34	825	(27)	934	(28.7)	858	(28.3)	3.77	3.89	3.62
35-39	539	(18)	550	(16.9)	573	(18.9)	4.69	4.27	4.36
≥40	160	(5.3)	201	(6.2)	175	(5.8)	5.42	6.29	5.62
Not known	45	(1.5)	0	(0.0)	2	(0.1)	11.19	0.00	0.08
Socio-economic deprivation quintile•									
1 - Least deprived	473	(14)	491	(15.1)	464	(15.3)	3.11	3.23	3.00
2	580	(18)	596	(18.3)	513	(16.9)	3.70	3.82	3.25
3	635	(19)	666	(20.4)	570	(18.8)	4.14	4.35	3.68
4	785	(24)	697	(21.4)	690	(22.7)	5.09	4.52	4.44
5 - Most deprived	790	(24)	771	(23.7)	787	(25.9)	5.08	4.97	5.05
Not known	20	(0.6)	37	(1.1)	10	(0.3)	2.04	3.03	2.09

Table 24: Neonatal mortality rates by mother's age and socio-economic deprivation quintile of residence by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mother's characteristic	Number (%)§						Rate per 1,000 births§		
	Neonatal deaths						Neonatal deaths‡		
	2013		2014		2015		2013	2014	2015
Mother's age (years)									
<20	71	(5.4)	68	(4.9)	77	(5.6)	2.35	2.33	2.95
20-24	248	(18.8)	229	(16.5)	239	(17.4)	2.02	1.82	2.03
25-29	331	(25.0)	352	(25.4)	360	(26.2)	1.65	1.61	1.68
30-34	375	(28.4)	405	(29.3)	377	(27.5)	1.72	1.69	1.60
35-39	219	(16.6)	249	(18.0)	242	(17.6)	1.91	1.94	1.85
≥40	78	(5.9)	78	(5.6)	78	(5.7)	2.66	2.46	2.52
Not known	0	(0.0)	3	(0.2)	0	(0.0)	0.00	0.41	0.00
Socio-economic deprivation quintile•									
1 - Least deprived	234	(16.3)	225	(16.3)	218	(15.9)	1.54	1.48	1.41
2	253	(17.6)	223	(16.1)	237	(17.3)	1.62	1.43	1.51
3	294	(20.5)	260	(18.8)	247	(18.0)	1.93	1.71	1.60
4	292	(20.3)	307	(22.2)	310	(22.6)	1.90	2.00	2.00
5 - Most deprived	348	(24.2)	349	(25.2)	353	(25.7)	2.25	2.26	2.28
Not known	15	(1.0)	20	(1.5)	8	(0.6)	1.53	1.64	1.68

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
† per 1,000 total births
• based on mothers' postcodes at time of delivery, using the Children in Low-Income Families Local Measure
‡ per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 25: Ratios of mortality rates for stillbirth by mother's age and socio-economic deprivation quintile of residence by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mother's characteristic	Ratio of mortality rates (RR)§		
	Stillbirths		
	2013	2014	2015
Mother's age (years)			
<20	1.40 (1.18 to 1.66)	1.32 (1.11 to 1.56)	1.28 (1.06 to 1.55)
20-24	1.09 (0.98 to 1.22)	1.20 (1.09 to 1.33)	1.17 (1.04 to 1.30)
25-29	1.04 (0.95 to 1.15)	0.98 (0.89 to 1.08)	1.03 (0.94 to 1.13)
30-34	Reference	Reference	Reference
35-39	1.24 (1.12 to 1.39)	1.10 (0.99 to 1.22)	1.20 (1.08 to 1.34)
≥40	1.44 (1.21 to 1.70)	1.62 (1.39 to 1.89)	1.55 (1.32 to 1.82)
Socio-economic deprivation quintile•			
1 - Least deprived	Reference	Reference	Reference
2	1.19 (1.05 to 1.34)	1.20 (1.06 to 1.35)	1.08 (0.96 to 1.23)
3	1.33 (1.18 to 1.50)	1.35 (1.20 to 1.51)	1.23 (1.09 to 1.39)
4	1.63 (1.46 to 1.83)	1.41 (1.25 to 1.58)	1.48 (1.31 to 1.66)
5 - Most deprived	1.63 (1.46 to 1.83)	1.53 (1.37 to 1.71)	1.68 (1.50 to 1.89)

Table 26: Ratios of mortality rates for neonatal death by mother's age and socio-economic deprivation quintile of residence by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mother's characteristic	Ratio of mortality rates (RR)§		
	Neonatal deaths		
	2013	2014	2015
Mother's age (years)			
<20	1.37 (1.06 to 1.76)	1.38 (1.06 to 1.78)	1.85 (1.44 to 2.36)
20-24	1.18 (1.00 to 1.38)	1.08 (0.92 to 1.27)	1.27 (1.08 to 1.49)
25-29	0.96 (0.83 to 1.11)	0.95 (0.83 to 1.10)	1.05 (0.91 to 1.21)
30-34	Reference	Reference	Reference
35-39	1.11 (0.94 to 1.31)	1.15 (0.98 to 1.35)	1.16 (0.99 to 1.36)
≥40	1.55 (1.21 to 1.97)	1.45 (1.14 to 1.85)	1.58 (1.24 to 2.01)
Socio-economic deprivation quintile•			
1 - Least deprived	Reference	Reference	Reference
2	1.05 (0.88 to 1.25)	0.98 (0.81 to 1.17)	1.07 (0.89 to 1.28)
3	1.25 (1.05 to 1.48)	1.14 (0.95 to 1.36)	1.13 (0.94 to 1.36)
4	1.23 (1.04 to 1.46)	1.35 (1.14 to 1.60)	1.42 (1.19 to 1.68)
5 - Most deprived	1.46 (1.23 to 1.72)	1.48 (1.25 to 1.75)	1.61 (1.36 to 1.91)

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
• based on mothers' postcodes at time of delivery, using the Children in Low-Income Families Local Measure
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

8.2 Mortality rates and ratios of rates: babies' characteristics

The prevalence of characteristics of babies in terms of sex, multiplicity of birth, ethnicity, gestational age at birth and birthweight and their related ratios of mortality rate for stillbirths and neonatal deaths over the period 2013 to 2015 are presented in Tables 27 to 30. A small reduction in mortality rates over time can be seen for most of the characteristics for both stillbirth and neonatal mortality rates, with similar small variations in their associated mortality rate ratios apart from an increase in the rate of stillbirth for the Black, Black British ethnic group from 7.02 to 8.17 per 1,000 total births.

Table 27: Stillbirth rates by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Baby's characteristic	Number (%)[§]						Rate per 1,000 births[§]		
	Stillbirths						Stillbirths[†]		
	2013		2014		2015		2013	2014	2015
Sex									
Male	1,642	(50.0)	1,594	(48.9)	1,566	(51.6)	4.10	3.98	3.90
Female	1,540	(46.9)	1,562	(47.9)	1,451	(47.8)	4.05	4.09	3.81
Not known	101	(3.1)	102	(3.1)	17	(0.6)			
Multiplicity									
1	3,068	(93.4)	2,975	(91.3)	2,819	(92.9)	4.07	3.96	3.72
2	207	(6.3)	265	(8.1)	200	(6.6)	9.03	11.07	8.34
≥3	8	(0.2)	6	(0.2)	13	(0.4)	12.46	9.98	21.81
Not known	0	(0.0)	12	(0.4)	2	(0.1)			
Baby's ethnicity									
White	1,993	(65.8)	2,145	(65.8)	1,987	(65.5)	3.82	3.78	3.55
Mixed	136	(4.5)	154	(4.7)	162	(5.3)	4.09	4.06	4.11
Asian, Asian British	436	(14.4)	476	(14.6)	433	(14.3)	6.28	6.32	5.88
Black, Black British	225	(7.4)	255	(7.8)	269	(8.9)	7.02	7.49	8.17
Other	64	(2.1)	65	(2.0)	71	(2.3)	4.63	4.11	3.56
Refused/Not Known	174	(5.7)	151	(4.6)	112	(3.7)			
Gestational age at birth (weeks)									
24^{+0}-27^{+6}	731	(22.2)	726	(22.2)	733	(24.2)	222.66	227.09	227.57
28^{+0}-31^{+6}	516	(15.7)	538	(16.4)	495	(16.3)	82.60	83.15	75.48
32^{+0}-36^{+6}	790	(24.0)	806	(24.6)	762	(25.1)	17.50	16.32	15.35
37^{+0}-41^{+6}	1,210	(36.8)	1,151	(35.1)	1,025	(33.8)	1.89	1.67	1.51
≥42^{+0}	35	(1.1)	21	(0.6)	15	(0.5)	1.55	0.96	0.79
Not known	4	(0.1)	35	(1.1)	4	(0.1)			
Birthweight (g)									
<1,500	1,307	(39.8)	1,306	(40.1)	1,283	(42.3)	163.64	163.31	156.23
1,500-2,499	728	(22.2)	754	(23.1)	691	(22.8)	17.03	16.39	14.75
2,500-3,499	893	(27.2)	867	(26.6)	813	(26.8)	2.43	2.19	2.05
3,500-4,499	295	(9.0)	270	(8.3)	218	(7.2)	1.04	0.90	0.71
≥4,500	23	(0.7)	18	(0.6)	13	(0.4)	1.96	1.44	1.03
Not known	37	(1.1)	43	(1.3)	16	(0.5)			

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[†] per 1,000 total births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 28: Neonatal mortality rates by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Baby's characteristic	Number (%)§						Rate per 1,000 births§		
	Neonatal deaths						Neonatal deaths‡		
	2013		2014		2015		2013	2014	2015
Sex									
Male	795	(55.4)	727	(52.5)	819	(59.7)	1.99	1.82	2.05
Female	621	(43.3)	623	(45.0)	553	(40.3)	1.64	1.64	1.46
Not known	20	(1.4)	34	(2.5)	1	(0.1)			
Multiplicity									
1	1,240	(86.3)	1,193	(86.2)	1,235	(89.9)	1.65	1.59	1.64
2	182	(12.7)	185	(13.4)	125	(9.1)	8.01	7.81	5.26
≥3	13	(0.9)	5	(0.4)	13	(0.9)	20.50	8.40	22.30
Not known	1	(0.1)	1	(0.1)	0	(0.0)			
Baby's ethnicity									
White	900	(68.1)	959	(69.3)	953	(69.4)	1.73	1.70	1.71
Mixed	45	(3.4)	53	(3.8)	65	(4.7)	1.36	1.40	1.66
Asian, Asian British	175	(13.2)	175	(12.6)	183	(13.3)	2.54	2.34	2.50
Black, Black British	89	(6.7)	82	(5.9)	80	(5.8)	2.80	2.43	2.45
Other	33	(2.5)	35	(2.5)	32	(2.3)	2.40	2.22	1.61
Refused/Not Known	80	(6.1)	75	(5.4)	60	(4.4)			
Gestational age at birth (weeks)									
24^{+0}-27^{+6}	445	(31.0)	384	(27.2)	387	(28.2)	174.37	155.40	155.55
28^{+0}-31^{+6}	202	(14.1)	182	(12.9)	207	(15.1)	35.25	30.68	34.14
32^{+0}-36^{+6}	241	(16.8)	311	(22.0)	271	(19.7)	5.43	6.40	5.54
37^{+0}-41^{+6}	517	(36.0)	510	(36.1)	500	(36.4)	0.81	0.74	0.74
≥42^{+0}	16	(1.1)	10	(0.7)	7	(0.5)	0.71	0.46	0.37
Not known	15	(1.0)	15	(1.1)	1	(0.1)			
Birthweight (g)									
<1,500	617	(43.0)	558	(40.3)	553	(40.3)	92.37	83.40	79.81
1,500-2,499	272	(18.9)	298	(21.5)	303	(22.1)	6.47	6.58	6.56
2,500-3,499	370	(25.8)	359	(25.9)	367	(26.7)	1.01	0.91	0.93
3,500-4,499	134	(9.3)	137	(9.9)	127	(9.2)	0.47	0.46	0.41
≥4,500	12	(0.8)	8	(0.6)	10	(0.7)	1.02	0.64	0.79
Not known	31	(2.2)	24	(1.7)	13	(0.9)			

§ excluding terminations of pregnancy and births <24^{+0} weeks gestational age
‡ per 1,000 live births
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 29: Ratios of mortality rates for stillbirth by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Baby's characteristic	Ratio of mortality rates (RR)[§]		
	Stillbirths		
	2013	2014	2015
Sex			
Male	1.01 (0.94 to 1.09)	0.97 (0.91 to 1.04)	1.02 (0.95 to 1.10)
Female	Reference	Reference	Reference
Multiplicity			
1	Reference	Reference	Reference
2	2.22 (1.93 to 2.56)	2.80 (2.47 to 3.17)	2.24 (1.94 to 2.59)
≥3	3.06 (1.53 to 6.13)	2.52 (1.13 to 5.62)	5.86 (3.40 to 10.10)
Baby's ethnicity			
White	Reference	Reference	Reference
Mixed	1.07 (0.90 to 1.27)	1.07 (0.91 to 1.27)	1.16 (0.99 to 1.36)
Asian, Asian British	1.64 (1.48 to 1.82)	1.67 (1.51 to 1.85)	1.66 (1.49 to 1.84)
Black, Black British	1.84 (1.60 to 2.11)	1.98 (1.74 to 2.26)	2.30 (2.03 to 2.61)
Other	1.21 (0.95 to 1.56)	1.09 (0.85 to 1.39)	1.00 (0.79 to 1.27)
Gestational age at birth (weeks)			
24^{+0}-27^{+6}	118.11 (107.75 to 129.46)	136.13 (124.06 to 149.38)	150.45 (136.84 to 165.41)
28^{+0}-31^{+6}	43.81 (39.52 to 48.57)	49.83 (44.98 to 55.20)	49.90 (44.82 to 55.55)
32^{+0}-36^{+6}	9.28 (8.49 to 10.15)	9.78 (8.94 to 10.70)	10.15 (9.24 to 11.14)
37^{+0}-41^{+6}	Reference	Reference	Reference
≥42^{+0}	0.82 (0.59 to 1.15)	0.58 (0.37 to 0.89)	0.52 (0.31 to 0.87)
Birthweight (g)			
<1,500	156.65 (138.06 to 177.75)	181.26 (159.00 to 206.63)	220.00 (190.57 to 253.96)
1,500-2,499	16.30 (14.24 to 18.67)	18.19 (15.83 to 20.90)	20.77 (17.84 to 24.19)
2,500-3,499	2.33 (2.04 to 2.65)	2.43 (2.12 to 2.79)	2.89 (2.49 to 3.35)
3,500-4,499	Reference	Reference	Reference
≥4,500	1.88 (1.23 to 2.87)	1.60 (0.99 to 2.58)	1.45 (0.83 to 2.53)

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Table 30: Ratios of mortality rates for neonatal death by baby's sex, multiplicity of birth, ethnicity, gestational age, and birthweight by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Baby's characteristic	Ratio of mortality rates (RR)[§]		
	Neonatal deaths		
	2013	2014	2015
Sex			
Male	1.22 (1.09 to 1.35)	1.11 (1.00 to 1.24)	1.40 (1.26 to 1.56)
Female	Reference	Reference	Reference
Multiplicity			
1	Reference	Reference	Reference
2	4.86 (4.16 to 5.67)	4.91 (4.20 to 5.73)	3.21 (2.67 to 3.86)
≥3	12.43 (7.19 to 21.46)	5.28 (2.19 to 12.70)	13.62 (7.89 to 23.53)
Baby's ethnicity			
White	Reference	Reference	Reference
Mixed	0.79 (0.58 to 1.06)	0.83 (0.63 to 1.09)	0.97 (0.75 to 1.25)
Asian, Asian British	1.46 (1.25 to 1.72)	1.38 (1.17 to 1.62)	1.46 (1.25 to 1.71)
Black, Black British	1.62 (1.30 to 2.01)	1.43 (1.14 to 1.79)	1.43 (1.14 to 1.80)
Other	1.39 (1.98 to 1.96)	1.31 (0.94 to 1.84)	0.94 (0.66 to 1.34)
Gestational age at birth (weeks)			
24^{+0}-27^{+6}	216.06 (190.34 to 245.26)	209.92 (183.88 to 239.64)	210.49 (184.33 to 240.36)
28^{+0}-31^{+6}	43.67 (37.12 to 51.39)	41.43 (34.98 to 49.07)	46.20 (39.29 to 54.33)
32^{+0}-36^{+6}	6.73 (5.78 to 7.84)	8.64 (7.51 to 9.95)	7.50 (6.47 to 8.70)
37^{+0}-41^{+6}	Reference	Reference	Reference
≥42^{+0}	0.88 (0.53 to 1.44)	0.62 (0.33 to 1.16)	0.50 (0.24 to 1.05)
Birthweight (g)			
<1,500	194.45 (161.32 to 234.39)	182.25 (151.19 to 219.70)	192.77 (158.96 to 233.77)
1,500-2,499	13.63 (11.08 to 16.76)	14.39 (11.75 to 17.62)	15.86 (12.89 to 19.51)
2,500-3,499	2.13 (1.74 to 2.59)	1.99 (1.63 to 2.42)	2.24 (1.83 to 2.74)
3,500-4,499	Reference	Reference	Reference
≥4,500	2.16 (1.19 to 3.89)	1.40 (0.69 to 2.87)	1.91 (1.00 to 3.63)

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

Once again, in 2015 for stillbirths there is no excess risk of mortality for males whereas, for neonatal death, male babies show a significant excess risk of 40% compared with female babies. The trend in the pattern of the ratios of mortality rates for baby's ethnicity is similar over the years for both stillbirth and neonatal death; the relative risk of stillbirth is higher for babies of Black or Black British ethnicity (130% increased risk) and Asian or Asian British ethnicity (66% increased risk) than for babies of White ethnicity, and around 45% increased risk of neonatal death in both these groups.

8.3 Mothers' demographic, behavioural and pregnancy characteristics of deaths

Data is collected by MBRRACE-UK for a number of the mothers' characteristics known to be associated with increased perinatal mortality but for which UK-wide denominator data is not available. Therefore, mortality rates cannot be calculated for these characteristics. In Table 31 to Table 36 the prevalence of these factors is presented for stillbirths and neonatal deaths for each year of MBRRACE-UK data collection, i.e. 2013 to 2015. These tables show demographic, behavioural and pregnancy characteristics. Over time, MBRRACE-UK has been monitoring the completeness of this data for both stillbirths and neonatal deaths; a large proportion of missing data for the neonatal deaths seemed to be due to data that is only available in the maternal notes. Reporters to MBRRACE-UK are now familiar with the reporting system and frequently use the facility to temporarily assign cases between the Trusts and Health Boards where care was provided in order to facilitate data collection from the maternal notes. This can be clearly seen for all maternal characteristics in the tables in this chapter, where there has been a reduction in the percentage of stillbirths and neonatal deaths with missing data. There is, however, still room for further improvement in data quality and completeness, and Trusts and Health Boards are encouraged to check their data completeness in the overall summary of the data completeness for key variables which can be found in Figure 28 and Table 38 (see Appendix A5), which provide information for the UK as a whole and for individual Trusts and Health Boards.

MBRRACE-UK Recommendation

All Trusts and Health Boards should endeavour to continue to improve the quality and completeness of data reported to MBRRACE-UK. Children's hospitals should develop and embed systems that allow for consistent liaison with birth hospitals to facilitate the collection of maternal details.

As in last year's report, the results from breath carbon monoxide testing to monitor smoking during pregnancy are collected by MBRRACE-UK and presented in Table 33 for stillbirths and Table 34 for neonatal deaths. This information will facilitate the evaluation of this aspect of the Stillbirth Care Bundle from NHS England [4] (which was launched in March 2016) and other initiatives which indicate that a carbon monoxide (CO) test should be provided to all pregnant women at booking to determine their smoking status and to encourage women to quit [5]. Around one fifth of the mothers of both stillbirths and neonatal deaths were identified as smoking throughout pregnancy in 2015. This is substantially higher than the 10.6% prevalence of smoking reported for all women at the time of delivery in England in 2015-16 [6], and higher than in Scotland where 17.3% of pregnant women reported smoking at booking in 2015 [7]. Overall, although the data collection for carbon monoxide has improved from 2014, this information is still missing for two thirds of stillbirths and neonatal deaths.

Table 31: Stillbirths by mothers' demographic characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' demographic characteristics	Number (%)[§]					
	Stillbirths					
	2013		2014		2015	
Body Mass Index						
<16.0	4	(0.1)	6	(0.2)	9	(0.3)
16.0 to 18.4	87	(2.7)	79	(2.5)	70	(2.3)
18.5 to 24.9	1,268	(39.0)	1,297	(40.4)	1,163	(38.3)
25.0 to 29.9	917	(28.2)	884	(27.5)	806	(26.6)
30.0 to 34.9	479	(14.7)	446	(13.9)	449	(14.8)
≥35.0	306	(9.4)	333	(10.4)	314	(10.3)
Not known	194	(6.0)	165	(5.1)	223	(7.4)
Previous obstetric history[v]						

Mothers' demographic characteristics	Number (%)[§]					
	Stillbirths					
	2013		2014		2015	
Never pregnant	1,212	(37.3)	1,185	(36.9)	1,101	(38.2)
Stillbirth or neonatal death	163	(5.0)	165	(5.1)	117	(4.1)
Pre 24 week loss	856	(26.3)	868	(27.0)	652	(22.6)
Surviving child	1,558	(47.9)	1,579	(49.2)	1,520	(52.7)
Not known	68	(2.1)	27	(0.8)	8	(0.3)
Consanguinity						
Unrelated	2,681	(82.4)	2,696	(84.0)	2,636	(86.9)
First cousins or closer	84	(2.6)	88	(2.7)	80	(2.6)
Other relation	56	(1.7)	43	(1.3)	27	(0.9)
Not known	434	(13.3)	383	(11.9)	291	(9.6)
Born in the UK						
Yes	2,125	(65.3)	2,154	(67.1)	1,968	(64.9)
No	779	(23.9)	793	(24.7)	791	(26.1)
Not known	351	(10.8)	263	(8.2)	275	(9.1)
Time resident in the UK[~]						
Less than 1 year	93	(2.9)	79	(2.5)	70	(2.3)
More than 1 year	2,792	(85.8)	3072	(94.4)	2894	(95.4)
Not known	370	(11.4)	101	(3.2)	71	(2.3)
Support during pregnancy						
Partner, cohabiting	2,650	(81.4)	2,664	(83.0)	2,526	(83.3)
Partner, not cohabiting	180	(5.5)	192	(6.0)	191	(6.3)
Family/friend	227	(7.0)	224	(7.0)	220	(7.3)
None	37	(1.1)	26	(0.8)	30	(1.0)
Not known	161	(4.9)	104	(3.2)	67	(2.2)
Employment status						
Employed or self-employed	1,756	(53.9)	1,778	(55.4)	1,789	(59.0)
Unemployed (looking for work)	455	(14.0)	419	(13.1)	329	(10.8)
Retired	0	(0.0)	0	(0.0)	0	(0.0)
Student	103	(3.2)	93	(2.9)	88	(2.9)
Looking after home/family	585	(18.0)	608	(18.9)	610	(20.1)
Permanently sick/disabled	11	(0.3)	8	(0.3)	16	(0.5)
Other	36	(1.1)	26	(0.8)	26	(0.9)
Not known	309	(9.5)	278	(8.7)	176	(5.8)

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[v] multiparous mothers can be included in more than one category
[~] women not born in the UK
Data sources: MBRRACE-UK

Table 32: Neonatal deaths by mothers' demographic characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' demographic characteristics	Number (%)[§]					
	Neonatal deaths					
	2013		2014		2015	
Body Mass Index						
<16.0	0	(0.0)	4	(0.3)	3	(0.2)
16.0 to 18.4	24	(1.7)	23	(1.7)	41	(3.0)
18.5 to 24.9	341	(24.2)	400	(29.3)	449	(32.7)
25.0 to 29.9	233	(16.5)	267	(19.5)	274	(20.0)
30.0 to 34.9	132	(9.3)	137	(10.0)	153	(11.1)
≥35.0	76	(5.4)	102	(7.5)	107	(7.8)
Not known	606	(42.9)	433	(31.7)	346	(25.2)
Previous obstetric history[ν]						
Never pregnant	544	(38.4)	515	(37.7)	437	(33.5)
Stillbirth or neonatal death	79	(5.6)	63	(4.6)	83	(6.4)
Pre 24 week loss	335	(23.7)	358	(26.2)	339	(26.0)
Surviving child	634	(44.8)	678	(49.6)	721	(55.3)
Not known	83	(5.9)	28	(2.0)	10	(0.8)
Consanguinity						
Unrelated	983	(69.6)	1,047	(76.7)	1,118	(81.4)
First cousins or closer	42	(3.0)	41	(3.0)	51	(3.7)
Other relation	20	(1.4)	17	(1.2)	23	(1.7)
Not known	367	(26.0)	261	(19.1)	181	(13.2)
Born in the UK						
Yes	795	(54.2)	837	(61.3)	925	(67.4)
No	223	(15.8)	213	(15.6)	235	(17.1)
Not known	424	(30.0)	316	(23.1)	213	(15.5)
Time resident in the UK~						
Less than 1 year	22	(1.6)	15	(1.1)	20	(1.5)
More than 1 year	948	(67.1)	1314	(96.2)	1314	(95.7)
Not known	442	(31.3)	37	(2.7)	39	(2.8)
Support during pregnancy						
Partner, cohabiting	1,053	(74.6)	1,090	(79.8)	1,120	(81.6)
Partner, not cohabiting	70	(5.0)	79	(5.8)	101	(7.4)
Family/friend	63	(4.5)	54	(4.0)	83	(6.0)
None	3	(0.2)	7	(0.5)	8	(0.6)
Not known	223	(15.8)	136	(10.0)	61	(4.4)
Employment status						
Employed or self-employed	629	(44.5)	654	(47.9)	689	(50.2)
Unemployed (looking for work)	144	(10.2)	124	(9.1)	132	(9.6)
Retired	0	(0.0)	0	(0.0)	0	(0.0)
Student	41	(2.9)	36	(2.6)	38	(2.8)
Looking after home/family	205	(14.5)	234	(17.1)	286	(20.8)
Permanently sick/disabled	6	(0.4)	4	(0.3)	1	(0.1)
Other	12	(0.8)	14	(1.0)	8	(0.6)
Not known	375	(26.6)	299	(21.9)	219	(16.0)

§ excluding terminations of pregnancy and births <24+0 weeks gestational age
ᵛ multiparous mothers can be included in more than one category
˜ women not born in the UK
Data sources: MBRRACE-UK

Table 33: Stillbirths by mothers' behavioural characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' behavioural characteristics	Number (%)§					
	Stillbirths					
	2013		2014		2015	
Smoking status						
Never smoked	2,043	(62.8)	2,029	(63.2)	1,920	(63.3)
Gave up before pregnancy	285	(8.8)	295	(9.2)	273	(9.0)
Gave up during pregnancy	140	(4.3)	130	(4.1)	137	(4.5)
Smoker	658	(20.2)	657	(20.5)	605	(19.9)
Not known	129	(4.0)	99	(3.1)	99	(3.3)
Breath carbon monoxide (ppm)						
<3			582	(18.1)	796	(26.2)
3-6			84	(2.6)	129	(4.3)
7-9			36	(1.1)	40	(1.3)
10+			108	(3.4)	124	(4.1)
Unknown			2,400	(74.8)	1,945	(64.1)
Alcohol consumption pre-pregnancy (weekly)						
0 units	1,863	(57.2)	1,871	(58.3)	1,931	(63.6)
1-2	177	(5.4)	176	(5.5)	200	(6.6)
3-5	128	(3.9)	144	(4.5)	129	(4.3)
6-14	146	(4.5)	164	(5.1)	150	(4.9)
≥15	40	(1.2)	40	(1.3)	34	(1.1)
Not known	901	(27.7)	815	(25.4)	590	(19.4)
Alcohol consumption at booking (weekly)						
0 units	2,446	(75.1)	2,464	(76.8)	2,545	(83.9)
1-2	43	(1.3)	34	(1.1)	30	(1.0)
3-5	19	(0.6)	16	(0.5)	14	(0.5)
6-14	12	(0.4)	14	(0.4)	14	(0.5)
≥15	7	(0.2)	8	(0.3)	4	(0.1)
Not known	728	(22.4)	674	(21.0)	427	(14.1)
Substance abuse						
No	3,049	(93.7)	3,039	(94.7)	2,879	(94.9)
Yes	77	(2.4)	91	(2.8)	83	(2.7)
Not known	129	(4.0)	80	(2.5)	72	(2.4)

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

Table 34: Neonatal deaths by mothers' behavioural characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' behavioural characteristics	Number (%)§					
	Neonatal deaths					
	2013		2014		2015	
Smoking status						
Never smoked	758	(53.7)	798	(58.4)	797	(58.0)
Gave up before pregnancy	67	(4.7)	75	(5.5)	82	(6.0)
Gave up during pregnancy	37	(2.6)	36	(2.6)	52	(3.8)
Smoker	256	(18.1)	240	(17.6)	290	(21.1)
Not known	294	(20.8)	217	(15.9)	152	(11.1)
Breath carbon monoxide (ppm)						
<3			204	(14.9)	306	(22.3)
3-6			17	(1.2)	44	(3.2)
7-9			11	(0.8)	16	(1.2)
10+			28	(2.0)	54	(3.9)
Unknown			1,106	(81.0)	953	(69.4)
Alcohol consumption pre-pregnancy (weekly)						
0 units	607	(43.0)	618	(45.2)	769	(56.0)
1-2	33	(2.3)	48	(3.5)	58	(4.2)
3-5	22	(1.6)	33	(2.4)	47	(3.4)
6-14	39	(2.8)	37	(2.7)	50	(3.6)
≥15	14	(1.0)	8	(0.6)	9	(0.7)
Not known	697	(49.4)	622	(45.5)	440	(32.0)
Alcohol consumption at booking (weekly)						
0 units	752	(53.3)	801	(58.6)	1,020	(74.3)
1-2	13	(0.9)	7	(0.5)	12	(0.9)
3-5	6	(0.4)	2	(0.2)	6	(0.4)
6-14	2	(0.1)	2	(0.2)	6	(0.4)
≥15	2	(0.1)	1	(0.1)	1	(0.1)
Not known	637	(45.1)	553	(40.5)	328	(23.9)
Substance abuse						
No	1,157	(81.9)	1,166	(85.4)	1,244	(90.6)
Yes	26	(1.8)	30	(2.2)	47	(3.4)
Not known	229	(16.2)	170	(12.4)	82	(6.0)

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

Table 35: Stillbirths by mothers' pregnancy characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' pregnancy characteristics	Number (%)§					
	Stillbirths					
	2013		2014		2015	
Booking (weeks gestational age)						
Less than 12^{+0}	2,138	(65.7)	2,194	(68.3)	2,103	(69.3)
12^{+0} to 17^{+6}	642	(19.7)	597	(18.6)	566	(18.7)
18^{+0}	270	(8.3)	236	(7.3)	217	(7.2)
Not known	205	(6.3)	183	(5.7)	148	(4.9)
Documented poor antenatal care attender						
No	2,913	(89.5)	2,936	(91.5)	2,805	(92.5)
Yes	106	(3.3)	104	(3.2)	114	(3.8)
Not known	236	(7.3)	170	(5.3)	115	(3.8)
Assisted conception						
Not assisted	2,952	(90.7)	2,980	(92.8)	2,850	(93.9)
Ovulation induction only	36	(1.1)	20	(0.6)	26	(0.9)
In vitro fertilisation (IVF)◦	89	(2.7)	112	(3.5)	102	(3.4)
Artificial insemination▫	3	(0.1)	13	(0.4)	3	(0.1)
Not known	175	(5.4)	85	(2.7)	53	(1.7)

Table 36: Neonatal deaths by mothers' pregnancy characteristics by year: United Kingdom and Crown Dependencies, for births in 2013 to 2015

Mothers' pregnancy characteristics	Number (%)§					
	Neonatal deaths					
	2013		2014		2015	
Booking (weeks gestational age)						
Less than 12^{+0}	590	(41.8)	678	(49.6)	757	(55.1)
12^{+0} to 17^{+6}	157	(11.1)	204	(14.9)	240	(17.5)
18^{+0}	79	(5.6)	69	(5.1)	85	(6.2)
Not known	586	(41.5)	415	(30.4)	291	(21.2)
Documented poor antenatal care attender						
No	981	(69.5)	1,037	(75.9)	1,123	(81.8)
Yes	23	(1.6)	26	(1.9)	29	(2.1)
Not known	408	(28.9)	303	(22.2)	221	(16.1)
Assisted conception						
Not assisted	1,002	(71.0)	1,059	(77.5)	1,145	(83.4)
Ovulation induction only	6	(0.4)	5	(0.4)	8	(0.6)
In vitro fertilisation (IVF)◦	75	(5.3)	60	(4.4)	68	(5.0)
Artificial insemination▫	2	(0.1)	3	(0.2)	2	(0.1)
Not known	327	(23.2)	239	(17.5)	150	(10.9)

§ 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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Key Findings

1. The rate of extended perinatal mortality in the UK has fallen from 6.04 to 5.61 deaths per 1,000 total births over the period 2013 to 2015 for babies born at 24^{+0} weeks gestational age or later.

2. The fall in the extended perinatal mortality rate for the UK is mainly due to a reduction in the rate of stillbirth, which has fallen from 4.20 to 3.87 stillbirths per 1,000 total births, in particular for antepartum stillbirths of at least 32^{+0} weeks gestational age.

3. There has been a small change in the rate of neonatal mortality in the UK over the period 2013 to 2015 from 1.84 to 1.74 deaths per 1,000 live births.

4. Deaths to babies born before 24^{+0} weeks gestational age (both late fetal losses and neonatal deaths) and deaths due to congenital anomalies account for much of the variation in mortality rates between health organisations and geographical areas.

5. For the Trusts and Health Boards which care for the most complex pregnancies and deliveries, the reported mortality rates are likely to reflect their high-risk case-mix which cannot be fully accounted for by stabilisation and adjustment.

6. Data for Sustainability and Transformation Plan (STP) footprints (presented for the first time in this report) shows that there are marked variations in stabilised & adjusted rates of neonatal mortality between those areas in the north of England compared to those in the south, with rates ranging from 1.17 to 2.45 deaths per 1,000 live births.

7. Whilst there has been a steady improvement in data quality overall there continues to be a problem with the completion of maternal data for deaths occurring in children's hospitals.

8. There has been little improvement in the percentage of stillbirths in the UK for which placental histology is carried out: 88.8% in 2015 compared to 88.4% in 2014.

9. Almost one third of stillbirths (30.3%: 360 out of 1,190) with an unknown primary cause of death were potentially growth restricted (<10th centile birth weight).

10. Significant variation in the rates of extended perinatal mortality across the UK persist, even after taking into account the effects of chance variation and the case-mix differences we are able to account for, with stabilised & adjusted extended perinatal mortality rates for commissioning organisations ranging from 5.00 to 6.75 deaths per 1,000 total births.

Recommendations

1. Close monitoring of mortality rates is required to ensure that the decline in rates of stillbirth is continued in order to meet Government ambitions. (Page 24)

2. A renewed focus on neonatal deaths is required in order to achieve a significant reduction in neonatal mortality rates from the position seen over the past three years. (Page 24)

3. More research is required to identify the extent to which deaths before 32 weeks gestational age are avoidable and to try to develop practices and policies which could reduce potential variation in management across the UK. (Page 21)

4. A national forum should be established by NHS England, NHS Scotland, NHS Wales, and Health and Social Care in Northern Ireland, in conjunction with professional bodies and national healthcare advisors responsible for clinical standards in relevant specialties, to agree the appropriate approach to reporting the influence on overall mortality rates of neonatal deaths and late fetal losses amongst babies born before 24 weeks gestational age and of deaths due to congenital anomalies. (Page 85)

5. Those Trusts and Health Boards providing the most complex care to particularly high-risk mothers and babies should ensure that the data provided to MBRRACE-UK is of the highest quality. This will permit more appropriate sub-analyses and comparisons. (Page 53)

6. Sustainability and Transformation Plans (STPs) in England need to address existing inequalities, particularly in relation to neonatal mortality. (Page 41)

7. All Trusts and Health Boards should endeavour to continue to improve the quality and completeness of data reported to MBRRACE-UK. Children's hospitals should develop and embed systems that allow for consistent liaison with birth hospitals to facilitate the collection of maternal details. (Page 98)

8. Placental histology should be undertaken (if possible) for all stillbirths, preferably by a perinatal pathologist. (Page 90)

9. Trusts and Health Boards should ensure that systems are in place to implement appropriate national guidance related to monitoring fetal growth. (Page 88)

10. There is a continuing need for Trusts and Health Boards with a stabilised & adjusted extended perinatal mortality rate that falls in the red or amber band to conduct a local review in order to develop an action plan to improve the quality of their care provision. However, all Trusts and Health Boards, irrespective of their extended perinatal mortality rate, should investigate individual stillbirths and neonatal deaths using a standardised process and independent multidisciplinary peer review as recommended in the Report of the Morecambe Bay Investigation as well as by the Perinatal Mortality Review Task and Finish Group convened by Sands and the Department of Health. The information within the MBRRACE-UK Perinatal Surveillance Reports (including the reports for individual Trusts and Health Boards) and recommendations from MBRRACE-UK Confidential Enquiries can facilitate this process. (Page 50)

Appendices

A1. Perinatal mortality in the UK from routine sources

Data presented in Table 37 shows the stillbirth, neonatal death and extended perinatal death rates in the UK for 2005 to 2015 obtained from statutory registered births and deaths.

Table 37: Total stillbirth, neonatal, and extended perinatal mortality rates from statutory registrations by country: United Kingdom, 2005 to 2015

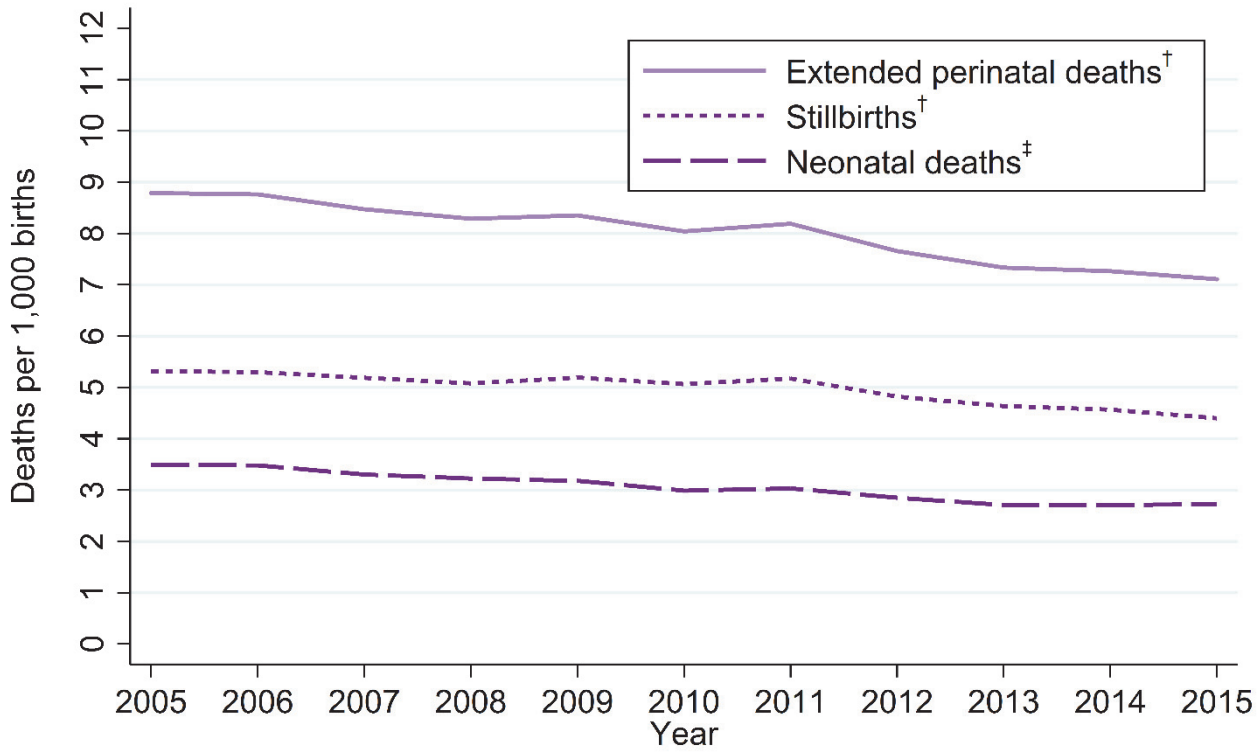
Rate per 1,000 births	Country	Year of death										
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Stillbirths†	UK	5.32	5.30	5.19	5.08	5.19	5.07	5.17	4.82	4.64	4.57	4.40
	England	5.35	5.35	5.18	5.07	5.17	5.08	5.23	4.81	4.65	4.59	4.42
	Scotland	5.34	5.29	5.63	5.38	5.34	4.93	5.08	4.70	4.16	4.00	3.81
	Wales	5.34	5.09	4.94	4.61	5.13	5.26	4.67	5.11	4.51	5.25	4.73
	Northern Ireland	3.97	3.81	4.15	4.47	4.75	4.13	3.59	4.18	4.51	3.31	3.13
Neonatal deaths‡	UK	3.50	3.46	3.26	3.18	3.12	2.96	2.95	2.85	2.71	2.71	2.72
	England	3.45	3.49	3.24	3.18	3.10	2.93	2.94	2.86	2.71	2.69	2.73
	Scotland	3.49	3.09	3.25	2.80	2.79	2.55	2.71	2.55	2.34	2.42	2.03
	Wales	2.88	2.68	3.31	2.95	3.09	2.73	2.75	2.92	2.43	2.38	2.46
	Northern Ireland	4.97	3.87	3.31	3.71	3.89	4.58	3.48	2.77	3.38	3.94	4.21
Extended perinatal deaths†	UK	8.80	8.74	8.43	8.24	8.30	8.01	8.11	7.59	7.33	7.26	7.11
	England	8.79	8.82	8.40	8.24	8.25	8.00	8.16	7.58	7.34	7.26	7.14
	Scotland	8.82	8.36	8.86	8.17	8.12	7.46	7.78	7.24	6.49	6.41	5.84
	Wales	8.21	7.75	8.24	7.54	8.2	7.97	7.41	7.85	6.93	7.62	7.18
	Northern Ireland	8.92	7.66	7.45	8.16	8.63	8.69	7.06	6.94	7.87	7.23	7.33

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

Differences in the law in Northern Ireland relating to the termination of pregnancy means that a greater proportion of babies with severe congenital anomalies are carried to term, but then die after birth. This may well be responsible for the relatively high rate of neonatal death for Northern Ireland.

The UK-wide rates are also shown in Figure 23.

Figure 23: Total stillbirth, neonatal and extended perinatal mortality rates from statutory registrations: United Kingdom, 2005 to 2015



Data sources: ONS, NRS & NISRA

† per 1,000 total births
‡ per 1,000 live births

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A2. MBRRACE-UK Lead Reporters

Dawn Apsee	Intrapartum Service Lead Midwife - Princess of Wales Hospital & Singleton Hospital	Abertawe Bro Morgannwg University Health Board
Joanna Webb	Consultant Neonatologist - Singleton Hospital	Abertawe Bro Morgannwg University Health Board
Beverley Beaumont	Labour Ward Coordinator - Airedale General Hospital	Airedale NHS Foundation Trust
Kathleen Graham	Consultant Obstetrician - Airedale General Hospital	Airedale NHS Foundation Trust
Sarah Stephenson	Quality and Governance Manager	Alder Hey Children's NHS Foundation Trust
Christine Bradley	Quality and Patient Safety Coordinator	Aneurin Bevan Health Board
Clare Payne	Senior Nurse Neonatal Services - Royal Gwent Hospital and Nevill Hall Hospital	Aneurin Bevan Health Board
Deb Jackson	Head of Midwifery - Nevill Hall Hospital	Aneurin Bevan Health Board
Jayne Beasley	Senior Midwifery Manager	Aneurin Bevan Health Board
Louise Taylor	Senior Midwifery Manager - Royal Gwent Hospital and Nevill Hall Hospital	Aneurin Bevan Health Board
Helen Barrington	Deputy Sister Neonatal Unit - St Peter's Hospital	Ashford & St Peter's Hospital NHS Foundation Trust
Jacqui Rees	Clinical Quality Lead, Women's Health & Paediatrics	Ashford & St Peter's Hospital NHS Foundation Trust
Sandra Simpson	Bereavement Support Midwife	Ashford & St Peter's Hospital NHS Foundation Trust
Zara Chamberlain	Birth Reflection/Counselling Support Midwife - St Peter's Hospital	Ashford & St Peter's Hospital NHS Foundation Trust
Claire Waters	Bereavement Midwife - Queen's Hospital	Barking Havering & Redbridge University Hospitals NHS Trust
Elizabeth Dorey	Bereavement Midwife	Barking Havering & Redbridge University Hospitals NHS Trust
Jenny Harper	Family Care Coordinator - Queen's Hospital	Barking Havering & Redbridge University Hospitals NHS Trust
Cath Jones	Bereavement Midwife - Barnsley Hospital	Barnsley Hospital NHS Foundation Trust
Chinwe Ejiofor	Bereavement Support Midwife - The Royal London Hospital	Barts Health NHS Trust
Imdad Ali	Consultant Neonatologist - Newham University Hospital	Barts Health NHS Trust
Michael Hird	Consultant Neonatal Paediatrician - The Royal London Hospital	Barts Health NHS Trust
Mun-Leng Lim	Women's Health Governance Lead - The Royal London Hospital	Barts Health NHS Trust
Sacha Greaves	Bereavement Specialist Midwife - Whipps Cross University Hospital	Barts Health NHS Trust
Vadivelam Murthy	Consultant Neonatologist - The Royal London Hospital	Barts Health NHS Trust
Debbie Olajugbagbe	Bereavement Specialist Midwife - Basildon University Hospital	Basildon and Thurrock University Hospitals NHS Foundation Trust
Tracey Glester	Matron/Manager Neonatal Intensive Care Unit - Basildon University Hospital	Basildon and Thurrock University Hospitals NHS Foundation Trust
Carol Warden	Neonatal Unit Ward Manager - Bedford Hospital	Bedford Hospital NHS Trust
Samantha Hunt	Midwifery Team Manager - Bedford Hospital	Bedford Hospital NHS Trust
Sarah Gates	Midwife - Bedford Hospital	Bedford Hospital NHS Trust
Thangamma Katimada-Annaiah	Consultant Obstetrician and Gynaecologist - Bedford Hospital	Bedford Hospital NHS Trust
Fiona Giraud	Associate Chief of Staff - Nursing and Midwifery - Ysbyty Gwynedd, Bangor	Betsi Cadwaladr University Health Board
Gaynor Lloyd	Governance and Risk Midwife	Betsi Cadwaladr University Health Board
Jane Sherwood	Midwife - Ysbyty Gwynedd, Bangor	Betsi Cadwaladr University Health Board
Lindsay Jones	Labour Ward Coordinator (West)	Betsi Cadwaladr University Health Board
Lucy Dobbins	Labour Ward Shift Leader - Wrexham Maelor Hospital	Betsi Cadwaladr University Health Board
Lynne Clayton	Labour Ward Shift Leader - Glan Clwyd Maternity Unit	Betsi Cadwaladr University Health Board
Melissa Keeble	Labour Ward Shift Leader - Wrexham Maelor Hospital	Betsi Cadwaladr University Health Board
Zoe Waine	Midwifery Sister - Glan Clwyd Hospital	Betsi Cadwaladr University Health Board
Claire Mooney	Clinical Nurse Specialist, Palliative Care - Birmingham Children's Hospital	Birmingham Children's Hospital NHS Foundation Trust
Clare Daly	Clinical Nurse Specialist, Palliative Care - Birmingham Children's Hospital	Birmingham Children's Hospital NHS Foundation Trust
Janette Vyse	Lead for Patient Experience and Bereavement Care Services - Birmingham Children's Hospital	Birmingham Children's Hospital NHS Foundation Trust

Nicki Fitzmaurice	Manager of Bereavement Care Services, Lead for End of Life and Palliative Care Services - Birmingham Children's Hospital	Birmingham Children's Hospital NHS Foundation Trust
Tasmin Butt	Family Liaison/Manager of Magnolia House - Birmingham Children's Hospital	Birmingham Children's Hospital NHS Foundation Trust
Alison Rea	Bereavement Midwife - Birmingham Women's Hospital	Birmingham Women's NHS Foundation Trust
Joyce O'Neill	PA to Bereavement and Spiritual Care Services - Birmingham Women's Hospital	Birmingham Women's NHS Foundation Trust
Karen Henson	Bereavement and Spiritual Care service Manager - Birmingham Women's Hospital	Birmingham Women's NHS Foundation Trust
Matthew Nash	Consultant Neonatologist - Birmingham Women's Hospital	Birmingham Women's NHS Foundation Trust
Rachel Rees	Maternity Risk and Governance Lead - Birmingham Women's Hospital	Birmingham Women's NHS Foundation Trust
Elizabeth Haslett	Consultant Obstetrician - Royal Victoria Hospital	Blackpool Teaching Hospitals NHS Foundation Trust
Christopher Rawlingson	Consultant Paediatrician - Royal Victoria Hospital	Blackpool Teaching Hospitals NHS Foundation Trust
Karen Hurst	Midwife - Royal Victoria Hospital	Blackpool Teaching Hospitals NHS Foundation Trust
Kathryn Whitfield	Governance Manager - Royal Bolton Hospital	Bolton NHS Foundation Trust
Neeraja Singh	Consultant Obstetrician and Gynaecologist - Royal Bolton Hospital	Bolton NHS Foundation Trust
Julie Key	Bereavement Support Midwife - Bradford Royal Infirmary	Bradford Teaching Hospitals NHS Foundation Trust
Sunita Seal	Consultant Neonatologist - Bradford Royal Infirmary	Bradford Teaching Hospitals NHS Foundation Trust
Hayley Stevenson	Labour Ward Coordinator Bereavement Midwife - Royal Sussex County Hospital	Brighton and Sussex University Hospitals NHS Trust
Heather Brown	Deputy Medical Director Consultant Obstetrician and Gynaecologist and Honorary Senior Clinical Lecturer - Princess Royal Hospital and Royal Sussex County Hospital	Brighton and Sussex University Hospitals NHS Trust
Patricia Walker	Neonatal Secretary	Brighton and Sussex University Hospitals NHS Trust
Phil Amess	Consultant Neonatologist - Royal Sussex County Hospital	Brighton and Sussex University Hospitals NHS Trust
Sonya Brear	Bereavement Lead - Princess Royal Hospital	Brighton and Sussex University Hospitals NHS Trust
Kimberley Cox	Midwife - Stoke Mandeville Hospital	Buckinghamshire Healthcare NHS Trust
Angela Edwards	Staff Nurse Neonatal Unit - Queen's Hospital	Burton Hospitals NHS Foundation Trust
Caroline Dodd	Senior Sister for Paediatrics - Queen's Hospital	Burton Hospitals NHS Foundation Trust
Claire Cookson	Bereavement Midwife - Queen's Hospital	Burton Hospitals NHS Foundation Trust
Ellen Deane	Senior Sister for Paediatrics - Queen's Hospital	Burton Hospitals NHS Foundation Trust
Samantha Evans	Bereavement Midwife Sister - Queen's Hospital	Burton Hospitals NHS Foundation Trust
Eilean Crosbie	Consultant Paediatrician - Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust
Lindsay Chandler	Midwife - Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust
Sandra Pinder	Midwife - Calderdale Royal Hospital	Calderdale and Huddersfield NHS Foundation Trust
Janet Latimer	Bereavement Midwife - Rosie Maternity Hospital	Cambridge University Hospitals NHS Foundation Trust
Liz Hopkin	Neonatal Clinical Risk Manager - Rosie Maternity Hospital	Cambridge University Hospitals NHS Foundation Trust
Susan Woolley	Safety Investigator and Advisor	Cambridge University Hospitals NHS Foundation Trust
Laura Wyatt	Bereavement Midwife	Cardiff and Vale University Health Board
Roshan Adappa	Consultant Neonatologist - University Hospital of Wales	Cardiff and Vale University Health Board
Emma Lane	Midwife and Bereavement Midwife - St Mary's Hospital	Central Manchester University Hospitals NHS Foundation Trust
Lyndsey Evans	Midwife	Central Manchester University Hospitals NHS Foundation Trust
Ngozi Edi-Osagie	Consultant Neonatologist - St Mary's Hospital	Central Manchester University Hospitals NHS Foundation Trust
Alexandra Mancini	Neonatal Matron - Chelsea & Westminster Hospital	Chelsea and Westminster Hospital NHS Foundation Trust
Anna Hanley	Midwife - Chelsea & Westminster Hospital	Chelsea and Westminster Hospital NHS Foundation Trust
Jenny Ryan	Midwife	Chelsea and Westminster Hospital NHS Foundation Trust

Lynn Parker	Specialist Palliative and Bereavement Care Neonatal Nurse - Chelsea and Westminster Hospital	Chelsea and Westminster Hospital NHS Foundation Trust
Sally Kelly	Specialist Midwife Bereavement - West Middlesex University Hospital	Chelsea and Westminster Hospital NHS Foundation Trust
Heather Durward	Associate Specialist in Paediatrics - Chesterfield Royal Hospital	Chesterfield Royal Hospital NHS Foundation Trust
Heather Cooke	Midwife	Chesterfield Royal Hospital NHS Foundation Trust
Julie Clark	Maternity Matron - Chesterfield Royal Hospital	Chesterfield Royal Hospital NHS Foundation Trust
Linda Gustard	Divisional Head of Midwifery - Chesterfield Royal Hospital	Chesterfield Royal Hospital NHS Foundation Trust
Lyn Guerriero	Birth Centre Coordinator - Chesterfield Royal Hospital	Chesterfield Royal Hospital NHS Foundation Trust
Majd Abu-Harb	Consultant Neonatologist and Clinical Lead - Sunderland Royal Hospital	City Hospitals Sunderland NHS Foundation Trust
Paula Berry	Directorate Administration Manager - Sunderland Royal Hospital	City Hospitals Sunderland NHS Foundation Trust
Aravind Shastri	Consultant Paediatrician - Colchester General Hospital	Colchester Hospital University NHS Foundation Trust
Fiona Binnie	IT Lead Midwife - Colchester General Hospital	Colchester Hospital University NHS Foundation Trust
Catherine Sales	Supervisor of Midwives - Countess of Chester Hospital	Countess of Chester Hospital NHS Foundation Trust
Eirian Powell	Neonatal Nurse Specialist - Countess of Chester Hospital	Countess of Chester Hospital NHS Foundation Trust
Usha Roa	Consultant Obstetrician and Gynaecologist - Countess of Chester Hospital	Countess of Chester Hospital NHS Foundation Trust
Anita Goel	Locum Consultant - Darlington Memorial Hospital	County Durham and Darlington NHS Foundation Trust
Emma Bouic	Midwife - Darlington Memorial Hospital	County Durham and Darlington NHS Foundation Trust
Kate Abbott	Midwife - University Hospital North Durham	County Durham and Darlington NHS Foundation Trust
Linda MacKinnon	Midwife - University Hospital of North Durham	County Durham and Darlington NHS Foundation Trust
Lisa Russell	Staff Midwife - Darlington Memorial Hospital	County Durham and Darlington NHS Foundation Trust
Sharon Stephenson	Midwife - University Hospital North Durham	County Durham and Darlington NHS Foundation Trust
Arun Kumar	Consultant Paediatrician - Croydon University Hospital	Croydon Health Services NHS Trust
Belphoebe Lundy	Pregnancy Loss Specialist Midwife - Croydon University Hospital	Croydon Health Services NHS Trust
Jayne Dowsett	Midwife	Croydon Health Services NHS Trust
Julie Tucker	Specialist Midwife for Pregnancy Loss - Croydon University Hospital	Croydon Health Services NHS Trust
Karen Rooke	Maternity Governance and Risk Manager - Croydon University Hospital	Croydon Health Services NHS Trust
Lena Laurice Karam	Matron for Inpatient Services	Croydon Health Services NHS Trust
Nicola Lucas	IT Administrator - Maternity	Croydon Health Services NHS Trust
Rebecca Board	Clinical Midwifery Manager - Croydon University Hospital	Croydon Health Services NHS Trust
Myfanwy Ellis	Risk Manager for Obstetrics and Gynaecology and Sexual Health - Prince Charles Hospital	Cwm Taf Health Board
Deborah Mcallion	Head of Midwifery - Darent Valley Hospital	Dartford and Gravesham NHS Trust
Joanne Seymour	Clinical Governance Midwifery Manager - Darent Valley Hospital	Dartford and Gravesham NHS Trust
Lynn Brooks	Matron Paediatrics - Darent Valley Hospital	Dartford and Gravesham NHS Trust
John McIntyre	Consultant Paediatrician - Royal Derby Hospital	Derby Teaching Hospitals NHS Foundation Trust
Sue Rucklidge	Bereavement Midwife - Royal Derby Hospital	Derby Teaching Hospitals NHS Foundation Trust
Carol Lee	Bereavement Support Midwife - Doncaster Royal Infirmary	Doncaster and Bassetlaw Hospitals NHS Foundation Trust
Elaine Merrills	Infant Feeding Coordinator/ Deputy Matron	Doncaster and Bassetlaw Hospitals NHS Foundation Trust
Sarah Louise Spenser	Lead Nurse Bereavement	Doncaster and Bassetlaw Hospitals NHS Foundation Trust
Sophie Wilson	Midwife - Dorset County Hospital	Dorset County Hospital NHS Foundation Trust
Tara Putt	Midwife - Dorset County Hospital	Dorset County Hospital NHS Foundation Trust
Bev Morrison	Paediatric Liaison Health Visitor - Lister Hospital	East and North Hertfordshire NHS Trust
Jacqui Hylton	Bereavement Midwife - Lister Hospital	East and North Hertfordshire NHS Trust

Jonathan Kefas	Consultant Neonatologist/Clinical Director - Lister Hospital	East and North Hertfordshire NHS Trust
Heather Millward	Safeguarding Midwife - Macclesfield District General Hospital	East Cheshire NHS Trust
Michelle Moran	Clinical Governance Midwife - Macclesfield District General Hospital	East Cheshire NHS Trust
Emmeline Powell	Midwife - Queen Elizabeth Queen Mother Hospital	East Kent Hospitals University NHS Foundation Trust
Jo Olagboyega	Clinical Governance Midwife - Kent & Canterbury Hospital	East Kent Hospitals University NHS Foundation Trust
Liz Martindale	Consultant Obstetrician and Gynaecologist - Burnley General Hospital	East Lancashire Hospitals NHS Trust
Julie Birch	Team Leader Neonatal Unit - Burnley General Hospital	East Lancashire Hospitals NHS Trust
Louise Bardon	Bereavement Support Midwife	East Lancashire Hospitals NHS Trust
Jane Bedford-Clark	Midwifery Matron/Bereavement Midwife	East Sussex Healthcare NHS Trust
Kirsty Milward	Midwifery Matron/Bereavement Midwife	East Sussex Healthcare NHS Trust
Rachel Ayers	Patient Safety/ Clinical Governance Lead Women's and Children	East Sussex Healthcare NHS Trust
Catherine Swanson	Matron Neonatal Service - St Helier Hospital	Epsom and St Helier University Hospitals NHS Trust
Claire Hill	IT Midwife	Epsom and St Helier University Hospitals NHS Trust
Geraldine Mackey	Patient Safety Midwife	Frimley Health NHS Foundation Trust
Helen Whapshott	Labour Ward Manager/Supervisor of Midwives - Frimley Park Hospital	Frimley Health NHS Foundation Trust
Jennifer Lomas	Neonatal Ward Manager - Frimley Park Hospital	Frimley Health NHS Foundation Trust
Rekha Sanghavi	Consultant Paediatrician - Wexham Park Hospital	Frimley Health NHS Foundation Trust
Andrea Tweddell	Risk Management Midwife - Queen Elizabeth Hospital	Gateshead Health NHS Foundation Trust
Dennis Bosman	Consultant Paediatrician - Queen Elizabeth Hospital	Gateshead Health NHS Foundation Trust
Rob Walker	Consultant Obstetrician and Gynaecologist - Queen Elizabeth Hospital	Gateshead Health NHS Foundation Trust
Caroline Wood	Sister Special Care Baby Unit - George Eliot Hospital	George Eliot Hospital NHS Trust
Gaynor Armstrong	Lead Governance Midwife	George Eliot Hospital NHS Trust
Mukta Jain	Consultant Paediatrician, Current SCBU lead	George Eliot Hospital NHS Trust
Suet Wong	Sister Special Care Baby Unit - George Eliot Hospital	George Eliot Hospital NHS Trust
Donna Lorraine Lloyd	Bereavement Midwife - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Jennifer Holman	Consultant Paediatrician - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Miles Wagstaff	Consultant Paediatrician - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Nikki Dobson	Bereavement Midwife - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Russell Peek	Consultant Paediatrician - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Shyam Bhakthavalsala	Consultant Neonatologist - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Simon Pirie	Consultant Paediatrician - Gloucestershire Royal Hospital	Gloucestershire Hospitals NHS Foundation Trust
Andrew Pearson	Clinical Audit Manager - Great Ormond Street Hospital	Great Ormond Street Hospital for Children NHS Foundation Trust
Helen Pepler	Practice Development Midwife - The Great Western Hospital	Great Western Hospitals NHS Foundation Trust
Angela Costa	Patient Safety and Quality Facilitator	Guy's and St Thomas' NHS Foundation Trust
Gemma Westcott	Deputy Clinical Governance Facilitator - Evelina London Children's Hospital	Guy's and St Thomas' NHS Foundation Trust
Karen Turnock	Consultant Neonatologist	Guy's and St Thomas' NHS Foundation Trust
Mitra Bakhtiari	Maternity Matron - St Thomas' Hospital	Guy's and St Thomas' NHS Foundation Trust
Samantha Luk	Patient Safety and Quality Facilitator	Guy's and St Thomas' NHS Foundation Trust
Ruth Wigfield	Consultant Paediatrician - Basingstoke and North Hampshire Hospital	Hampshire Hospitals NHS Foundation Trust
Sandie Skinner	Consultant Nurse in Neonatal Care - Royal Hampshire County Hospital	Hampshire Hospitals NHS Foundation Trust
Stephanie Goodwin	Maternity Risk and Governance Manager - Basingstoke and North Hampshire Hospital and Royal Hampshire County Hospital	Hampshire Hospitals NHS Foundation Trust
Chandra Jampala	Consultant Paediatrician - Harrogate District Hospital	Harrogate and District NHS Foundation Trust
Kim Pitt	Senior Sister Special Care Baby Unit - Harrogate District Hospital	Harrogate and District NHS Foundation Trust
Sue Oxendale	Midwife/Labour Ward Coordinator- Harrogate District Hospital	Harrogate and District NHS Foundation Trust
Clare Beesley	Bereavement Lead Midwife - Heartlands & Good Hope Hospital	Heart of England NHS Foundation Trust
Jaideep Singh	Consultant Neonatologist - Birmingham Heartlands Hospital	Heart of England NHS Foundation Trust
Hilary Dixon	Consultant Paediatrician and Lead Clinician for Special Care Baby Unit - Hinchingbrooke Hospital	Hinchingbrooke Health Care NHS Trust
Sandra Sibanda	Risk Midwife/Audit Lead/Supervisor of Midwives	Hinchingbrooke Health Care NHS Trust

Sarah Kitchen	Deputy Head of Midwifery, Lead Midwife Inpatients and CNST, Supervisor of Midwives - Hinchingbrooke Hospital	Hinchingbrooke Health Care NHS Trust
Paul Fleming	Consultant Neonatologist - Homerton Hospital	Homerton University Hospital NHS Foundation Trust
Tracy Hodgkinson	Midwife/Bereavement Midwife - Homerton Hospital	Homerton University Hospital NHS Foundation Trust
Catharine Atkinson	Midwife - Hull Royal Infirmary	Hull and East Yorkshire Hospitals NHS Trust
Christopher Wood	Consultant Neonatologist - Hull Royal Infirmary	Hull and East Yorkshire Hospitals NHS Trust
Jean Rennison	Midwifery Sister - Hull Royal Infirmary	Hull and East Yorkshire Hospitals NHS Trust
Prem Kumar Pitchaikani	Consultant Paediatrician - Glangwili Hospital	Hywel Dda Health Board
Sally Davies	Senior Midwife - Bronglais Hospital, Aberystwyth	Hywel Dda Health Board
Geraldine Ng	Consultant Neonatologist - Hammersmith Hospital	Imperial College Healthcare NHS Trust
Jacqui Mallard	Risk Management Midwife - Queen Charlotte's & Chelsea Hospital	Imperial College Healthcare NHS Trust
Jane Scott	Senior Bereavement Midwife - Queen Charlotte's & Chelsea Hospital	Imperial College Healthcare NHS Trust
Sarah Beake	Risk Management Midwife - St Mary's Hospital	Imperial College Healthcare NHS Trust
Beverley Gordon	Clinical Governace Lead - Ipswich Hospital	Ipswich Hospital NHS Trust
Emma Hearnden	Midwife - Noble's Hospital	Isle of Man Department of Health
Paul McCann	Neonatal Lead Nurse - Noble's Hospital	Isle of Man Department of Health
Prakash Thiagarajan	Consultant Paediatrician - Noble's Hospital	Isle of Man Department of Health
Tarun Ghosh	Consultant Obstetrician and Gynaecologist - Noble's Hospital	Isle of Man Department of Health
Yvonne Harris	Clinical Lead - St Mary's Hospital	Isle of Wight NHS Trust
Jayne Utting	Risk Midwife - James Paget University Hospital	James Paget University Hospitals NHS Foundation Trust
Karen Julie Crossan	Clinical Midwifery Manager - James Paget University Hospital	James Paget University Hospitals NHS Foundation Trust
Kerry Burwood	Senior Midwife, Coordinator Bereavement Link - James Paget University Hospital	James Paget University Hospitals NHS Foundation Trust
Lesley Yates	Senior Midwife, Coordinator Bereavement Link - James Paget University Hospital	James Paget University Hospitals NHS Foundation Trust
Priyadarshan Ambadkar	Consultant Paediatrician - James Paget University Hospital	James Paget University Hospitals NHS Foundation Trust
Samantha Jones	Bereavement Midwife	James Paget University Hospitals NHS Foundation Trust
Stephanie Fretter	Bereavement Midwife - Kettering General Hospital	Kettering General Hospital NHS Foundation Trust
Joanne Beltran	Governance and Workforce Lead Midwife	King's College Hospital NHS Foundation Trust
Layla Harhala	Specialist Midwife for Pregnancy Loss	King's College Hospital NHS Foundation Trust
Lisa Moss	Bereavement Midwife	King's College Hospital NHS Foundation Trust
Maxine Spencer	Director of Midwifery	King's College Hospital NHS Foundation Trust
Ravindra Bhat	Consultant Neonatologist - King's College Hospital	King's College Hospital NHS Foundation Trust
Louise Wheeler	Maternity Risk Manager - Kingston Hospital	Kingston Hospital NHS Trust
Marie Richter	Neonatal Matron - Kingston Hospital	Kingston Hospital NHS Trust
Nirujan Neduncheliyan	Senior Business Analyst	Kingston Hospital NHS Trust
Laura Jane Doran	Midwife	Lancashire Teaching Hospitals NHS Foundation Trust
Ruth Kirby	Specialist Bereavement Midwife/Counsellor - Royal Preston Hospital	Lancashire Teaching Hospitals NHS Foundation Trust
Sandeep Dharmaraj	Consultant Neonatologist - Royal Preston Hospital	Lancashire Teaching Hospitals NHS Foundation Trust
Diane Wilson	Bereavement Midwife - University Hospital Lewisham	Lewisham and Greenwich NHS trust
Emma Kenny	Clinical Governance Manager - Queen Elizabeth Hospital	Lewisham and Greenwich NHS trust
Jauro Kuna	Clinical Director for Neonatal Services - University Hospital Lewisham	Lewisham and Greenwich NHS trust
Michelle Wells-Braithwaite	Patient Safety Midwife - University Hospital Lewisham	Lewisham and Greenwich NHS trust
Sue Percival	Specialist Midwife - Fetal Medicine - University Hospital Lewisham	Lewisham and Greenwich NHS trust
Teresa Stimson	Sister Neonatal Unit - Queen Elizabeth Hospital	Lewisham and Greenwich NHS trust
Alison Whitters	Neonatal Nurse for IT Systems - Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust
Jane Saltmarsh	IT Nurse Specialist - Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust
Jennifer Robinson	Midwife - Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust
Joanne Brady	Neonatal Nurse for IT Systems - Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust
Lisa Waby-Brown	Midwife - Liverpool Women's Hospital	Liverpool Women's NHS Foundation Trust
Christine Pace	Clinical Audit and Effectiveness Team - Northwick Park Hospital	London North West Healthcare NHS Trust

Hiran Samarage	Consultant Obstetrician and Gynaecologist/Head of Fetal Medicine Unit - Northwick Park Hospital	London North West Healthcare NHS Trust
Marva Wilson	Bereavement Midwife - Northwick Park Hospital	London North West Healthcare NHS Trust
Anne-Marie Mead	Neonatal Nurse - Luton & Dunstable Hospital	Luton and Dunstable Hospital NHS Foundation Trust
Elizabeth Langham	Neonatal Lead Nurse - Luton & Dunstable Hospital	Luton and Dunstable Hospital NHS Foundation Trust
Tracey McGrath	Bereavement Midwife	Luton and Dunstable Hospital NHS Foundation Trust
Jackie Tyler	Paediatric Matron	Maidstone and Tunbridge Wells NHS Trust
Julie Coppin	Maternity Risk Manager/Supervisor of Midwives - Tunbridge Wells Hospital	Maidstone and Tunbridge Wells NHS Trust
Ruth Paul	Bereavement Support Midwife	Maidstone and Tunbridge Wells NHS Trust
Helen McElroy	Consultant Neonatologist - Medway Maritime Hospital	Medway NHS Foundation Trust
Julie Spencer	Lead Midwife Delivery Suite - Medway Maritime Hospital	Medway NHS Foundation Trust
Ranjit Akolekar	Consultant in Fetal Medicine and Obstetrics	Medway NHS Foundation Trust
Sarah Jones	Advanced Neonatal Nurse Practitioner - Medway Maritime Hospital	Medway NHS Foundation Trust
Suzanne Turner	Labour Ward Coordinator and Bereavement Lead - Leighton Hospital	Mid Cheshire Hospitals NHS Foundation Trust
Tracy Sellors	Senior Clinical Audit Facilitator - Leighton Hospital	Mid Cheshire Hospitals NHS Foundation Trust
Alison Cuthbertson	Head of Midwifery - Broomfield Hospital	Mid Essex Hospital Services NHS Trust
Toni Laing	Lead Nurse Neonatal Unit - Broomfield Hospital	Mid Essex Hospital Services NHS Trust
Indranil Misra	Consultant Paediatrician - Milton Keynes Hospital	Milton Keynes Hospital NHS Foundation Trust
Tracy Rea	Bereavement Midwife and Supervisor of Midwives - Milton Keynes Hospital	Milton Keynes Hospital NHS Foundation Trust
Inass Osman	Consultant in Obstetrics & Gynaecology - Ayrshire Maternity Hospital	NHS Ayrshire and Arran
Jane Ramsay	Clinical Director Obstetrics - Ayrshire Maternity Hospital	NHS Ayrshire and Arran
Sheena Kinmond	Consultant Paediatrician - Crosshouse Hospital	NHS Ayrshire and Arran
Andrew Duncan	Consultant Paediatrician - Borders General Hospital	NHS Borders
Brian Magowan	Consultant Obstetrician and Gynaecologist/Head of Service - Borders General Hospital	NHS Borders
Nicky Berry	Associate Nurse Director/Head of Midwifery and General Manager for Women and Children's Services	NHS Borders
Heather Armstrong	Associate Specialist, Paediatrician - Dumfries & Galloway Royal Infirmary	NHS Dumfries and Galloway
Stephen Wisdom	Consultant Obstetrician - Dumfries & Galloway Royal Infirmary	NHS Dumfries and Galloway
Annette Lobo	Consultant Midwife/Supervisor of Midwives - Victoria Hospital	NHS Fife
Sean Ainsworth	Consultant Neonatologist - Victoria Hospital	NHS Fife
Gail Bell	Deputy Head of Midwifery/Senior Midwife - Forth Valley Royal Hospital	NHS Forth Valley
Gillian McMillan	Clinical Coordinator - Forth Valley Royal Hospital	NHS Forth Valley
Lynette Mackenzie	Department Manager (Paediatrics & Neonates) - Forth Valley Royal Hospital	NHS Forth Valley
Lena Crichton	Consultant Obstetrician - Aberdeen Maternity Hospital	NHS Grampian
Mike Munro	Consultant Neonatologist - Aberdeen Maternity Hospital	NHS Grampian
Neil Maclean	Consultant Obstetrician and Gynaecologist - Doctor Gray's Hospital	NHS Grampian
Slawomir Wojcik	Consultant Paediatrician - Doctor Gray's Hospital	NHS Grampian
Allan Jackson	Consultant Neonatologist - Princess Royal Maternity Hospital	NHS Greater Glasgow and Clyde
Andrew Quinn	Consultant Obstetrician - Royal Alexandra Hospital	NHS Greater Glasgow & Clyde
Dawn Kernaghan	Consultant Obstetrician - The Princess Royal Maternity Hospital	NHS Greater Glasgow & Clyde
Hilary Conetta	Consultant Paediatrician - Royal Alexandra Hospital	NHS Greater Glasgow & Clyde
Janice Gibson	Consultant Obstetrician - Queen Elizabeth University Hospital	NHS Greater Glasgow & Clyde
Kathleen O'Reilly	Consultant Neonatologist - Queen Elizabeth University Hospital & Royal Hospital for Children	NHS Greater Glasgow & Clyde
Anne Angus	Clinical Risk Midwife	NHS Highland
Laura Menzies	Team Leader - Caithness General Hospital	NHS Highland
Philine Van Der Heide	Consultant Paediatrician - Raigmore Hospital	NHS Highland
Colin Malcolm	Consultant Obstetrician and Gynaecologist	NHS Lanarkshire
Mary Moffat	Management Secondment Maternity - Wishaw General Hospital	NHS Lanarkshire
Samuel Ibhanesebhor	Consultant Neonatologist - Wishaw General Hospital	NHS Lanarkshire
Ewen Johnston	Consultant Neonatologist - Edinburgh Royal Infirmary	NHS Lothian
Frances McGuire	Clinical Manager - St John's Livingston	NHS Lothian

Nithiya Palaniappan	Consultant Obstetrician - Royal Infirmary Edinburgh	NHS Lothian
Sarah Court	Neonatal Specialist Registrar - St John's Livingston	NHS Lothian
Peter Oduro	Consultant Obstetrician	NHS Orkney
Elaine McCover	Senior Charge Midwife - Gilbert Bain Hospital	NHS Shetland
Kate Kenmure	Child and Family Health Manager	NHS Shetland
Jennifer Scotland	Consultant Neonatologist - Ninewells Hospital	NHS Tayside
Pauline Lynch	Clinical Lead for Labour Suite - Ninewells Hospital	NHS Tayside
Roselyn Mudenha	Consultant Obstetrician and Gynaecologist - Ninewells Hospital	NHS Tayside
Catherine Macdonald	Head of Midwifery - Western Isles Hospital	NHS Western Isles
Jill Tinsey	IT Midwife - Norfolk and Norwich University Hospital	Norfolk and Norwich University Hospitals NHS Foundation Trust
Mark Dyke	Consultant Neonatologist - Norfolk and Norwich University Hospital	Norfolk and Norwich University Hospitals NHS Foundation Trust
Jacqui Lewis	Midwife - Southmead Hospital	North Bristol NHS Trust
Paul Mannix	Consultant Neonatologist - Southmead Hospital	North Bristol NHS Trust
Stephanie Withers	Practice Development Midwife Supervisor of Midwives - Southmead Hospital	North Bristol NHS Trust
Andrea Ewing	Pregnancy Loss Midwife - Cumberland Infirmary	North Cumbria University Hospitals NHS Trust
Bernadette Bowness	Bereavement Specialist Midwife - West Cumberland Hospital	North Cumbria University Hospitals NHS Trust
Glyn Jones	Consultant Paediatrician - Cumberland Infirmary	North Cumbria University Hospitals NHS Trust
Alison (aka 'Morag') Oldfield	Governance Midwife - North Middlesex University Hospital	North Middlesex University Hospital NHS Trust
Michelle Lynch	Maternity - Bereavement Midwife	North Middlesex University Hospital NHS Trust
Chidambara Harikumar	Consultant Paediatrician - University Hospital of North Tees	North Tees and Hartlepool NHS Foundation Trust
Debbie Bryan	Ward Manager - Neonatal Unit - University Hospital of North Tees	North Tees and Hartlepool NHS Foundation Trust
Iona MacLeod	Consultant Obstetrician	North Tees and Hartlepool NHS Foundation Trust
Jane Malcolm	Ward Manager - Neonatal Unit - University Hospital of North Tees	North Tees and Hartlepool NHS Foundation Trust
Rebecca Taylor	Senior Staff Nurse - Neonatal Unit	North Tees and Hartlepool NHS Foundation Trust
Stephanie El-Malak	Delivery Suite Manager	North Tees and Hartlepool NHS Foundation Trust
Rachael Moss	Bereavement Support and Pre-Natal Diagnosis Midwife	Northampton General Hospital NHS Trust
Rachel Surl	Bereavement Midwife	Northampton General Hospital NHS Trust
Carolyn Hide	Labour Ward Coordinator - North Devon District Hospital	Northern Devon Healthcare NHS Trust
Elizabeth Mills	Lead Nurse for Paediatrics/Neonatal Services - North Devon District Hospital	Northern Devon Healthcare NHS Trust
Jo Morgan	Midwife Coordinator	Northern Devon Healthcare NHS Trust
Michael Selter	Consultant Paediatrician/Neonatal Services - North Devon District Hospital	Northern Devon Healthcare NHS Trust
Amy Trippitt	Quality and Audit Facilitator	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Dianne Bradley	Senior Staff Midwife - Diana Princess of Wales Hospital	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Gill Ibbotson	Coordinator on Central Delivery Suite - Scunthorpe General Hospital	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Hayli Garrod	Quality and Audit Facilitator	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Nicola Atter	Staff Nurse - Diana Princess of Wales Hospital	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Pauline Adiotomre	Consultant Paediatrician - Diana Princess of Wales Hospital	Northern Lincolnshire and Goole Hospitals NHS Foundation Trust
Malini Shivanath	Consultant Obstetrician and Gynaecologist	Northumbria Healthcare NHS Foundation Trust
Amy Brears	Neonatal Bereavement Support Facilitator - Nottingham City Hospital	Nottingham University Hospitals NHS Trust
Heather McEwen	Bereavement Care Link Midwife	Nottingham University Hospitals NHS Trust
Jane Pidgeon	Maternity Governance Team Midwife/Supervisor of Midwives	Nottingham University Hospitals NHS Trust
Joy Moran	Lead Nurse Child Death Review Team - Queen's Medical Centre	Nottingham University Hospitals NHS Trust
Louise Crabtree	Advanced Neonatal Nurse Practitioner - Nottingham City Hospital	Nottingham University Hospitals NHS Trust
Mandy Dann	Bereavement Midwife	Nottingham University Hospitals NHS Trust
Catherine Bartlett	Midwife - John Radcliffe Hospital and Horton Maternity Hospital	Oxford University Hospitals NHS Trust
Lesley Carline	Bereavement Specialist Midwife - Peterborough City Hospital	Peterborough and Stamford Hospitals NHS Foundation Trust

Shirley Steel	Consultant Obstetrician and Gynaecologist - Peterborough City Hospital	Peterborough and Stamford Hospitals NHS Foundation Trust
Mo Cleland	Bereavement Midwife	Plymouth Hospitals NHS Trust
Sue Wilkins	Head of Midwifery/Associate Director of Nursing - Derriford Hospital	Plymouth Hospitals NHS Trust
Alison McGuinness	Bereavement Support Midwife - St Mary's Maternity Unit, Poole Hospital	Poole Hospital NHS Foundation Trust
Daniel Webster	Consultant Obstetric Lead for Risk - Poole Hospital	Poole Hospital NHS Foundation Trust
Peter McEwan	Consultant Neonatologist - Poole Hospital	Poole Hospital NHS Foundation Trust
Charlotte Groves	Consultant Neonatologist - Queen Alexandra Hospital	Portsmouth Hospitals NHS Trust
Sharon Hackett	Senior Midwifery Manager Clinical Governance - Queen Alexandra Hospital	Portsmouth Hospitals NHS Trust
Tracey Lasisi	Midwifery Sister - Queen Alexandra Hospital	Portsmouth Hospitals NHS Trust
Cate Langley	Head of Midwifery - Powys	Powys Teaching Health Board
Donna Owen	Lead Midwife (Risk)	Powys Teaching Health Board
Jennifer Milam	Maternal Child Unit flight Commander/Perinatal Clinical Nurse specialist	RAF Lakenheath (48th Medical Group)
Amy Wood-Blagrove	Bereavement Midwife	Royal Berkshire NHS Foundation Trust
Val Hedley	Sister Paediatric Intensive Care Unit - Royal Brompton Hospital	Royal Brompton and Harefield NHS Foundation Trust
Karen Stoyles	Antenatal Ward Manager/Bereavement Midwife - Royal Cornwall Hospital	Royal Cornwall Hospitals NHS Trust
Paul Munyard	Consultant Paediatrician - Royal Cornwall Hospital	Royal Cornwall Hospitals NHS Trust
Deborah Smith-Ringer	Perinatal and Child Death Coordinator - Royal Devon & Exeter Hospital	Royal Devon and Exeter NHS Foundation Trust
Alina Lau	Bereavement Midwife - Royal Free Hospital	Royal Free London NHS Foundation Trust
Lindsay Frank	Advanced Neonatal Nurse Practitioner - Royal Free Hospital	Royal Free London NHS Foundation Trust
Michele Ramos-Gonzalez	Women's and Children's Clinical Governance and Risk Manager/Supervisor of Midwives	Royal Free London NHS Foundation Trust
Meg Wilkinson	Labour Ward Matron - Royal Free Hospital	Royal Free London NHS Foundation Trust
Miranda Ryan	Staff Nurse - Barnet Hospital	Royal Free London NHS Foundation Trust
Monica Delolmo	Bereavement Midwife	Royal Free London NHS Foundation Trust
Seeking Lee	Ward Lead - Starlight Neonatal Intensive Care Unit - Barnet Hospital	Royal Free London NHS Foundation Trust
Claire Worthington	Clinical Governance Midwife	Royal Surrey County Hospital NHS Foundation Trust
Sheryl Roy	Bereavement Midwife - Royal Surrey County Hospital	Royal Surrey County Hospital NHS Foundation Trust
Rachel Pass	Midwife - Royal United Hospital	Royal United Hospital Bath NHS Trust
Stephen W Jones	Consultant Paediatrician - Royal United Hospital	Royal United Hospital Bath NHS Trust
Clare Baggot	Midwife - Salisbury District Hospital	Salisbury NHS Foundation Trust
Clare Smith	Midwife - Salisbury District Hospital	Salisbury NHS Foundation Trust
Louise Jones	Risk Manager - Salisbury District Hospital	Salisbury NHS Foundation Trust
Philippa Ridley	Consultant Paediatrician - Salisbury District Hospital	Salisbury NHS Foundation Trust
Lindsay Halpern	Consultant Neonatologist - City Hospital	Sandwell and West Birmingham Hospitals NHS Trust
Mary Molloy	Bereavement Midwife - City Hospital	Sandwell and West Birmingham Hospitals NHS Trust
Neil Shah	Consultant in Obstetrics & Fetal Medicine - City Hospital	Sandwell and West Birmingham Hospitals NHS Trust
Nicola Robinson	Risk and Governance Lead Maternity and Neonates - City Hospital	Sandwell and West Birmingham Hospitals NHS Trust
Anton Mayer	Consultant in Paediatric Intensive Care	Sheffield Children's NHS Foundation Trust
Lilias Alison	Consultant Paediatrician - Sheffield Children's Hospital	Sheffield Children's NHS Foundation Trust
Michelle Glave	Governance Coordinator - Jessop Wing	Sheffield Teaching Hospitals NHS Foundation Trust
Simon Clark	Consultant Neonatologist - Jessop Wing	Sheffield Teaching Hospitals NHS Foundation Trust
Alison Whitham	Head of Midwifery and Matron for Children's Services - King's Mill Hospital	Sherwood Forest Hospitals NHS Foundation Trust
Kate Draper	Clinical Lead Neonatal Unit - King's Mill Hospital	Sherwood Forest Hospitals NHS Foundation Trust
Alison Russell	Central Delivery Suite Manager - James Cook University Hospital & The Friarage Hospital	South Tees Hospitals NHS Foundation Trust
Caroline Marshall	Research/Audit Coordinator	South Tees Hospitals NHS Foundation Trust
Shalabh Garg	Consultant Neonatologist - James Cook University Hospital	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 District Hospital	South Tyneside NHS Foundation Trust
Melanie Crockett	Head of Midwifery	South Warwickshire NHS Foundation Trust
Yvonne Hood	Bereavement Midwife	South Warwickshire NHS Foundation Trust
Karradene Aird	Risk Management Midwife - Southend University Hospital	Southend University Hospital NHS Foundation Trust
Angela Ashurst	Audit Officer	Southport and Ormskirk Hospital NHS Trust
Angela Cullen	Maternity CDOP/Bereavement Link Midwife	Southport and Ormskirk Hospital NHS Trust
Karen Wareing	Neonatal Unit Manager - Ormskirk and District General Hospital	Southport and Ormskirk Hospital NHS Trust
Julian Sutton	Lead Midwife for Clinical Governance - St George's Hospital	St George's Healthcare NHS Trust
Justin Richards	Consultant Neonatologist - St George's Hospital	St George's Healthcare NHS Trust
Margaret Flynn	Senior Midwife for Risk	St George's Healthcare NHS Trust
Melanie O'Byrne	Bereavement Specialist Midwife - St George's Hospital	St George's Healthcare NHS Trust
Nasreen Aziz	Consultant Neonatologist - St George's Hospital	St George's Healthcare NHS Trust
Sijo Francis	Consultant Neonatologist - St George's Hospital	St George's Healthcare NHS Trust
Catherine Hargreaves	Special Care Baby Unit Manager	St Helens and Knowsley Teaching Hospitals NHS Trust
Jacqui Kourellias	Interim Matron Maternity and Gynaecology - Whiston Hospital	St Helens and Knowsley Teaching Hospitals NHS Trust
Julie Sanderson	Shift Leader Delivery Suite/Bereavement Lead Midwife - Whiston Hospital	St Helens and Knowsley Teaching Hospitals NHS Trust
Katherine Hughes	Bereavement Midwife	St Helens and Knowsley Teaching Hospitals NHS Trust
Mary Hornby	Interim Delivery Suite Manager Delivery Suite Coordinator	St Helens and Knowsley Teaching Hospitals NHS Trust
Susan Mundy	Interim Head of Midwifery Services - Whiston Hospital	St Helens and Knowsley Teaching Hospitals NHS Trust
Dawn Watterson	Midwifery Clinical Lead - Risk	States of Guernsey Health and Social Services
Jan Auffret	Clinical Manager - Delivery Suite	States of Jersey Health and Social Services
Julie Mycock	Lead Midwife - General Hospital	States of Jersey Health and Social Services
Carole Beales	Bereavement Midwife - Stepping Hill Hospital	Stockport NHS Foundation Trust
Julie Estcourt	Head of Midwifery/Nursing - Stepping Hill Hospital	Stockport NHS Foundation Trust
Marie Dooley	Governance and Quality Manager/Supervisor of Midwives - Stepping Hill Hospital	Stockport NHS Foundation Trust
K Abdul Khader	Consultant Paediatrician and Neonatal Lead - East Surrey Hospital	Surrey and Sussex Healthcare NHS Trust
Mavis Bloomfield	Midwife	Surrey and Sussex Healthcare NHS Trust
Sharmila Sivarajan	Consultant Obstetrician and Gynaecologist - East Surrey Hospital	Surrey and Sussex Healthcare NHS Trust
Gillian Singleton	Central Delivery Suite Manager and Supervisor of Midwives	Tameside and Glossop Integrated Care NHS Foundation Trust
Sue Moore	Neonatal Clinical Manager - Tameside	Tameside and Glossop Integrated Care NHS Foundation Trust
Julie Harland	Clinical Risk Management Midwife - Musgrove Park Hospital	Taunton and Somerset NHS Foundation Trust
Sue Fulker	Neonatal Unit Manager - Musgrove Park Hospital	Taunton and Somerset NHS Foundation Trust
Bev Paterson	Lead Midwife Risk/Bereavement - Russells Hall Hospital	The Dudley Group NHS Foundation Trust
Anita Hutchins	Acting Head of Midwifery	The Hillingdon Hospitals NHS Foundation Trust
Ann Palmer	Bereavement Midwife - The Hillingdon Hospital	The Hillingdon Hospitals NHS Foundation Trust
Eithne Harte	Senior Midwife - The Hillingdon Hospital	The Hillingdon Hospitals NHS Foundation Trust
Jide Menakaya	Consultant Neonatologist - The Hillingdon Hospital	The Hillingdon Hospitals NHS Foundation Trust
Lawrence Miall	Consultant Neonatologist - Leeds General Infirmary	The Leeds Teaching Hospitals NHS Trust
Medha Rathod	Consultant Obstetrician	The Leeds Teaching Hospitals NHS Trust
Sharon Beanland	Sister Paediatric Intensive Care Unit - Royal Brompton Hospital	The Leeds Teaching Hospitals NHS Trust
Tracey Glanville	Consultant in Feto Maternal Medicine	The Leeds Teaching Hospitals NHS Trust
Chitra Rajagopalan	Head of Service for Obstetrics Consultant Obstetrician and Gynaecologist - Dewsbury and District Hospital	The Mid Yorkshire Hospitals NHS Trust
David Gibson	Lead Neonatologist - Pinderfields General Hospital	The Mid Yorkshire Hospitals NHS Trust
Gill Pownall	Head of Midwifery	The Mid Yorkshire Hospitals NHS Trust
Sarah Hall	Bereavement Midwife - Pinderfields General Hospital and Pontefract Hospital	The Mid Yorkshire Hospitals NHS Trust
Jenna Wall	Senior Midwife	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Michaela Higson	Risk Management Midwife - Royal Victoria Infirmary	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Rhona Collis	Senior Midwife Risk Management - Royal Victoria Infirmary	The Newcastle upon Tyne Hospitals NHS Foundation Trust

Richard Hearn	Consultant Paediatrician - Royal Victoria Infirmary	The Newcastle upon Tyne Hospitals NHS Foundation Trust
Anan Boulos	Consultant Obstetrician and Gynaecologist - Royal Oldham Hospital	The Pennine Acute Hospitals NHS Trust
Caroline Rice	Consultant Obstetrician - North Manchester General Hospital	The Pennine Acute Hospitals NHS Trust
Lydia Bowden	Consultant Neonatologist - Royal Oldham Hospital	The Pennine Acute Hospitals NHS Trust
Susan Brierley	Bereavement Midwife - Royal Oldham Hospital	The Pennine Acute Hospitals NHS Trust
Fiona Walkinshaw	Women's and Neonatal Services Manager	The Portland (HCA Health Care)
Kathryn Beechinor	Staff Midwife - The Portland Hospital	The Portland (HCA Health Care)
Deborah Bridgewater	Maternity Bereavement Advisor for Women's Health	The Princess Alexandra Hospital NHS Trust
Jacqui Featherstone	Head of Midwifery - The Princess Alexandra Hospital	The Princess Alexandra Hospital NHS Trust
Jodie Jupe	Quality and Safety Specialist Midwife/CDS Coordinator - The Queen Elizabeth Hospital	The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust
Yvonne Fulcher	Delivery Suite Coordinator/Bereavement Support Midwife - The Queen Elizabeth Hospital	The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust
Clare Storer	Bereavement Specialist Midwife - Rotherham General Hospital	The Rotherham NHS Foundation Trust
Kathryn Parke	Senior Nurse/Service Manager - Rotherham General Hospital	The Rotherham NHS Foundation Trust
Radhika Gosakan	Consultant Obstetrician and Gynaecologist	The Rotherham NHS Foundation Trust
Eleanor Holyoak	Clinical Lead for Risk and Birthing Unit	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust
Jenny Turner	Community Midwife - Bournemouth Birth Centre	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust
Babu Kumararatne	Consultant Neonatologist - New Cross Hospital	The Royal Wolverhampton Hospitals NHS Trust
Carole Sadler	Specialist Midwife for Bereavement Services - New Cross Hospital	The Royal Wolverhampton Hospitals NHS Trust
Naomi McDermott	Sister - New Cross Hospital	The Royal Wolverhampton Hospitals NHS Trust
Jan Latham	Bereavement Specialist Midwife - Princess Royal Hospital	The Shrewsbury and Telford Hospital NHS Trust
Flo McGrattan	Delivery Suite Coordinator	Torbay and South Devon NHS Foundation Trust
Hazel Harrison	Labour Ward Matron Supervisor of Midwives - Pilgrim Hospital	United Lincolnshire Hospitals NHS Trust
Jackie Saxby	Midwife on Labour Ward - Lincoln County Hospital	United Lincolnshire Hospitals NHS Trust
Jude Wells	Staff Midwife - Pilgrim Hospital	United Lincolnshire Hospitals NHS Trust
Margaret Crawford	Consultant Paediatrician - Pilgrim Hospital	United Lincolnshire Hospitals NHS Trust
Melanie Smith	Labour Ward Coordinator - Pilgrim Hospital	United Lincolnshire Hospitals NHS Trust
Narasimharao Kollipara	Consultant Neonatologist - Lincoln County Hospital	United Lincolnshire Hospitals NHS Trust
Nicky Kirk	Specialist Bereavement Midwife	United Lincolnshire Hospitals NHS Trust
Cherie Raphael	Bereavement Coordinator - University College London Hospital	University College London Hospitals NHS Foundation Trust
Lyn Gilbert	Specialist Bereavement Midwife - University College London Hospital	University College London Hospitals NHS Foundation Trust
Chris Navin	Bereavement Midwife - Wythenshaw Hospital	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 - Princess Anne Hospital, but covers SB at all sites	University Hospital Southampton NHS Foundation Trust
Mark Johnson	ST8 Neonatal Medicine	University Hospital Southampton NHS Foundation Trust
Robert Ironton	Consultant Neonatologist - Princess Anne Hospital, but covers all sites	University Hospital Southampton NHS Foundation Trust
Sarah Davidson	Consultant Neonatologist	University Hospital Southampton NHS Foundation Trust
Kate Blake	Consultant Neonatologist/Clinical Lead Paediatrics & Neonatology - University Hospital Coventry	University Hospitals Coventry and Warwickshire NHS Trust
Letoya Smith	Safeguarding Administrator - University Hospital Coventry	University Hospitals Coventry and Warwickshire NHS Trust
Karen MacDonald-Taylor	Patient Safety Advisor - St Michael's Hospital	University Hospitals of Bristol NHS Foundation Trust
Denise Brookes	Delivery Suite Manager - Leicester Royal Infirmary	University Hospitals of Leicester NHS Trust
Penny McParland	Consultant Obstetrician - Leicester Royal Infirmary	University Hospitals of Leicester NHS Trust
Samantha Belton	Clinical Risk and Quality Facilitator - Leicester Royal Infirmary	University Hospitals of Leicester NHS Trust
Alison Sambrook	Consultant Governance Lead Consultant Obstetrician and Gynaecologist - Cross all sites	University Hospitals of Morecambe Bay NHS Foundation Trust
Celia Sykes	Bereavement Specialist Midwife	University Hospitals of Morecambe Bay NHS Foundation Trust
Julia Alcide	Consultant Obstetrician and Gynaecologist - Furness General Hospital	University Hospitals of Morecambe Bay NHS Foundation Trust
Kath Granger	Consultant Obstetrician and Gynaecologist - Royal Lancaster Infirmary	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 - Lancaster Royal Infirmary, Furness General Hospital, Barrow and Westmorland General Hospital Kendal	University Hospitals of Morecambe Bay NHS Foundation Trust
Lee Abbott	Consultant Neonatologist	University Hospitals of North Midlands NHS Trust
Margaret Elizabeth Jennings	Bereavement Specialist Midwife - Royal Stoke University Hospital	University Hospitals of North Midlands NHS Trust
Sarah Lake	Bereavement Specialist Midwife - Royal Stoke University Hospital	University Hospitals of North Midlands NHS Trust
Carol Hollington	Quality and Risk Management Matron - Walsall Manor Hospital	Walsall Healthcare NHS Trust
Lisa Poston	Neonatal Unit Ward Manager	Walsall Healthcare NHS Trust
Ann Goodwin	Governance Manager - Warrington Hospital	Warrington and Halton Hospitals NHS Foundation Trust
Debra Yates	Bereavement Coordinator	Warrington and Halton Hospitals NHS Foundation Trust
Rita Arya	Consultant Obstetrician Labour Ward Lead - Warrington Hospital	Warrington and Halton Hospitals NHS Foundation Trust
Justine Chung	Senior Midwife - Watford General Hospital	West Hertfordshire Hospitals NHS Trust
Kate Flack	Bereavement Lead Midwife	West Hertfordshire Hospitals NHS Trust
Renton L'Heureux	Consultant Paediatrician/Neonatologist - Watford General Hospital	West Hertfordshire Hospitals NHS Trust
Abigail Buhagiar	Senior Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Carly Strause	Senior Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Justine Ladds	Senior Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Lauri-Anne Croft	Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Robyn Harris	Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Sophie Bennett	Midwife - West Suffolk Hospital	West Suffolk NHS Foundation Trust
Fiona Churchill	Midwife	Western Sussex Hospitals NHS Foundation Trust
Janice White	Labour Ward Coordinator - St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust
Juliette Phelan	Senior Midwifery Manager/Matron - Worthing Hospital	Western Sussex Hospitals NHS Foundation Trust
Louise Fairs	Clinical Manager Inpatient Services - St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust
Maggie Warren	Labour Ward Coordinator - Worthing Hospital	Western Sussex Hospitals NHS Foundation Trust
Nicholas Brennan	Consultant Paediatrician/Neonatal Lead - St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust
Susan McRae	Deputy Sister Neonatal Unit - St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust
Zita Warren	Neonatal Unit Ward Manager - St Richard's Hospital	Western Sussex Hospitals NHS Foundation Trust
Amanda Lang	Patient Safety Midwife	Weston Area Health NHS Trust
Jane Laking	Bereavement Support Midwife - Whittington Hospital	Whittington Health
Diane Williams	Clinical Governance Coordinator - Arrowe Park Hospital	Wirral University Teaching Hospital NHS Foundation Trust
Donna Lloyd-Jones	Quality and Safety Specialist - Arrowe Park Hospital	Wirral University Teaching Hospital NHS Foundation Trust
Heather Lennox	Bereavement Midwife	Wirral University Teaching Hospital NHS Foundation Trust
Sri Babarao	Consultant Neonatologist	Wirral University Teaching Hospital NHS Foundation Trust
Stella Mwenechanya	Consultant Obstetrician Gynaecologist - Arrowe Park Hospital	Wirral University Teaching Hospital NHS Foundation Trust
Karen Kokoska	Deputy Head of Nursing and Midwifery/Divisional Governance Lead	Worcestershire Acute Hospitals NHS Trust
Trudy Berlet	Bereavement Support Midwife - Royal Worcester Hospital	Worcestershire Acute Hospitals NHS Trust
Cathy Stanford	Governance Lead Maternity and Child Health - Royal Albert Edward Infirmary	Wrightington, Wigan and Leigh NHS Foundation Trust
Julie Armstrong	Lead Neonatal Nurse - Royal Albert Edward Infirmary	Wrightington, Wigan and Leigh NHS Foundation Trust
Andrea Walker	Midwife - Hereford County Hospital	Wye Valley NHS Trust
Annette Arnold	Delivery Suite/Triage Manager	Wye Valley NHS Trust
Maxine Chong	Head of Midwifery and Nursing - Hereford County Hospital	Wye Valley NHS Trust
Sabrina Haddock	Governance and Risk Coordinator - Hereford County Hospital	Wye Valley NHS Trust
Simon Meyrick	Consultant Paediatrician - Hereford County Hospital	Wye Valley NHS Trust

Helen Williams	Associated Director of Nursing and Head of Midwifery	Yeovil District Hospital NHS Foundation Trust
Joanne Hayward	Midwifery Matron for Integrated Services	Yeovil District Hospital NHS Foundation Trust
Lindsey Burningham	Midwifery Clinical Lead for Risk	Yeovil District Hospital NHS Foundation Trust
Freya Oliver	Matron for Maternity and Gynaecology - Scarborough General Hospital	York Teaching Hospital NHS Foundation Trust
Guy Millman	Consultant Paediatrician - York Hospital	York Teaching Hospital NHS Foundation Trust
Kirsten Mack	Consultant Paediatrician with Expertise in Cardiology - Scarborough General Hospital	York Teaching Hospital NHS Foundation Trust
Leila Fahel	Consultant Obstetrician and Gynaecologist	York Teaching Hospital NHS Foundation Trust
Narmin Baraheni	Locum Consultant Obstetrician and Gynaecologist - York Hospital	York Teaching Hospital NHS Foundation Trust

A3. Description of the data items reported to MBRRACE-UK

Woman's identifiers

Family name/surname
Given name/first name
Address
Postcode
NHS/Community Health Index (CHI) number
Date of birth/Age
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
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

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 (EDD)
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 and 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 and outcomes summary [a]

Case definition
Was this a termination?
Reason for termination

Labour and 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 and 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 and 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 the 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 and late fetal losses only

A4. Further details of MBRRACE-UK data collection

A4.1 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 applied for in order to collect patient identifiable data and access information collected by statutory organisations 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 (from 10.10.2012); 15/CAG/0119 (from 01.05.2015)

Health & Social Care Information Centre (HSCIC), Data Access Advisory Group: IC604DS

Scotland

The NHS Scotland Caldicott Guardian: 2014-62 MBRRACE-UK Programme – Update (2013-05)

The Privacy Advisory Committee, ISD, NHS National Services Scotland: PAC16/14

Northern Ireland

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

A4.2 The system for online 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. All staff requesting online 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 deaths and to provide access to anonymised medical case 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 (subject to the use of a valid password) while access to identifiable data by MBRRACE-UK 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 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 carried out; for example, date values across the whole record are validated against each other to test for consistency.

There is a facility whereby reporters are allowed to indicate that particular data items are not known. The number of data items that allow the 'not known' option 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 by the technical, clinical or administrative staff, as appropriate.

Reports

The MBRRACE-UK online reporting system allows access to information relating to local deaths:

- the Trust/Health Board Reported Cases list provides abbreviated details of all deaths reported;
- the Trust/Health Board Summary provides the number of deaths by year, case-type and unit;
- the Trust/Health Board Case Review list provides the opportunity for local reporters to check the accuracy (within a fixed time frame) of the data reported by their organisation prior to the analysis for the report.

A 'sort' facility is available to facilitate the identification of deaths from a particular year or from a particular hospital, or to distinguish between cases of stillbirth and neonatal death. The display order of case lists can be changed by clicking on any of the headings.

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 reporting system need access to an up-to-date web browser compatible with these security specifications. Appropriate browsers are available to download free of charge, although the installation of such software may require the co-operation of local NHS IT departments.

A4.3 Ensuring all births for 2015 and extended perinatal deaths are identified

The sources of data used to ensure complete data collection of births in 2015 and extended perinatal deaths for this cohort are listed in Box 3. The combining and checking of this data is outlined briefly below and discussed further in Appendix 2.6.

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

England and Wales

Birth registration data – Office for National Statistics (ONS)

Death registration data – Office for National Statistics (ONS)

Personal Demographics Service data on all births – NHS Digital (PDS)

Scotland

Birth registration data – National Records of Scotland (NRS)

Death registration data – National Records of Scotland (NRS)

SMR02 inpatient data - ISD, NHS National Statistics Scotland

Northern Ireland

Birth registration data - NIMACH, Health and Social Care Public Health Agency – derived from Northern Ireland Maternity System (NIMATS)

Death registration data - NIMACH, Health and Social Care Public Health Agency – derived from Northern Ireland Maternity System (NIMATS)

Inpatient data - NIMACH, Health and Social Care Public Health Agency – derived from Northern Ireland Maternity System (NIMATS)

Crown Dependencies

Birth registration data - Health and Social Services Department, States of Guernsey

Death registration data - Health and Social Services Department, States of Guernsey

Birth registration data - Health Intelligence Unit, Public Health Services, States of Jersey

Death registration data - Health Intelligence Unit, Public Health Services, States of Jersey

PDS data on all births, Isle of Man – NHS Digital (PDS)

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 at time of delivery, Trust or Health Board of birth, baby's NHS number (England – where available), CHI number (Scotland), gestational age at delivery, date of delivery and date of death.

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 information on statutorily 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. 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, most often 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 [1, 2] 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 occurring at around 24^{+0} weeks gestational age, these deaths should all be reported to MBRRACE-UK.

There are no timely and easily accessible data sources for the 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.

Identifying all births in 2015

Individual level information on all births in the UK and Crown Dependencies is obtained in order to generate mortality rates adjusted for maternal, baby, and socio-demographic risk factors. Information for England, Wales and the Isle of Man (PDS and ONS birth registration data), Scotland (NRS and ISD), Northern Ireland (NIMATS), Bailiwick of Guernsey (Health and Social Services Department) and the Bailiwick of Jersey (Health Intelligence Unit) were combined to give a single dataset of births for the whole UK and Crown Dependencies. This data was then combined with the information on the deaths to obtain the final data for analysis. See Appendix A4.4 for a more complete discussion of this process.

The allocation of births to an organisation is complex, given the wide variation in the recording of the notifying organisation, and it was not always possible to easily identify the place of birth from the data reported. In many cases this either required further detailed enquiry or correction of the place of birth, as the incorrect organisation had inadvertently been recorded. Complete and accurate recording is vital to enable MBRRACE-UK to allocate births to the appropriate Trust or Health Board for analysis and reporting.

Home births were allocated to the Trust or Health Board responsible for this service whenever this was recorded, in order for the correct denominator(s) to be calculated. In 2015 the NN4B system was replaced by the Personal Demographics Service (PDS), which is a component of the NHS Spine. All Trusts and Health Boards in England, Wales and the Isle of Man completing information for the PDS should ensure that they are identified as the notifying organisation for all births related to their service.

A4.4 Generating the births dataset

The births and extended perinatal deaths identified using the sources and methods described in Appendix A4.3 were combined to generate a single dataset for analysis. Due to the variations in the data sources from the different countries, this was undertaken separately for each set of data sources as described below. Once the datasets had been generated for each country these were combined into a final, single dataset for analysis.

England and Wales

The complete dataset of births and extended perinatal deaths for England and Wales was generated using birth registration data (ONS), death registration data (ONS), PDS records, and MBRRACE-UK death notification records:

Step 1 All datasets were restricted to births in 2015.

Step 2: All records of births were combined into a single dataset (Figure 24): i.e. livebirth registrations (ONS); stillbirth registrations (ONS); PDS birth records; MBRRACE-UK notifications of late fetal loss. All of these datasets are used in order to obtain complete ascertainment of all births in England and Wales:

- late fetal losses (LFLs) are only recorded in the MBRRACE-UK death records;
- late birth registrations are captured by the PDS records;
- birth records removed from the PDS data due patient opt-outs are captured by the ONS births records.

Step 3 Births at less than 22^{+0} weeks gestational age and pregnancies ended by a termination of pregnancy are removed from the dataset of births as these are not reported by MBRRACE-UK.

Step 4 Births at 22^{+0} to 23^{+6} weeks gestational age are removed from the dataset of births for the main tables and maps as these births are currently reported separately by MBRRACE-UK.

Step 5 All records of late fetal losses, stillbirths, and neonatal deaths were combined into a single dataset (Figure 25): i.e. death registrations (ONS); MBRRACE-UK death notifications. Both of these datasets are used in order to obtain complete ascertainment of all extended perinatal deaths in England and Wales.

Step 6 All deaths where the births occurred at less than 22^{+0} weeks gestational age and pregnancies ended by a termination of pregnancy are removed from the dataset of deaths as these are not reported by MBRRACE-UK.

Step 7 All deaths where the births occurred at less than 24^{+0} weeks gestational age are removed from the dataset of deaths for the main tables and maps as these deaths are currently reported separately by MBRRACE-UK.

Step 8 The dataset of deaths are merged into the dataset of births in order to create a single dataset for analysis.

Figure 24: Flowchart for combining data sources in order to generate dataset of births in England and Wales in 2015

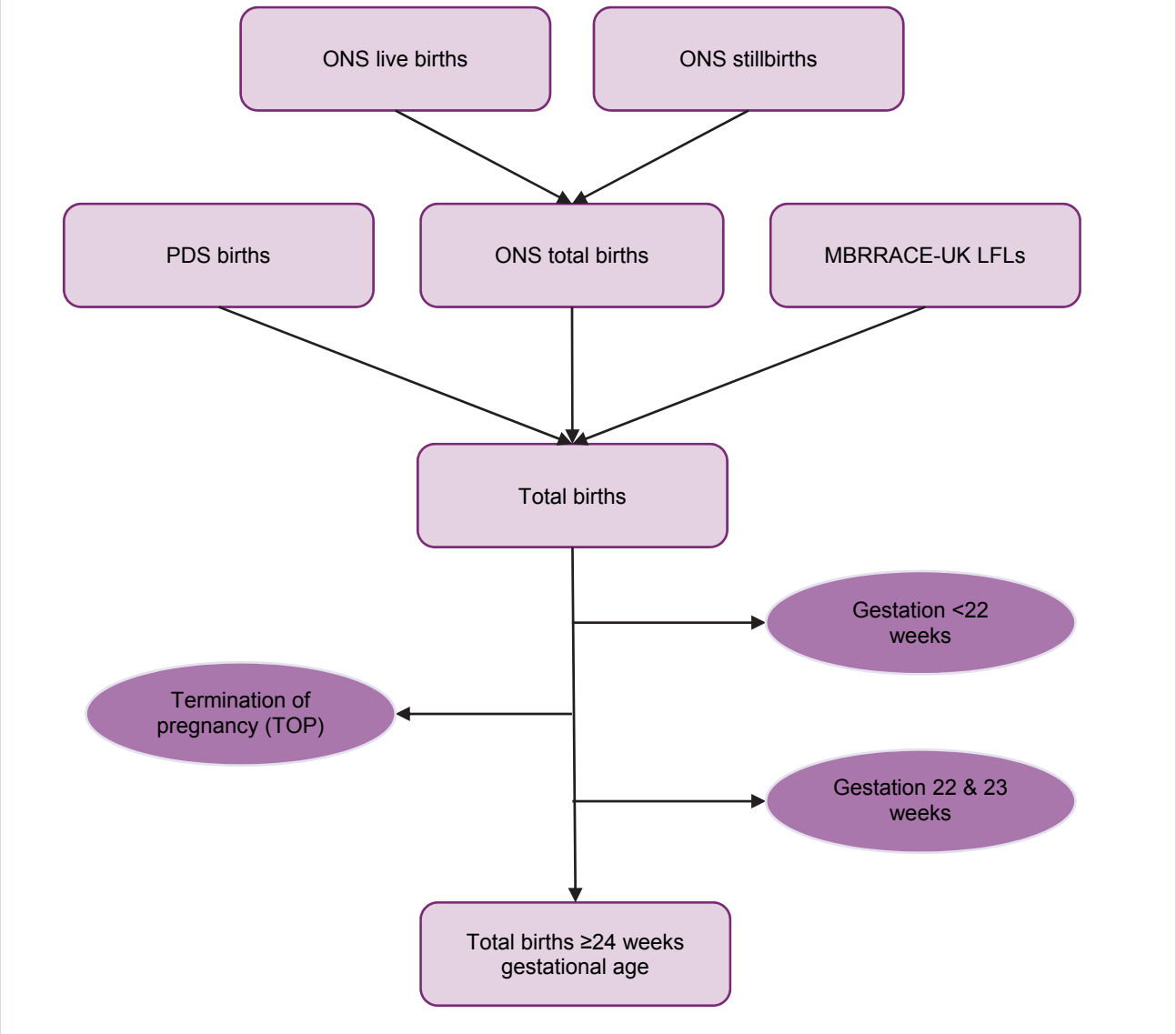
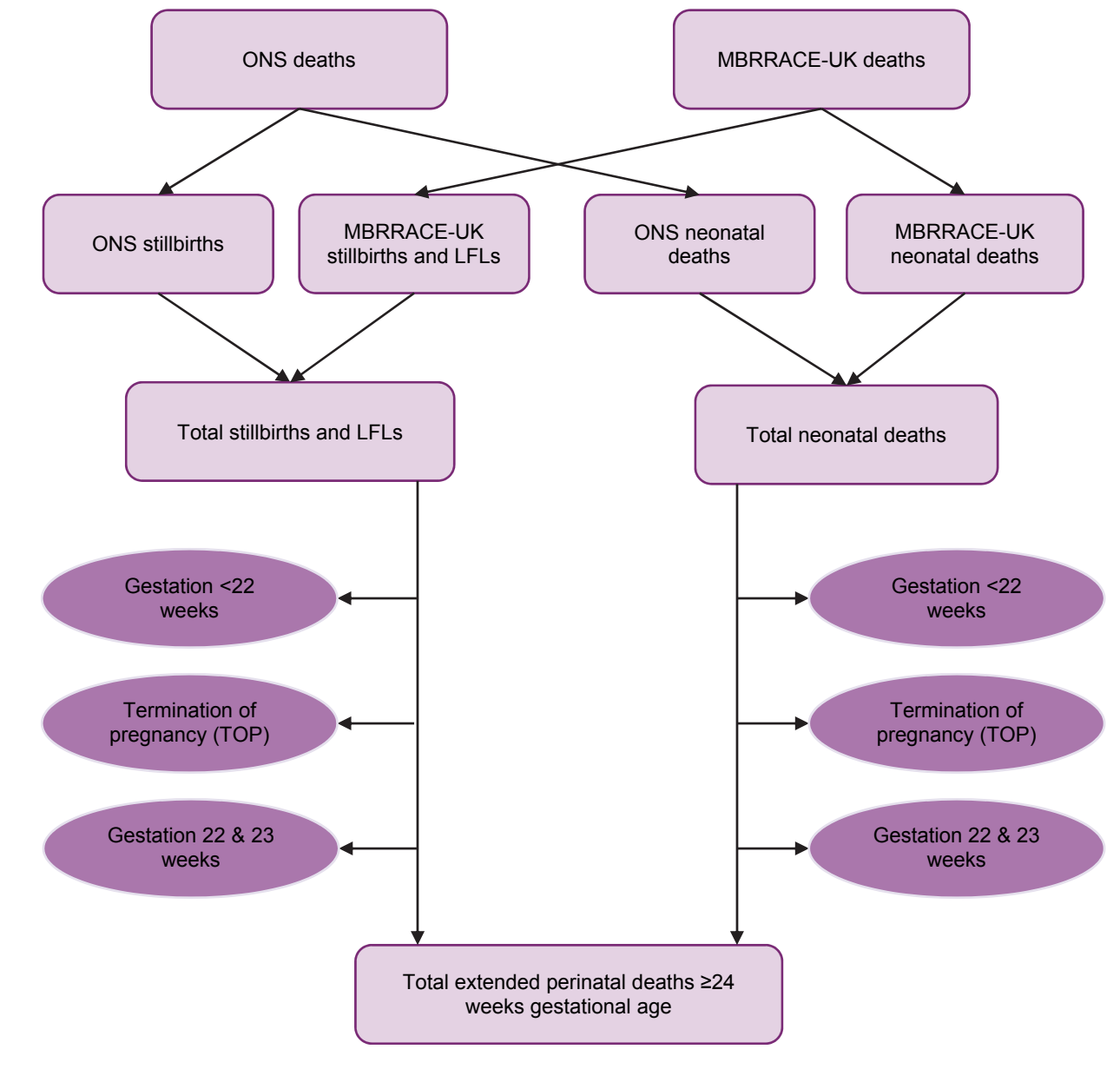


Figure 25: Flowchart for combining data sources in order to generate dataset of extended perinatal deaths for births in England and Wales in 2015



Scotland

The complete dataset of births and extended perinatal deaths for Scotland was generated using a similar approach to that used for England and Wales. For Scotland, data was obtained from birth registration data (NRS), death registration data (NRS), SMR02 Maternity Inpatient and Day Care Case records (ISD), and MBRRACE-UK death notification records. The birth registration data and the SMR02 data are merged before being released to MBRRACE-UK. The process undertaken by MBRRACE-UK was:

Step 1 All datasets were restricted to births in 2015.

Step 2: All records of births were combined into a single dataset (Figure 26): i.e. birth registrations (NRS); MBRRACE-UK notifications of late fetal loss. Both of these datasets are used in order to obtain complete ascertainment of all births in Scotland:

Step 3 Births at less than 22^{+0} weeks gestational age and pregnancies ended by a termination of pregnancy are removed from the dataset of births as these are not reported by MBRRACE-UK.

Step 4 Births at 22^{+0} to 23^{+6} weeks gestational age are removed from the dataset of births for the main tables and maps as these births are currently reported separately by MBRRACE-UK.

Step 5 All records of late fetal losses, stillbirths, and neonatal deaths were combined into a single dataset (Figure 27): i.e. death registrations (NRS); MBRRACE-UK death notifications. Both of these datasets are used in order to obtain complete ascertainment of all extended perinatal deaths in Scotland.

Step 6 All deaths where the births occurred at less than 22^{+0} weeks gestational age and pregnancies ended by a termination of pregnancy are removed from the dataset of deaths as these are not reported by MBRRACE-UK.

Step 7 All deaths where the births occurred at less than 24^{+0} weeks gestational age are removed from the dataset of deaths for the main tables and maps as these deaths are currently reported separately by MBRRACE-UK.

Step 8 The dataset of deaths is merged into the dataset of births in order to create a single dataset for analysis.

Figure 26: Flowchart for combining data sources in order to generate dataset of births in Scotland in 2015

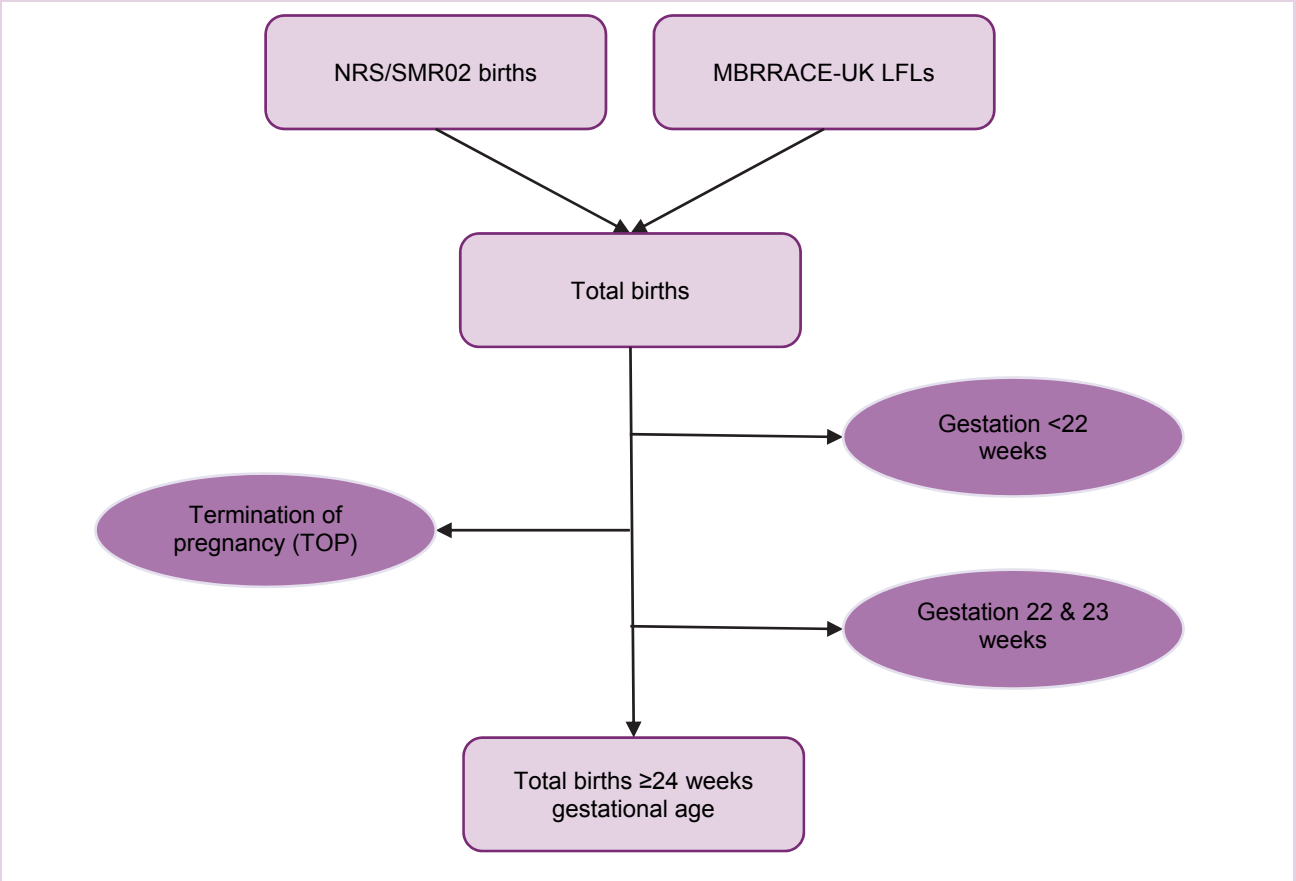
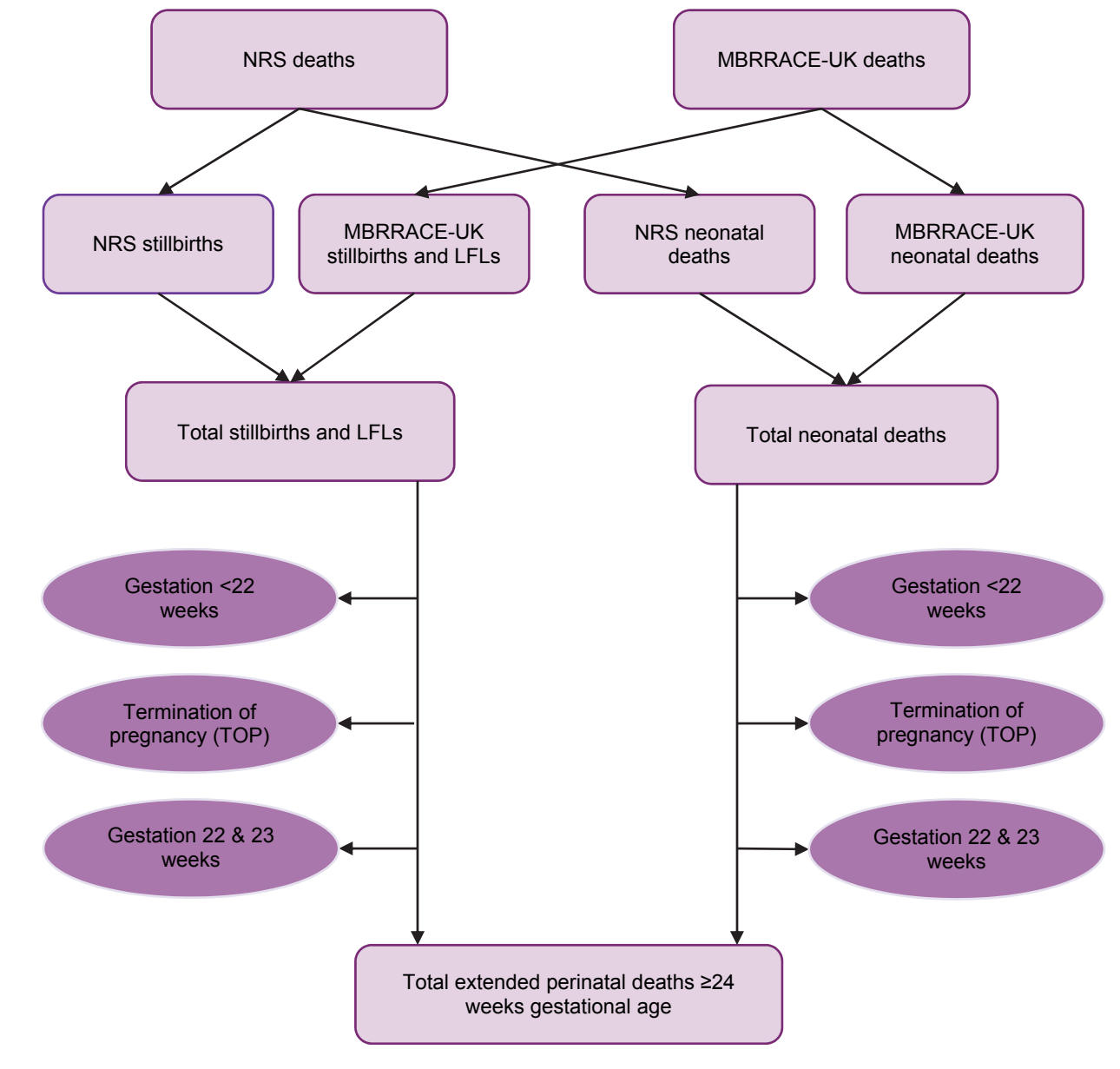


Figure 27: Flowchart for combining data sources in order to generate dataset of extended perinatal deaths for births in Scotland in 2015



Northern Ireland and the Crown Dependencies

Datasets of births and extended perinatal deaths for Northern Ireland, the Bailiwick of Guernsey, and the Bailiwick for Jersey are supplied to MBRRACE-UK as complete datasets from the appropriate national data providers. The birth records for the Isle of Man are obtained from the PDS records. In each case the birth and death records are then linked to the MBRRACE-UK records.

Data cleaning, linking and derived variables

Where information on a variables is available from more than one source a 'best value' algorithm was applied in order to obtain the value to be included in the analyses. The algorithm chosen was:

- where available, the value recorded in the MBRRACE-UK death record was used as the prime source;

- if unavailable (e.g. the baby survived the neonatal period) the value recorded in the statutory birth or death registration record was taken as the secondary source;
- for England and Wales, the value recorded in the PDS record was used as the third source: the gestational age at delivery is only available from the PDS records.

A4.5 Location of mother's residence

The postcode of the mother's residence at the time of delivery is used to identify the country, CCG (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), Crown Dependency, and local authority of reporting using postcode data supplied as part of GridLink. In addition, it is used to obtain the appropriate value for the child poverty index.

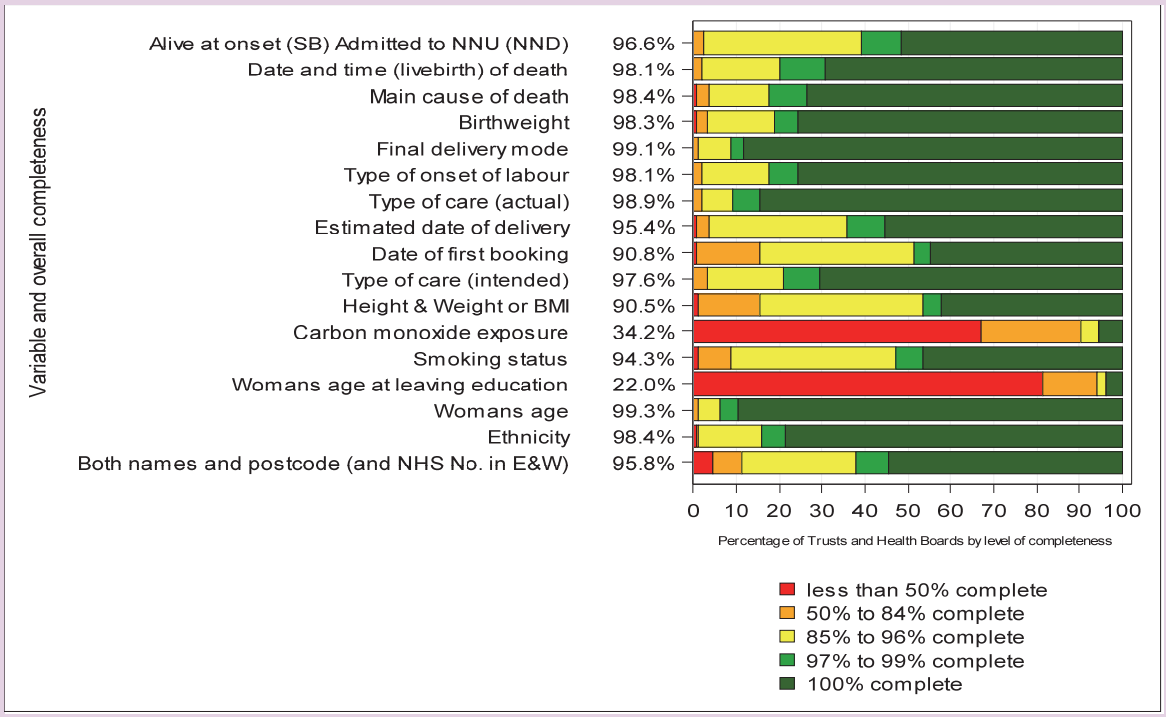
The Trust or Health Board of birth is derived using the most appropriate source from all available datasets. For England and Wales the recorded Communal Establishment Code in the ONS birth records is used as the primary source the location of the birth. When the place of birth could not be located from the ONS records (e.g. births at home and in-transit) in previous MBRRACE-UK reports the location was derived from the NN4B (the predecessor of PDS) dataset. Unfortunately, this information was not available in the PDS dataset for births in 2015 births and so, where available, the place of birth was obtained from the MBRRACE-UK death record. For Scotland, Northern Ireland and the Crown Dependencies the place of birth was available from the routine data.

The Trust or Health Board of death was obtained directly from the MBRRACE-UK death record.

A5. Completeness of the data reported to MBRRACE-UK

One aspect of data quality is the completeness of the data. In Figure 28, the overall completeness of selected key variables is shown together with the percentage of Trusts or Health Boards achieving different levels of completeness for their data.

Figure 28: Level of completeness of data reported by Trusts and Health Boards: United Kingdom and Crown Dependencies, for births in 2015



The completeness for groups of key data items reported to MBRRACE-UK for those deaths used in Chapter 3 is shown in Table 38, 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 at time of delivery (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; EDD.

4. Delivery and baby's characteristics for stillbirths: actual place of delivery; date and time of delivery; final delivery mode; type of onset of labour; birthweight; gestational age at delivery.

5. Delivery and baby's characteristics for neonatal deaths: actual place of delivery; date and time of delivery; final delivery mode; type of onset of labour; birthweight; gestational age at delivery.

6. Baby's outcome: date death confirmed (stillbirths only); whether alive at onset of care in 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: 100.0% complete.

Table 38: Completeness of selected data items reported to MBRRACE-UK by NHS Trust (England), Health Board (Scotland and Wales), Health and Social Care Trust (Northern Ireland), and Crown Dependency: United Kingdom and Crown Dependencies, for births in 2015

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
ENGLAND						
Airedale NHS Foundation Trust	72.7	84.8	100.0	100.0	100.0	100.0
Alder Hey Children's NHS Foundation Trust	76.8	66.7	81.0	*	94.0	100.0
Ashford & St Peter's Hospitals NHS Foundation Trust	66.2	68.6	80.4	100.0	100.0	100.0
Barking Havering & Redbridge University Hospitals NHS Trust	74.2	81.1	100.0	100.0	100.0	96.7
Barnsley Hospital NHS Foundation Trust	88.3	80.0	97.8	100.0	100.0	93.3
Barts Health NHS Trust	83.9	79.4	96.3	99.2	99.3	97.8
Basildon and Thurrock University Hospitals NHS Foundation Trust	75.0	96.3	98.1	100.0	100.0	100.0
Bedford Hospital NHS Trust	94.6	90.5	100.0	100.0	100.0	100.0
Birmingham Women's NHS Foundation Trust	78.2	72.1	96.1	99.6	94.4	98.8
Blackpool Teaching Hospitals NHS Foundation Trust	82.1	95.2	95.2	100.0	96.7	100.0
Bolton NHS Foundation Trust	80.8	78.6	95.7	99.4	98.5	97.4
Bradford Teaching Hospitals NHS Foundation Trust	75.0	91.1	96.4	99.2	100.0	96.4
Brighton and Sussex University Hospitals NHS Trust	79.7	69.8	85.4	98.4	90.9	95.8
Buckinghamshire Healthcare NHS Trust	71.9	68.1	97.2	100.0	88.9	95.8
Burton Hospitals NHS Foundation Trust	87.5	66.7	97.2	100.0	100.0	97.2
Calderdale & Huddersfield NHS Foundation Trust	85.3	75.9	98.9	99.2	100.0	98.9
Cambridge University Hospitals NHS Foundation Trust	72.3	39.7	72.3	93.3	96.9	97.2
Central Manchester University Hospitals NHS Foundation Trust	80.1	59.9	89.0	99.4	98.7	97.5
Chelsea and Westminster Hospital NHS Foundation Trust	76.6	66.0	96.5	100.0	100.0	99.3

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
Chesterfield Royal Hospital NHS Foundation Trust	75.0	66.7	100.0	100.0	*	95.8
City Hospitals Sunderland NHS Foundation Trust	61.8	68.6	96.1	98.6	96.7	94.1
Colchester Hospital University NHS Foundation Trust	75.0	98.3	100.0	100.0	100.0	100.0
Countess of Chester Hospital NHS Foundation Trust	76.3	89.5	100.0	100.0	97.9	98.2
County Durham & Darlington NHS Foundation Trust	74.0	79.2	95.8	97.9	89.6	93.1
Croydon Health Services NHS Trust	77.9	66.7	90.2	100.0	100.0	98
Dartford & Gravesham NHS Trust	100.0	100.0	100.0	100.0	100.0	98.6
Derby Teaching Hospitals NHS Foundation Trust	75.0	66.7	100.0	100.0	100.0	97.8
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	88.0	84.1	100.0	100.0	100.0	97.1
Dorset County Hospital NHS Foundation Trust	62.5	72.2	100.0	95.8	100.0	94.4
East Cheshire NHS Trust	50.0	100.0	100.0	100.0	*	100.0
East Kent Hospitals University NHS Foundation Trust	75.0	73.9	95.5	98.0	97.2	98.2
East Lancashire Hospitals NHS Trust	75.5	88.1	100.0	98.6	100.0	96.9
East Sussex Healthcare NHS Trust	75.0	66.7	100.0	98.3	100.0	97.4
East and North Hertfordshire NHS Trust	75.8	66.7	100.0	100.0	100.0	100.0
Epsom and St Helier University Hospitals NHS Trust	80.0	66.7	98.3	100.0	100.0	100.0
Frimley Health NHS Foundation Trust	83.9	69.0	99.2	100.0	100.0	100.0
Gateshead Health NHS Foundation Trust	75.0	50.0	100.0	100.0	100.0	100.0
George Eliot Hospital NHS Trust	100.0	100.0	95.8	100.0	100.0	100.0
Gloucestershire Hospitals NHS Foundation Trust	85.2	77.8	98.8	99.2	100.0	100.0
Great Ormond Street Hospital for Children NHS Foundation Trust	58.3	31.7	65.1	*	97.6	98.4
Great Western Hospitals NHS Foundation Trust	75.0	73.8	97.6	100.0	100.0	100.0
Guy's and St Thomas' NHS Foundation Trust	76.6	67.5	94.0	100.0	100.0	99.6
Hampshire Hospitals NHS Foundation Trust	67.0	54.5	86.4	84.1	100.0	80.3
Harrogate and District NHS Foundation Trust	87.5	70.8	100.0	100.0	100.0	95.8
Heart of England NHS Foundation Trust	82.3	76.9	98.7	99.7	93.9	96.0
Hinchingbrooke Health Care NHS Trust	85.7	66.7	100.0	100.0	*	100.0
Homerton University Hospital NHS Foundation Trust	73.8	72.9	96.9	100.0	100.0	100.0
Hull and East Yorkshire Hospitals NHS Trust	80.5	66.7	95.9	100.0	100.0	100.0
Imperial College Healthcare NHS Trust	90.2	72.2	91.4	98.6	99.1	98.5

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
Isle of Wight NHS Trust	75.0	73.3	100.0	100.0	100.0	100.0
James Paget University Hospitals NHS Foundation Trust	80.0	80.0	100.0	100.0	*	100.0
Kettering General Hospital NHS Foundation Trust	76.9	79.0	96.3	98.6	100.0	97.5
King's College Hospital NHS Foundation Trust	75.9	71.3	97.1	96.4	100.0	95.4
Kingston Hospital NHS Trust	75.0	66.7	100.0	100.0	100.0	97.2
Lancashire Teaching Hospitals NHS Foundation Trust	83.3	70.4	97.5	100.0	100.0	100.0
Lewisham and Greenwich NHS Trust	75.6	63.0	92.6	98.8	100.0	97.8
Liverpool Women's NHS Foundation Trust	72.7	59.6	78.7	100.0	100.0	98.2
London North West Healthcare NHS Trust	70.0	62.7	90.7	91.3	83.3	90.7
Luton and Dunstable Hospital NHS Foundation Trust	74.3	75.0	97.2	100.0	100.0	99.1
Maidstone and Tunbridge Wells NHS Trust	75.0	72.7	100.0	100.0	100.0	98.5
Medway NHS Foundation Trust	81.7	78.9	98.9	100.0	100.0	98.9
Mid Cheshire Hospitals NHS Foundation Trust	87.5	86.1	100.0	100.0	100.0	97.2
Mid Essex Hospital Services NHS Trust	78.1	72.9	97.9	96.7	100.0	89.6
Milton Keynes University Hospital NHS Foundation Trust	75.0	62.2	93.3	100.0	100.0	100.0
Norfolk and Norwich University Hospitals NHS Foundation Trust	75.0	75.7	98.2	100.0	100.0	98.2
North Bristol NHS Trust	75.8	78.8	99.0	98.7	100.0	98.0
North Cumbria University Hospitals NHS Trust	75.0	66.7	100.0	100.0	100.0	100.0
North Middlesex University Hospital NHS Trust	74.2	62.4	95.7	100.0	100.0	94.6
North Tees & Hartlepool NHS Foundation Trust	76.8	90.5	100.0	100.0	100.0	97.6
Northampton General Hospital NHS Trust	84.1	72.7	100.0	100.0	100.0	97.0
Northern Devon Healthcare NHS Trust	90.0	73.3	100.0	100.0	100.0	100.0
Northern Lincolnshire and Goole Hospitals NHS Foundation Trust	74.1	81.5	98.8	97.3	100.0	93.8
Northumbria Healthcare NHS Foundation Trust	87.5	88.1	100.0	100.0	100.0	97.6
Nottingham University Hospitals NHS Trust	84.6	77.9	98.5	99.1	100.0	99.0
Oxford University Hospitals NHS Trust	81.3	69.0	94.6	100.0	100.0	96.4
Peterborough & Stamford Hospitals NHS Foundation Trust	75.0	68.2	100.0	100.0	100.0	100.0
Plymouth Hospitals NHS Trust	76.7	66.7	95.6	98.7	100.0	100.0
Poole Hospital NHS Foundation Trust	75.0	88.2	100.0	100.0	100.0	98.0
Portsmouth Hospitals NHS Trust	88.7	61.3	93.5	100.0	100.0	96.8

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
Royal Berkshire NHS Foundation Trust	78.0	71.5	97.6	99.1	100.0	97.6
Royal Brompton & Harefield NHS Foundation Trust	65.0	40.0	53.3	*	90.0	100.0
Royal Cornwall Hospitals NHS Trust	78.9	64.9	94.7	100.0	100.0	100.0
Royal Devon & Exeter NHS Foundation Trust	77.3	81.8	100.0	100.0	100.0	100.0
Royal Free London NHS Foundation Trust	84.8	71.7	96.0	99.5	100.0	99.0
Royal Surrey County Hospital NHS Foundation Trust	75.0	48.5	90.9	100.0	100.0	100.0
Royal United Hospitals Bath NHS Foundation Trust	90.2	91.3	97.1	100.0	100.0	98.6
Salisbury NHS Foundation Trust	80.3	87.7	100.0	100.0	100.0	96.5
Sandwell & West Birmingham Hospitals NHS Trust	79.8	65.4	94.9	95.9	100.0	96.8
Sheffield Teaching Hospitals NHS Foundation Trust	77.1	66.2	87.2	100.0	100.0	99.1
Sherwood Forest Hospitals NHS Foundation Trust	80.0	78.3	91.7	100.0	100.0	98.3
South Tees Hospitals NHS Foundation Trust	74.2	71.9	93.8	100.0	100.0	99.0
South Tyneside NHS Foundation Trust	75.0	83.3	100.0	100.0	*	100.0
South Warwickshire NHS Foundation Trust	75.0	71.4	100.0	100.0	100.0	100.0
Southend University Hospital NHS Foundation Trust	98.7	57.9	80.7	100.0	100.0	100.0
Southport & Ormskirk Hospital NHS Trust	92.9	66.7	81.0	100.0	100.0	100.0
St George's University Hospital NHS Foundation Trust	73.9	59.4	90.6	100.0	99.1	98.6
St Helens & Knowsley Teaching Hospitals NHS Trust	73.3	88.9	97.8	100.0	100.0	100.0
Stockport NHS Foundation Trust	75.0	84.8	100.0	100.0	91.7	98.5
Surrey & Sussex Healthcare NHS Trust	73.4	68.8	100.0	94.4	100.0	93.8
Tameside and Glossop Integrated Care NHS Foundation Trust	75.0	100.0	100.0	100.0	*	100.0
Taunton & Somerset NHS Foundation Trust	97.2	96.3	100.0	100.0	100.0	100.0
The Dudley Group NHS Foundation Trust	78.3	88.9	96.7	99.2	97.9	96.7
The Hillingdon Hospitals NHS Foundation Trust	85.2	84.8	100.0	100.0	*	98.5
The Ipswich Hospital NHS Trust	75.0	71.8	100.0	100.0	100.0	100.0
The Leeds Teaching Hospitals NHS Trust	82.4	69	77.0	98.8	96.5	97.2
The Mid Yorkshire Hospitals NHS Trust	73.2	84.5	100.0	100.0	100.0	98.8
The Newcastle upon Tyne Hospitals NHS Foundation Trust	78.3	74.6	92.1	100.0	98.9	98.2
The Pennine Acute Hospitals NHS Trust	89.5	80.7	98.7	99.1	100.0	97.3
The Portland Hospital for Women and Children	100.0	100.0	100.0	100.0	*	100.0

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
The Princess Alexandra Hospital NHS Trust	89.3	76.2	100.0	97.6	*	100.0
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust	75.0	78.8	100.0	100.0	100.0	100.0
The Rotherham NHS Foundation Trust	92.9	81.0	100.0	100.0	*	100.0
The Royal Wolverhampton NHS Trust	79.4	75.8	95	96.1	95.7	99.2
The Shrewsbury and Telford Hospital NHS Trust	74.1	85.7	100.0	100.0	100.0	100.0
Torbay and South Devon NHS Foundation Trust	75.0	75.0	100.0	100.0	100.0	100.0
United Lincolnshire Hospitals NHS Trust	81.5	82.6	97.1	100.0	100.0	98.6
University College London Hospitals NHS Foundation Trust	82.1	89.7	97.4	100.0	100.0	100.0
University Hospital Birmingham NHS Foundation Trust	75.0	100.0	100.0	83.3	*	100.0
University Hospital Southampton NHS Foundation Trust	88.0	58.6	88.3	100.0	97.9	99.4
University Hospital of South Manchester NHS Foundation Trust	86.1	70.4	100.0	100.0	*	96.3
University Hospitals Coventry & Warwickshire NHS Trust	82.1	82.9	98.3	100.0	100.0	100.0
University Hospitals Bristol NHS Foundation Trust	75.4	68.9	89.4	100.0	99.5	100.0
University Hospitals of Leicester NHS Trust	78.5	69.7	97.0	99.6	99.0	98.3
University Hospitals of Morecambe Bay NHS Foundation Trust	77.1	72.2	100.0	100.0	100.0	100.0
University Hospitals of North Midlands NHS Trust	84.5	68.3	92.1	100.0	100.0	96.8
Walsall Healthcare NHS Trust	87.0	79.7	95.7	99.2	100.0	98.6
Warrington & Halton Hospitals NHS Foundation Trust	85.7	71.4	100.0	100.0	100.0	95.2
West Hertfordshire Hospitals NHS Trust	74.1	66.7	100.0	100.0	100.0	98.8
West Suffolk NHS Foundation Trust	60.7	52.4	76.2	80.0	50.0	61.9
Western Sussex Hospitals NHS Foundation Trust	79.4	68.6	100.0	100.0	100.0	100.0
Weston Area Health NHS Trust	75.0	66.7	100.0	100.0	*	100.0
Whittington Health	80.0	68.3	100.0	100.0	100.0	98.3
Wirral University Teaching Hospital NHS Foundation Trust	75.9	71.3	95.4	100.0	100.0	98.9
Worcestershire Acute Hospitals NHS Trust	91.9	72.0	95.7	99.3	100.0	97.8
Wrightington, Wigan & Leigh NHS Foundation Trust	82.5	63.3	93.3	88.9	100.0	90.0
Wye Valley NHS Trust	96.4	66.7	95.2	100.0	100.0	100.0
Yeovil District Hospital NHS Foundation Trust	50.0	50.0	83.3	75.0	*	75.0
York Teaching Hospital NHS Foundation Trust	81.6	77.2	96.5	100.0	97.6	98.2
SCOTLAND						

Trust or Health Board	Mother's details	Booking information	Antenatal care	Delivery and Baby's characteristics for stillbirths	Delivery and Baby's characteristics for neonatal deaths	Baby's outcome
NHS Ayrshire & Arran	75.0	93.0	100.0	100.0	100.0	94.7
NHS Borders	78.6	95.2	100.0	97.6	*	100.0
NHS Dumfries & Galloway	75.0	73.3	100.0	100.0	*	100.0
NHS Fife	75.0	96.3	98.1	100.0	100.0	98.1
NHS Forth Valley	78.1	91.7	87.5	90.5	100.0	95.8
NHS Grampian	80.2	86.2	95.4	100.0	100.0	98.9
NHS Greater Glasgow & Clyde	82.5	85.8	95.4	98.9	99.4	97.7
NHS Highland	79.5	84.8	93.9	97.2	100.0	87.9
NHS Lanarkshire	75.0	85.0	100.0	100.0	100.0	98.3
NHS Lothian	75.5	91.8	98.0	100.0	100.0	100.0
NHS Tayside	76.5	80.4	100.0	100.0	100.0	100.0
NHS Western Isles	100.0	100.0	100.0	100.0	*	100.0
WALES						
Abertawe Bro Morgannwg University Health Board	74.3	66.7	93.9	98.8	100.0	97.4
Aneurin Bevan University Health Board	83.8	82.5	98.3	100.0	100.0	100.0
Betsi Cadwaladr University Health Board	71.3	74.1	100.0	100.0	100.0	97.5
Cardiff and Vale University Health Board	69.4	61.2	92.5	100.0	100.0	97.3
Cwm Taf University Health Board	63.9	77.8	100.0	100.0	100.0	100.0
Hywel Dda University Health Board	76.6	68.8	95.8	100.0	100.0	100.0
NORTHERN IRELAND						
Belfast Health & Social Care Trust	79.4	62.4	91.9	95.1	99.6	96.8
Northern Health & Social Care Trust	77.5	66.7	100.0	100.0	100.0	96.7
South Eastern Health & Social Care Trust	82.1	61.9	93.7	97.4	97.9	96.8
Southern Health & Social Care Trust	82.6	62.0	93.5	98.3	97.9	99.1
Western Health & Social Care Trust	78.9	63.2	94.7	100.0	100.0	96.5
CROWN DEPENDENCIES						
Isle of Man Department of Health and Social Care	100.0	100.0	100.0	100.0	.	100.0
States of Guernsey Health & Social Services	50.0	66.7	100.0	100.0	.	100.0

* no stillbirths or neonatal deaths for this organisation

A6. Statistical methods to calculate stabilised & adjusted mortality rates

The stabilised & adjusted mortality rate for each organisation (m_j) is calculated by multiplying the appropriate 'comparator' mortality rate UK (M) by an organisation-specific standardised mortality rate (SMR_j) 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 appropriate comparator mortality rate

SMR_j is the estimated SMR for organisation j: $SMR_j = \frac{(\text{No. observeddeaths})}{(\text{No. expecteddeaths})}$

Currently, for all organisations, except for the Trusts and Health Boards of birth, the comparator mortality rate is the overall mortality rate for the whole of the UK and Crown Dependencies. For the Trusts and Health Boards of birth the comparator mortality rate is the overall rate for Trusts and Health Boards in the same comparator group (described below). The SMR is estimated using a multilevel logistic regression model:

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

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

x_{ij} is the vector of risk-adjustment factors for the i^{th} baby in the j^{th} organisation

z_j is the vector of risk-adjustment factors for the j^{th} organisation

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

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 [1]. 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*" [2]. 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:

$$SMR_j = \frac{\sum_{i=1}^{n_j} \frac{\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j + \delta_j\right]}{\left(1+\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j + \delta_j\right]\right)}}{\sum_{i=1}^{n_j} \frac{\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j\right]}{\left(1+\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j\right]\right)}}$$

and

$$m_j = M \times \frac{\sum_{i=1}^{n_j} \frac{\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j + \delta_j\right]}{\left(1+\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j + \delta_j\right]\right)}}{\sum_{i=1}^{n_j} \frac{\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j\right]}{\left(1+\exp\left[\alpha + \boldsymbol{\beta}\mathbf{x}_{ij} + \boldsymbol{\Gamma}\mathbf{z}_j\right]\right)}}$$

Risk-adjustment factors

The multilevel logistic regression model outlined in the previous section includes patient-level and organisation–level 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 patient-level risk-adjustment factors included in the statistical model were:

- mother's age (<20 years, 20-24 year, 25-29 years, 30-34 years, 35-39 years, ≥40 years);
- child poverty (measured by Children in Low Income Families Local Measure based on mother's residence (quintiles with approximately equal number of total births);
- baby's ethnicity (White, mixed or multiple ethnicity, Asian or Asian British, Black or Black British, other);
- baby's sex (male, non-male);
- multiple birth (singleton, multiple);
- interaction between child poverty and baby's ethnicity;
- interaction between child poverty and mother's age;
- gestational age at birth for neonatal death rates only (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, ≥42^{+0} weeks).

The only organisation-level factor (z_{ij}) currently included in the MBRRACE-UK analysis is a marker for the 'comparator group' of each organisation responsible for delivering maternity care. In the absence of detailed clinical data, to help account for the variation between organisations due to their differences in risk profile, all of the Trusts and Health Boards have been classified hierarchically into five mutually exclusive comparator groups based on their level of service provision. They are then compared to the average mortality rate within their comparator group. The five comparator groups are:

1. Availability of Level 3 Neonatal Intensive Care Unit (NICU) and Neonatal Surgery;
2. Availability of Level 3 NICU;
3. 4,000 or more births per annum at 24 weeks or later;
4. 2,000-3,999 births per annum at 24 weeks or later;
5. Under 2,000 births per annum at 24 weeks or later.

Statistical models

Two multilevel logistic regression models were used, one for the stillbirths as outcome and the other model for neonatal deaths. The reference group for the both models is the births surviving at least 28 days from birth. The multilevel logistic regression model for stillbirth compared to survival to the end of the neonatal period is:

$$\text{logit}\left[P_{(SB)ij}\left(Y_{(SB)ij}=1\middle|\mathbf{x_{ij}}\right)\right]=\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_{j}+\delta_{(SB)j}$$

where $Y(SB)_{ij}$ is the indicator variable of stillbirth for the i^{th} baby in the j^{th} organisation:

$Y(SB)_{ij}$ =1 if stillbirth; 0 if survivor to end of neonatal period; missing if neonatal death;

x_{ij} is the vector of risk adjustment factors for the i^{th} baby in the j^{th} organisation;

z_{ij} is the vector of risk adjustment factors for the j^{th} organisation;

$\delta(SB)_j$ is the random term representing organisation j: $\delta \sim \text{Normal}(0,\sigma^2)$.

A similar model was estimated for neonatal deaths:

$$\text{logit}\left[P_{(NND)ij}\left(Y_{(NND)ij}=1\middle|\mathbf{x_{ij}}\right)\right]=\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}$$

where $Y(NND)_{ij}$ is the indicator variable of neonatal death for the i^{th} baby in the j^{th} organisation: $Y(NND)_{ij}$ =1 if neonatal death; 0 if survivor to end of neonatal period; missing if stillbirth;

x_{ij} is the vector of risk adjustment factors for the i^{th} baby in the j^{th} organisation;

z_{ij} is the vector of risk adjustment factors for the j^{th} organisation;

$\delta(NND)_j$ is the random term representing organisation j: $\delta \sim \text{Normal}(0,\sigma^2)$.

The SMR for stillbirth is then given by combining these two models:

$$\text{SMR}_{(\text{SB})j}=\frac{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j+\delta_{(SB)j}\right)}{1+\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j+\delta_{(SB)j}\right)+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}\right)}\right]}{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j\right)}{1+\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j\right)+\exp\left(\alpha_{NND}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j\right)}\right]}$$

The SMR for neonatal deaths is derived directly from the second multilevel logistic regression model since stillbirths are not included in the calculation of neonatal death rates:

$$\text{SMR}_{(\text{NND})j}=\frac{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}\right)}{1+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}\right)}\right]}{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j\right)}{1+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j\right)}\right]}$$

The SMR for the extended perinatal deaths is obtained by combining the results of both models:

$$\text{SMR}_{(\text{EPD})j}=\frac{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j+\delta_{(SB)j}\right)+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}\right)}{1+\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j+\delta_{(SB)j}\right)+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j+\delta_{(NND)j}\right)}\right]}{\sum_{i=1}^{n_j}\left[\frac{\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j\right)+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j\right)}{1+\exp\left(\alpha_{(SB)}+\boldsymbol{\beta}_{(SB)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(SB)}\mathbf{z}_j\right)+\exp\left(\alpha_{(NND)}+\boldsymbol{\beta}_{(NND)}\mathbf{x}_{ij}+\boldsymbol{\Gamma}_{(NND)}\mathbf{z}_j\right)}\right]}$$

95% confidence intervals

The reported 95% confidence intervals for the stabilised & adjusted mortality rate are obtained through bootstrap methods [3]:

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: $\hat{\delta}_j$ and $\hat{error}\left(\delta_j\right)$ - 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^*, $\boldsymbol{\beta}^*$ and $\boldsymbol{\Gamma}^*$).
5. A new value (δ_j^*) for the organisation-specific random term is sampled, where $\delta_j^* \sim N\left(\hat{\delta}_j, \hat{error}\left[\delta_j\right]\right)$.

6. The bootstrap stabilised & adjusted mortality rate (m_j^*) is obtained by substituting (α^*, $\boldsymbol{\beta}^*$, $\boldsymbol{\Gamma}^*$ and δ_j^* for α, $\boldsymbol{\beta}$, $\boldsymbol{\Gamma}$ and δ_j as appropriate.

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.

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:

- mothers age - 30 to 34 years (unknown for 3.0% of births in 2015);
- socio-economic deprivation - middle quintile (unknown for 0.6% of births in 2015);
- baby's ethnicity - white (unknown for 7.5% of births in 2015);
- baby's sex - male (unknown for 0.1% of births in 2015);
- multiple birth - singleton (unknown for 0.2% of births in 2015);
- gestational age at birth - 37^{+0} to 41^{+6} weeks (unknown for 3.5% of births in 2015).

Since missing observations are imputed with values generally representing low risk groups, stabilised & adjusted mortality rates are potentially overestimated for those organisations with missing data. However, as the proportion of missing data is low, and the effect of adjustment is relatively small, any overestimation will be small and unlikely to change any conclusions inferred from the reported rates.

References

1. Mohammed MA, Manktelow BN, Hofer TP. Comparison of four methods for deriving hospital standardised mortality ratios from a single hierarchical logistic regression model. Statistical Methods in Medical Research 2016; 25(2): 706-715.

2. Shahian DM, Torchiana DF, Shemin RJ, Rawn JD, Normand S-LT. Massachusetts Cardiac Surgery Report Card: Implications of Statistical Methodology. The Annals of Thoracic Surgery 2005; 80(6): 2106-2113.

3. Ash AS, Fienberg SE, Louis TA, Normand S-LT, Stukel TA, Utts J. Statistical issues in assessing hospital performance. Quantitative Health Sciences Publications and Presentations 2012: Paper 1114.

A7. Further rates of mortality for organisations

A7.1 Rates of mortality by neonatal network in the United Kingdom

Figure 29: Crude stillbirth rates by neonatal network based on place of birth: United Kingdom, for births in 2015

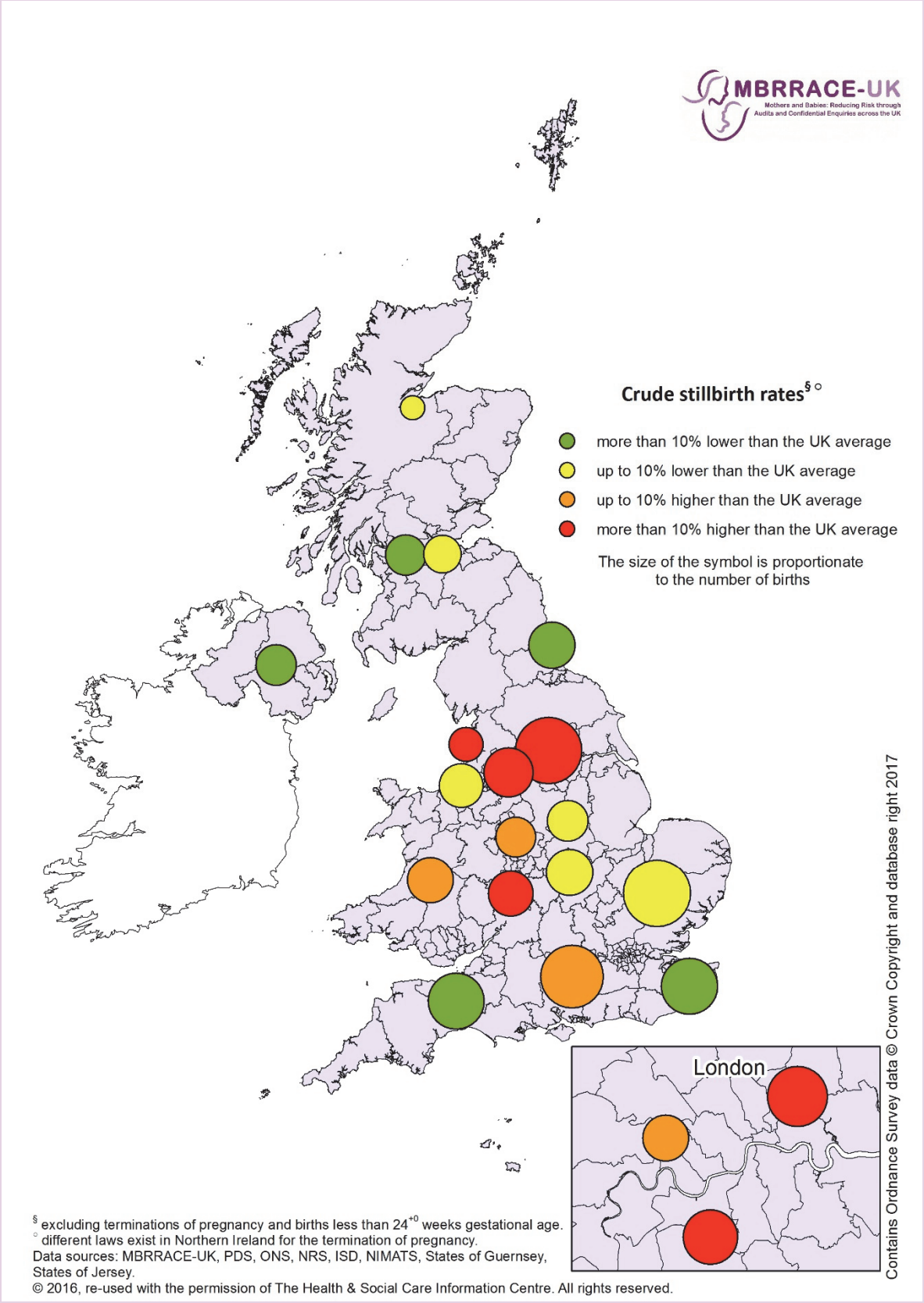


Figure 30: Stabilised & adjusted stillbirth rates by neonatal network based on place of birth: United Kingdom, for births in 2015

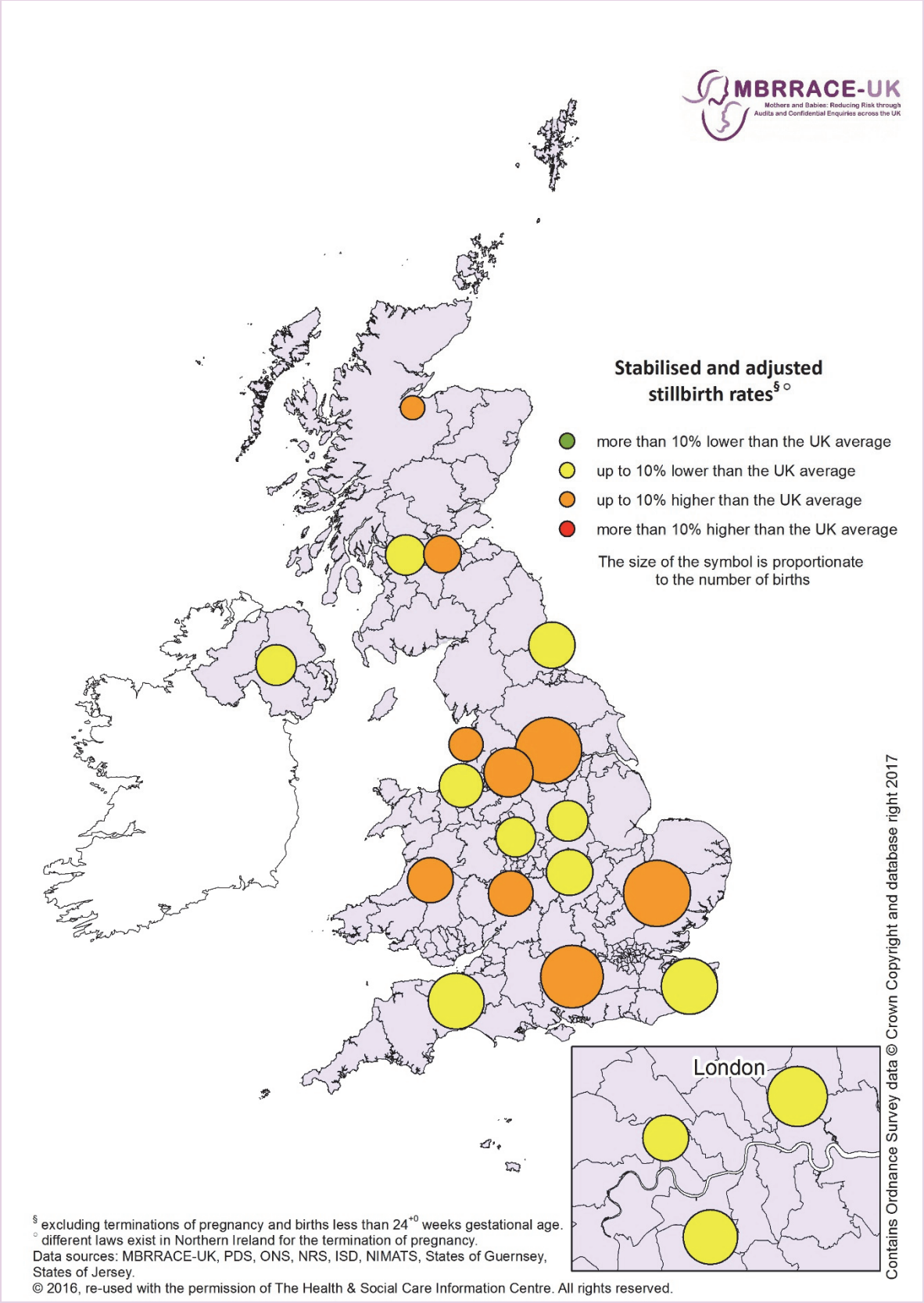


Figure 31: Crude neonatal mortality rates by neonatal network based on place of birth: United Kingdom, for births in 2015

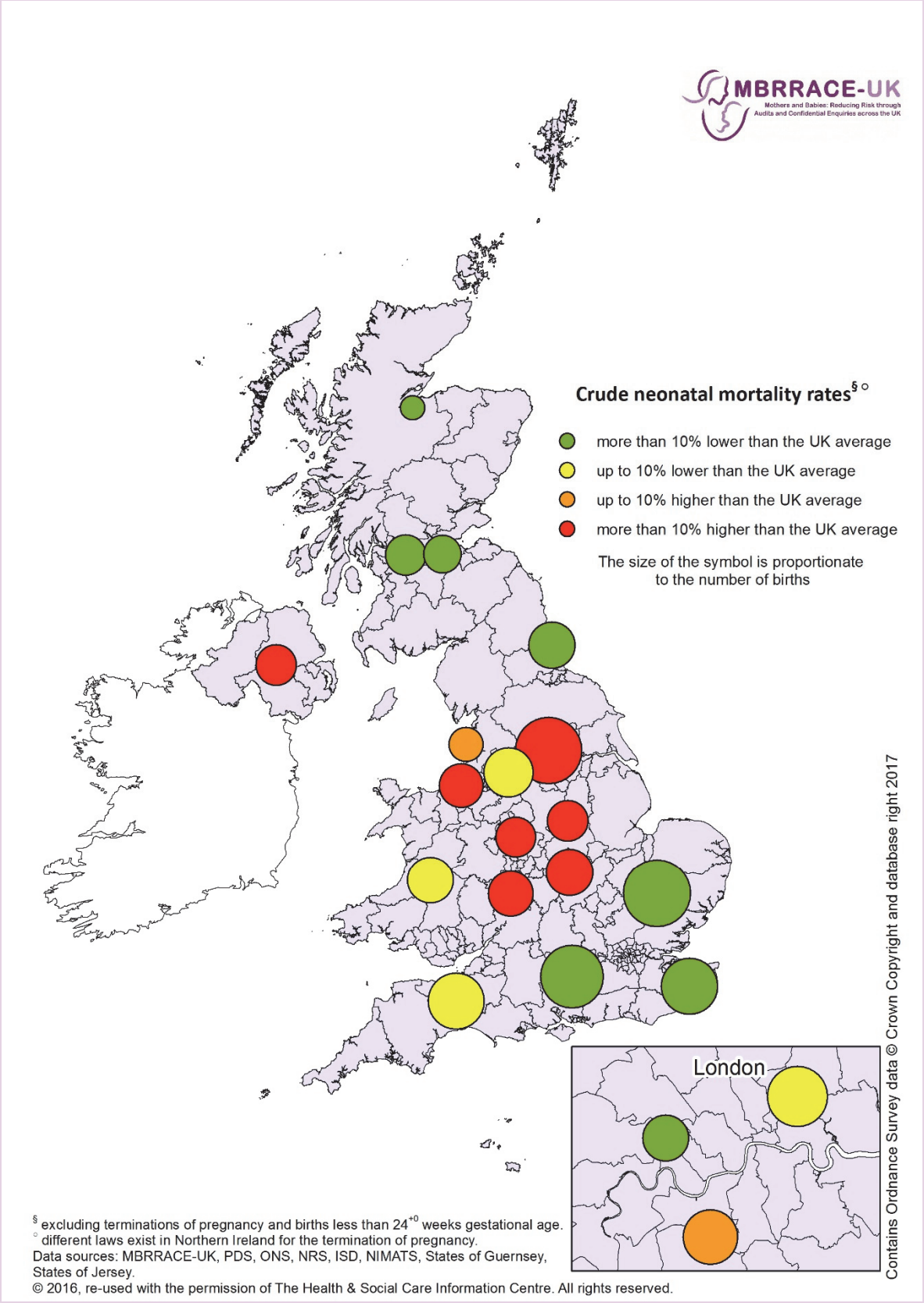


Figure 32: Stabilised & adjusted neonatal mortality rates by neonatal network based on place of birth: United Kingdom, for births in 2015

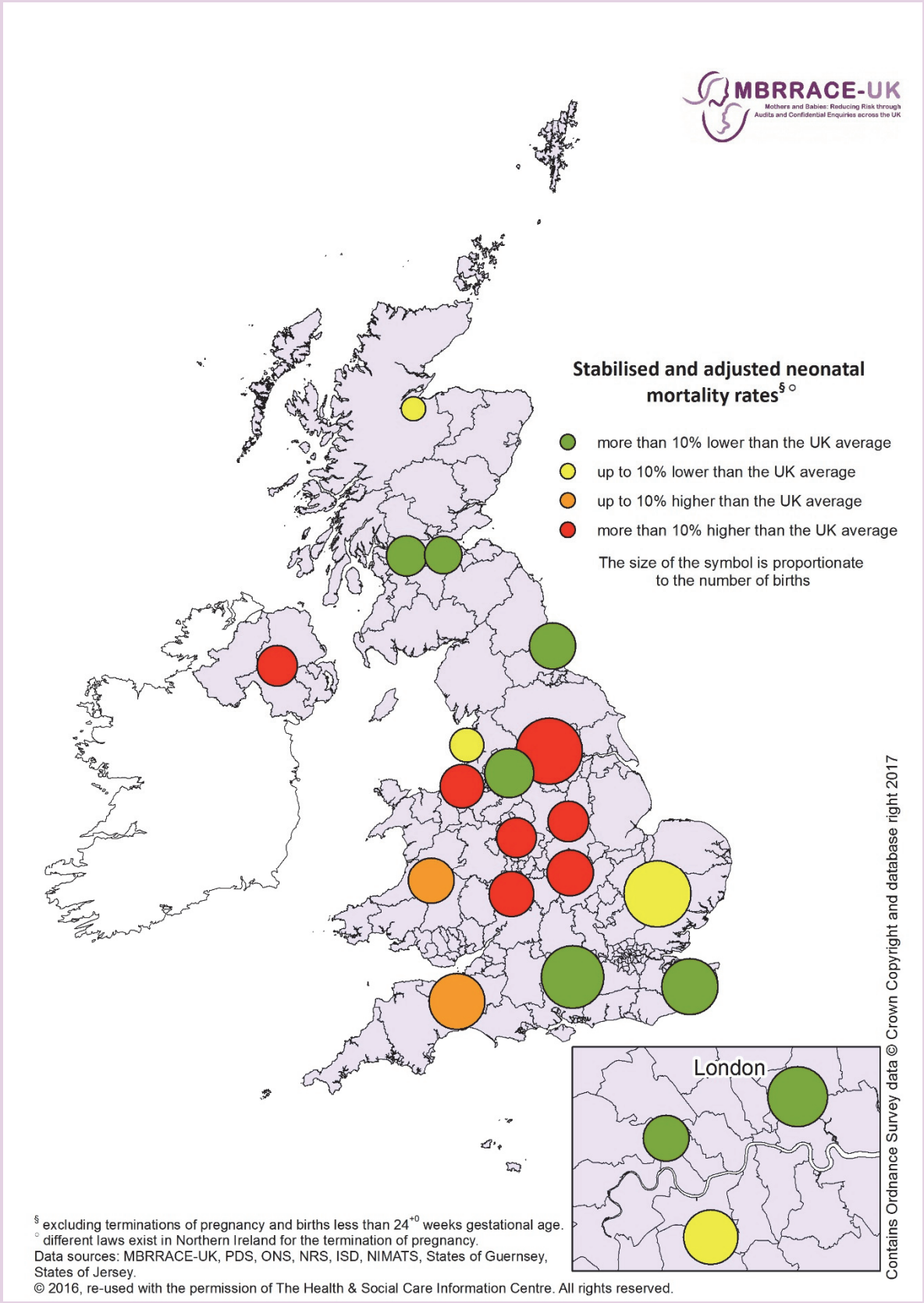


Figure 33: Crude extended perinatal mortality rates by neonatal network based on place of birth: United Kingdom, for births in 2015

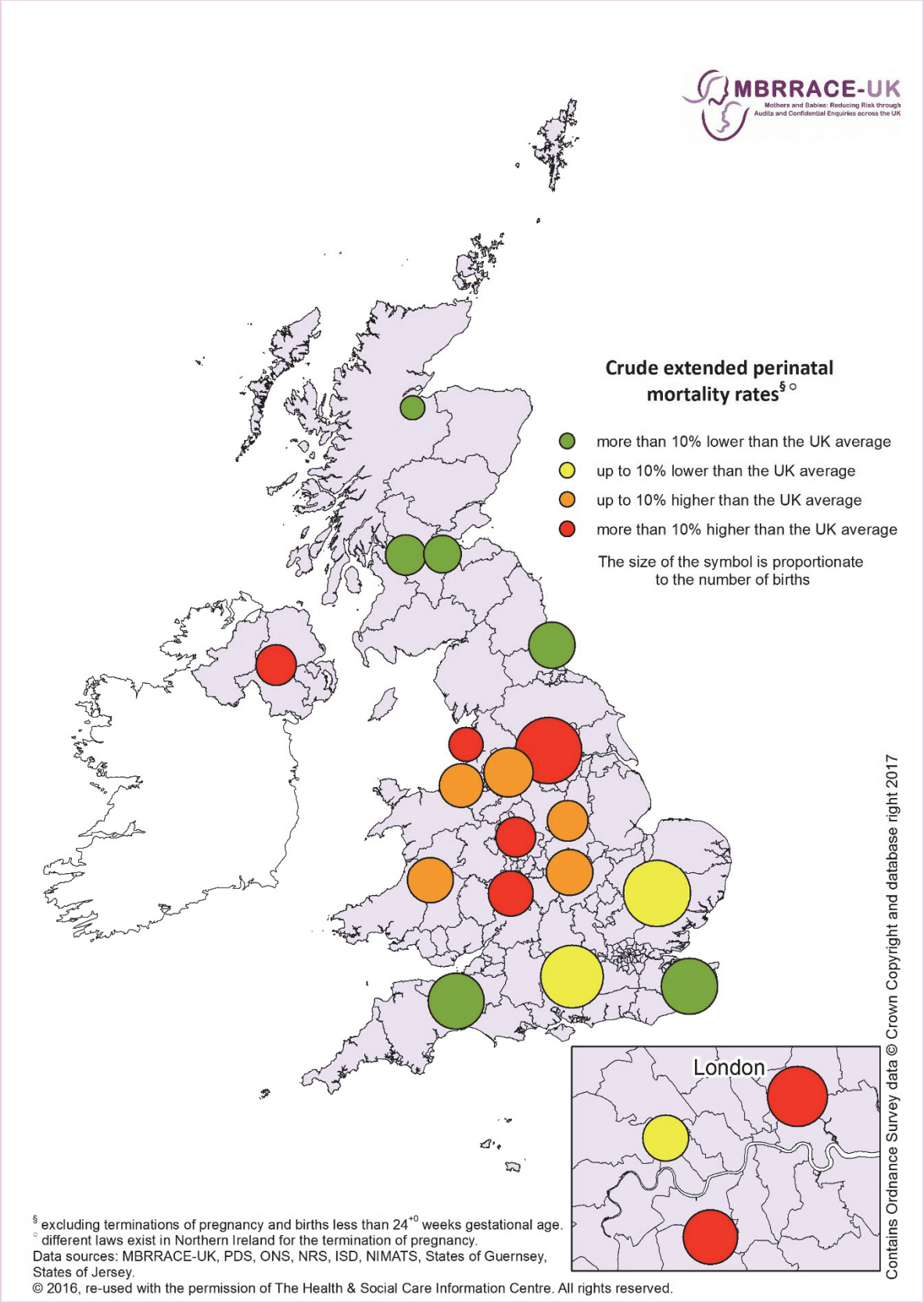


Figure 34: Stabilised & adjusted extended perinatal mortality rates by neonatal network based on place of birth: United Kingdom, for births in 2015

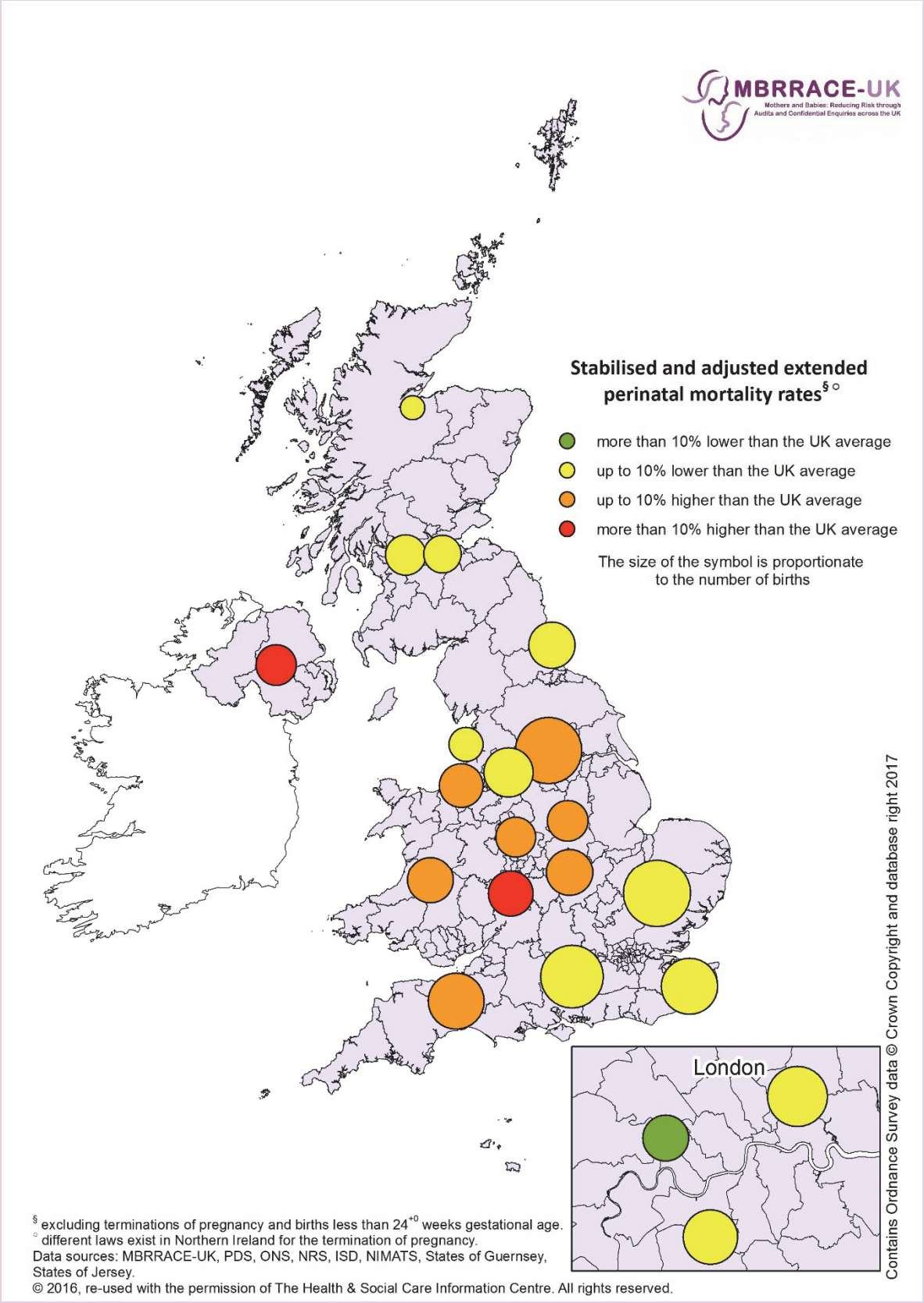


Table 39: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by neonatal network based on place of birth: United Kingdom, for births in 2015

Neonatal network	Total births[§]	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	32,751	3.79	3.86 (3.64 to 4.25)	2.18	2.09 (1.68 to 2.99)	5.95	5.96 (5.77 to 7.32)	
East of England	68,515	3.79	3.90 (3.68 to 4.52)	1.38	1.62 (1.27 to 2.12)	5.17	5.52 (5.23 to 6.45)	
North Central & East London	54,149	4.62	3.82 (3.58 to 4.41)	1.61	1.48 (1.23 to 1.98)	6.22	5.30 (5.23 to 6.27)	
North West (Cheshire and Merseyside)	28,573	3.71	3.87 (3.75 to 4.43)	2.46	2.19 (1.64 to 2.99)	6.16	6.11 (5.74 to 7.36)	
North West (Greater Manchester)	37,215	4.33	3.88 (3.73 to 4.38)	1.73	1.58 (1.27 to 2.26)	6.05	5.44 (5.30 to 6.47)	
North West (Lancashire and South Cumbria)	16,986	4.65	3.92 (3.71 to 4.55)	1.89	1.66 (1.36 to 2.23)	6.53	5.55 (5.42 to 6.63)	
North West London	31,635	4.08	3.81 (3.57 to 4.34)	1.11	1.15 (0.84 to 1.66)	5.18	4.95 (4.70 to 5.95)	
Northern	32,406	3.36	3.81 (3.50 to 4.39)	1.39	1.47 (1.10 to 2.16)	4.75	5.26 (5.03 to 6.30)	
South East Coast	47,857	3.36	3.83 (3.61 to 4.33)	1.32	1.40 (1.10 to 1.90)	4.68	5.19 (4.99 to 6.22)	
South London	44,547	4.47	3.86 (3.69 to 4.31)	1.78	1.74 (1.43 to 2.35)	6.24	5.59 (5.48 to 6.58)	
South West	47,147	3.35	3.84 (3.67 to 4.24)	1.70	1.80 (1.44 to 2.27)	5.05	5.64 (5.40 to 6.53)	
Southern West Midlands	30,800	5.55	3.98 (3.52 to 4.88)	3.30	2.79 (2.18 to 3.82)	8.83	6.80 (6.43 to 8.55)	
Staffordshire, Shropshire and Black Country	24,395	3.98	3.86 (3.69 to 4.39)	2.76	2.26 (1.87 to 3.19)	6.72	6.18 (6.04 to 7.41)	
Thames Valley and Wessex	59,988	4.13	3.99 (3.45 to 4.64)	1.44	1.52 (1.19 to 2.09)	5.57	5.48 (4.97 to 6.65)	
Trent	24,566	3.79	3.87 (3.76 to 4.31)	2.04	2.00 (1.51 to 2.67)	5.82	5.87 (5.59 to 6.98)	
Yorkshire & Humber	66,388	4.26	3.93 (3.56 to 4.69)	2.16	2.06 (1.63 to 2.83)	6.42	5.99 (5.78 to 7.28)	
SCOTLAND								
North of Scotland	9,117	3.62	3.89 (3.71 to 4.46)	1.21	1.61 (1.08 to 2.25)	4.83	5.48 (5.16 to 6.75)	
South East Scotland & Tayside	21,361	3.60	3.88 (3.71 to 4.24)	1.13	1.37 (0.99 to 1.94)	4.73	5.22 (4.91 to 6.23)	
West of Scotland	24,548	3.34	3.84 (3.63 to 4.39)	1.43	1.47 (1.15 to 2.10)	4.77	5.27 (5.07 to 6.42)	
WALES								
Wales	31,537	4.09	3.91 (3.54 to 4.49)	1.75	1.77 (1.37 to 2.35)	5.83	5.68 (5.42 to 6.64)	
NORTHERN IRELAND[◦]								
Northern Ireland[◦]	24,534	3.22	3.83 (3.52 to 4.29)	3.23	3.21 (2.44 to 4.82)	6.44	7.04 (6.55 to 8.89)	

[§] excluding terminations of pregnancy and births <24[+0] weeks gestational age
[†] per 1,000 total births
[‡] per 1,000 live births
[#] colours represent variation from UK average extended perinatal mortality rate
[◦] different laws exist in Northern Ireland for the termination of pregnancy
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS

A7.2 Rates of mortality by local authority based on postcode of mother's residence at time of delivery

Figure 35: Crude stillbirth rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

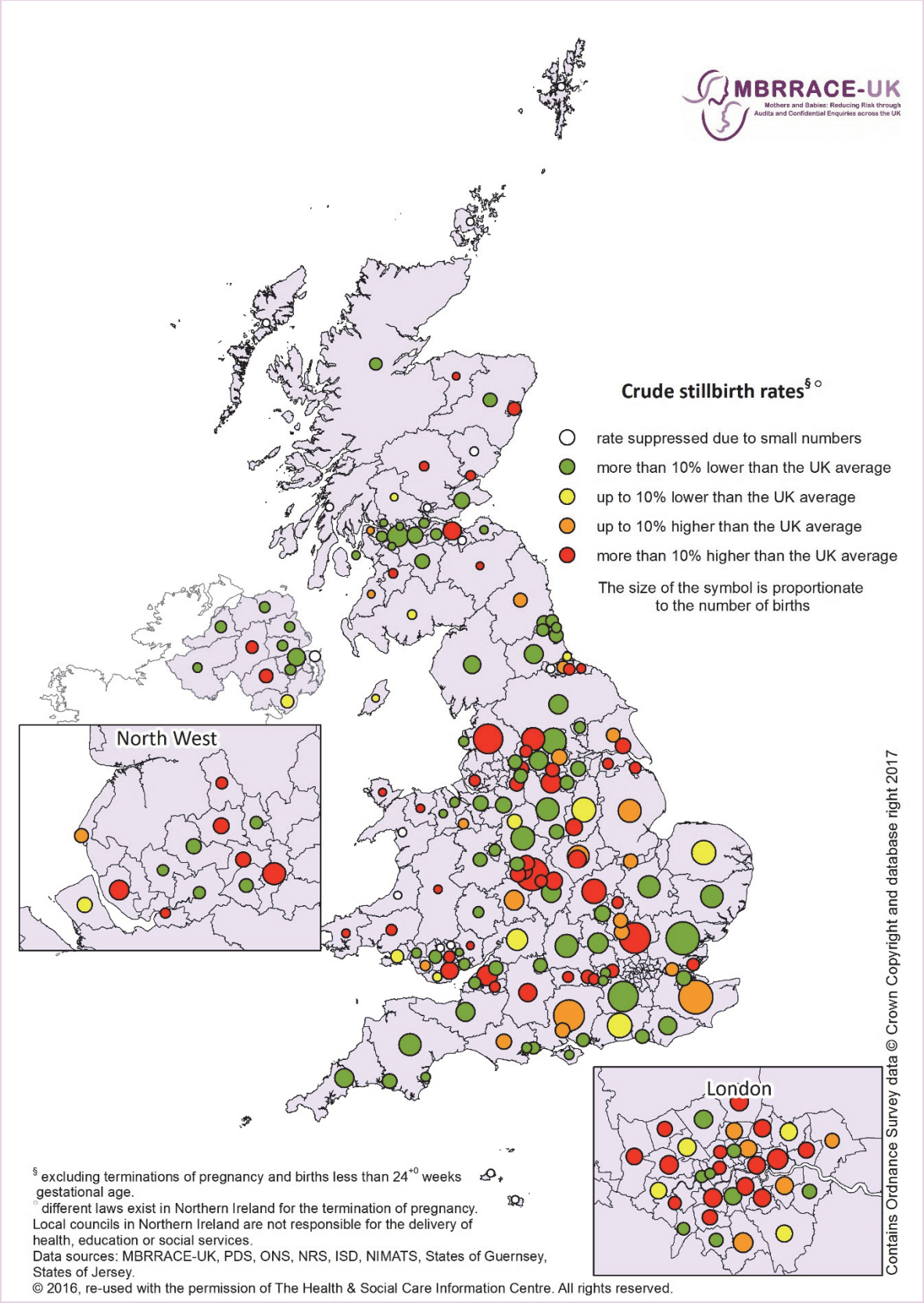


Figure 36: Stabilised & adjusted stillbirth rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

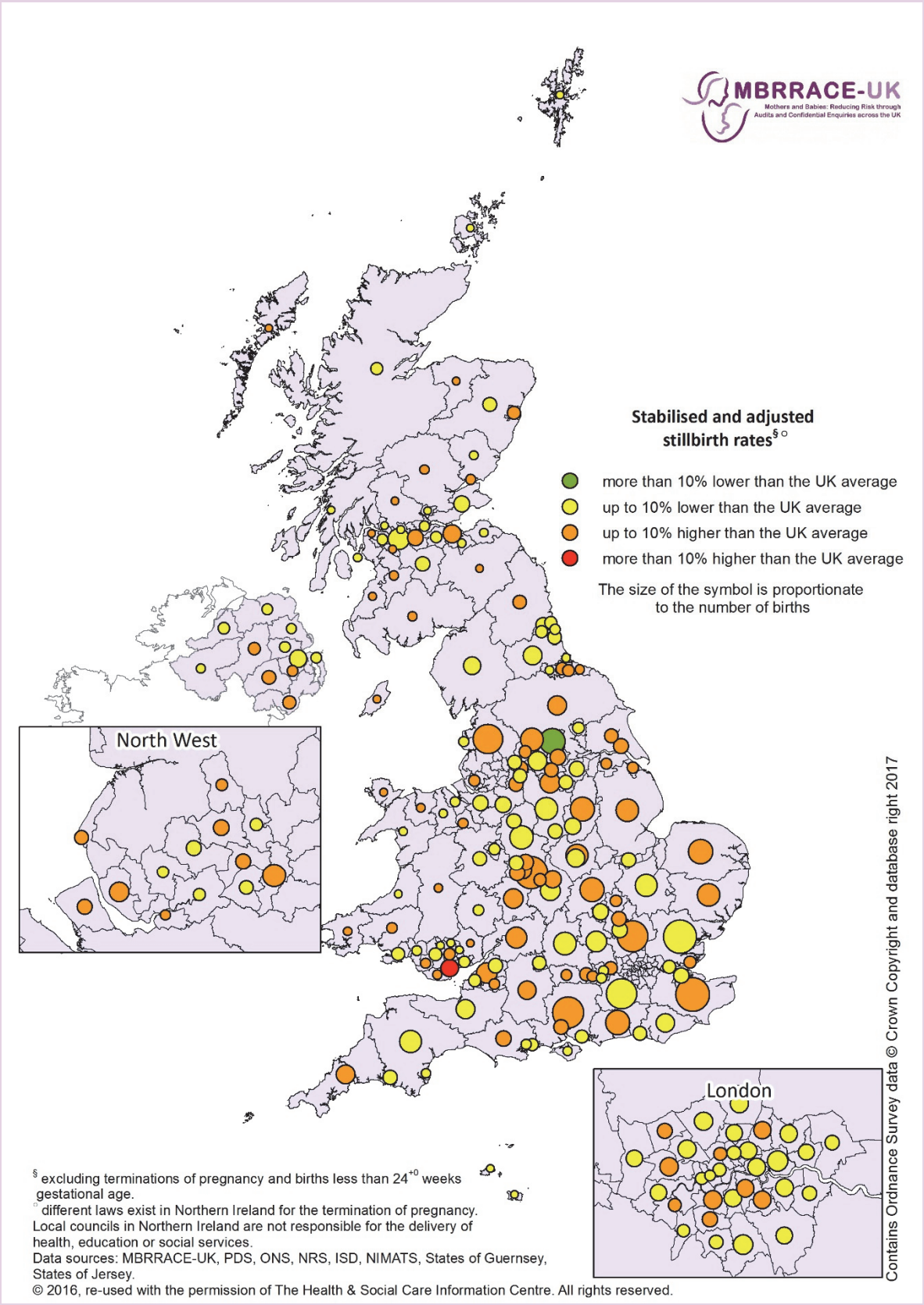


Figure 37: Crude neonatal mortality rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

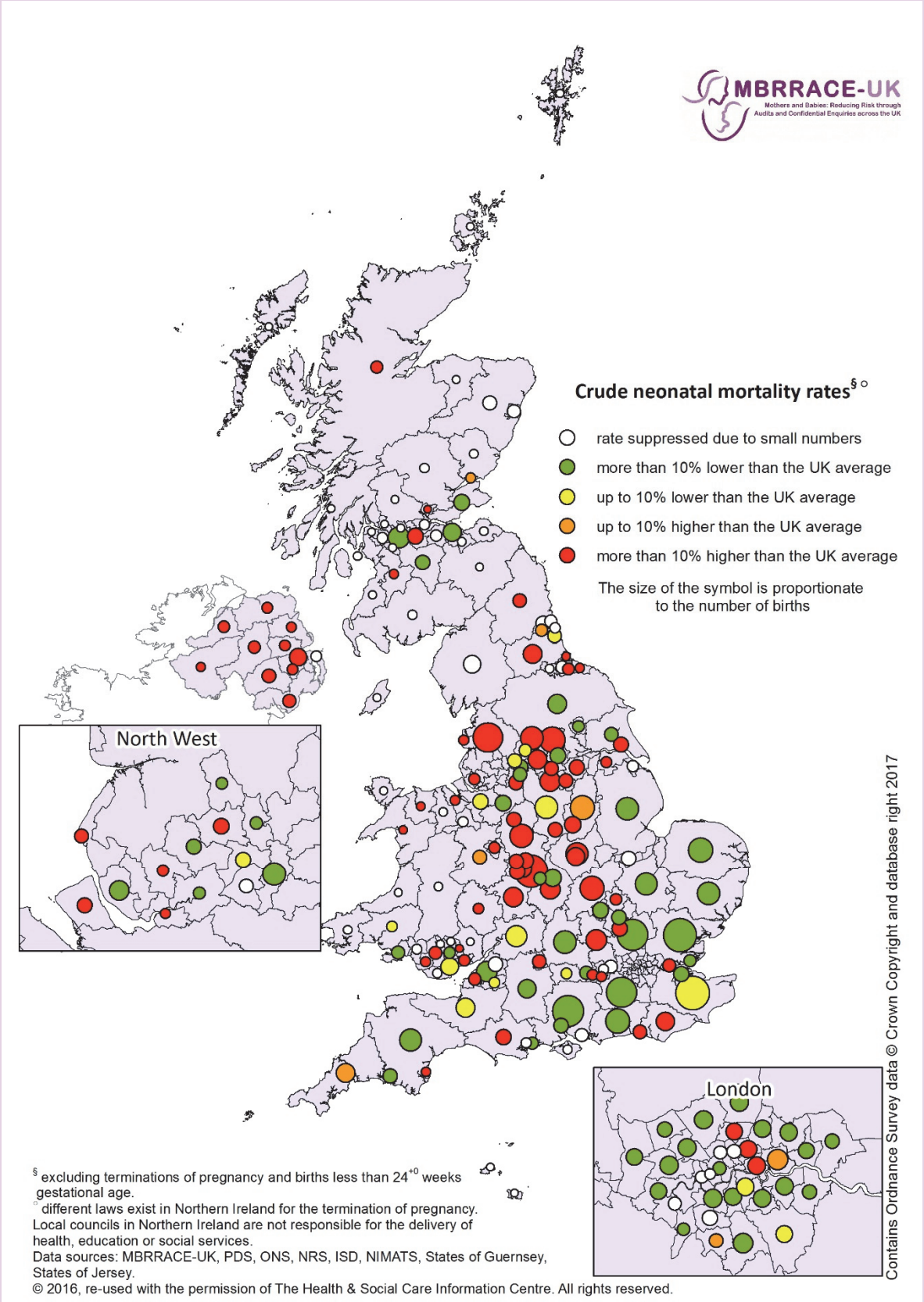


Figure 38: Stabilised & adjusted neonatal mortality rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

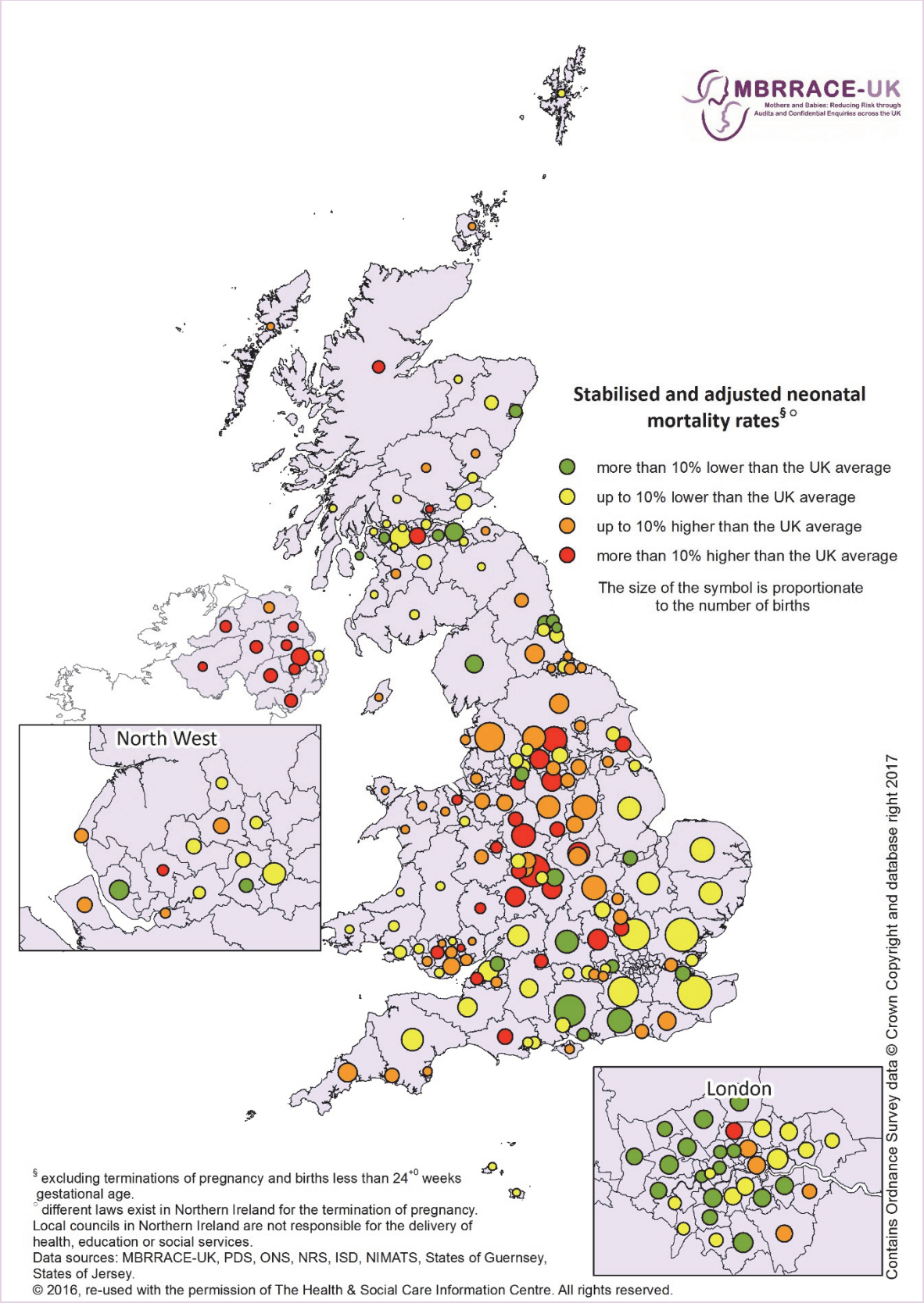


Figure 39: Crude extended perinatal mortality rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

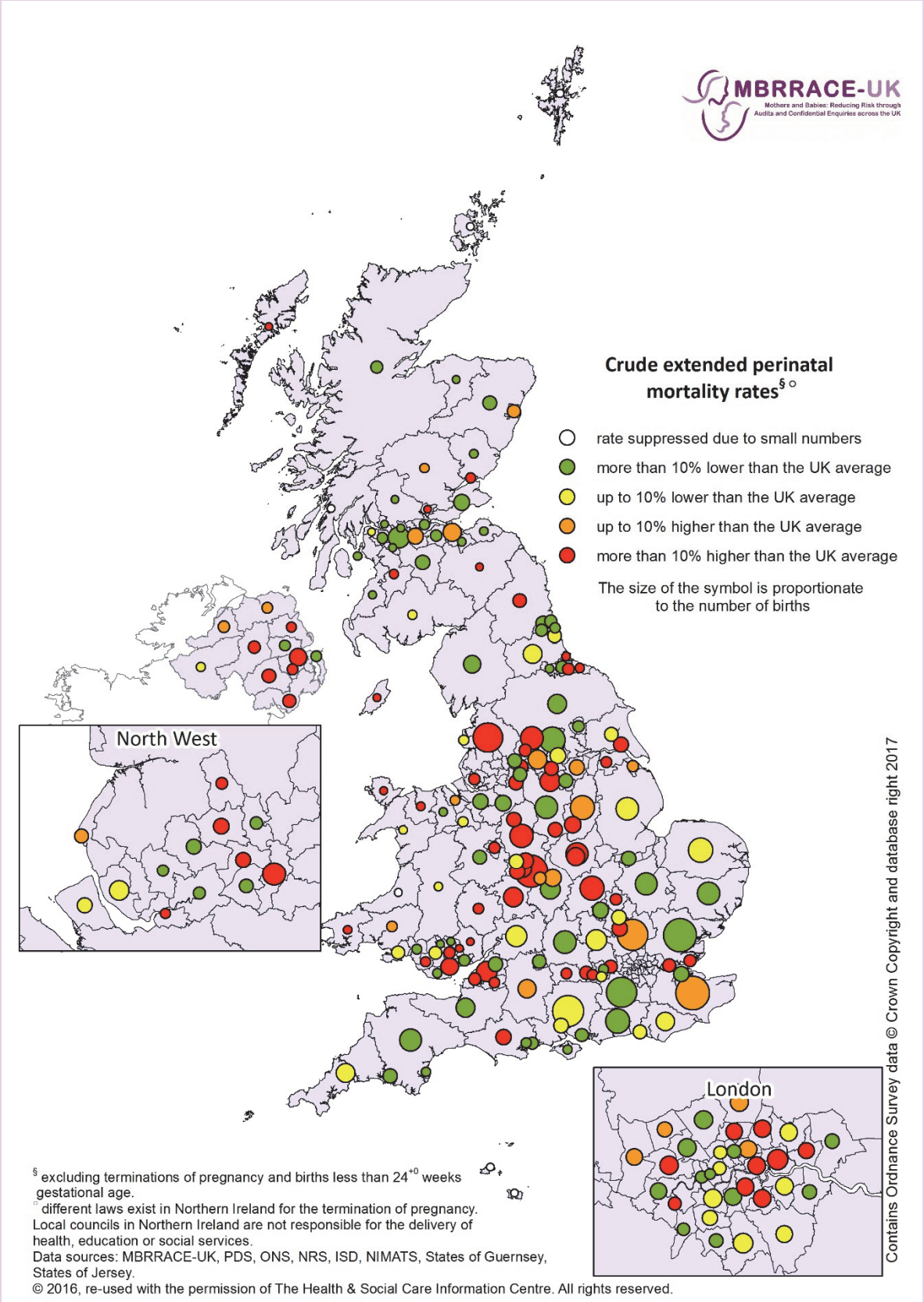


Figure 40: Stabilised & adjusted extended perinatal mortality rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

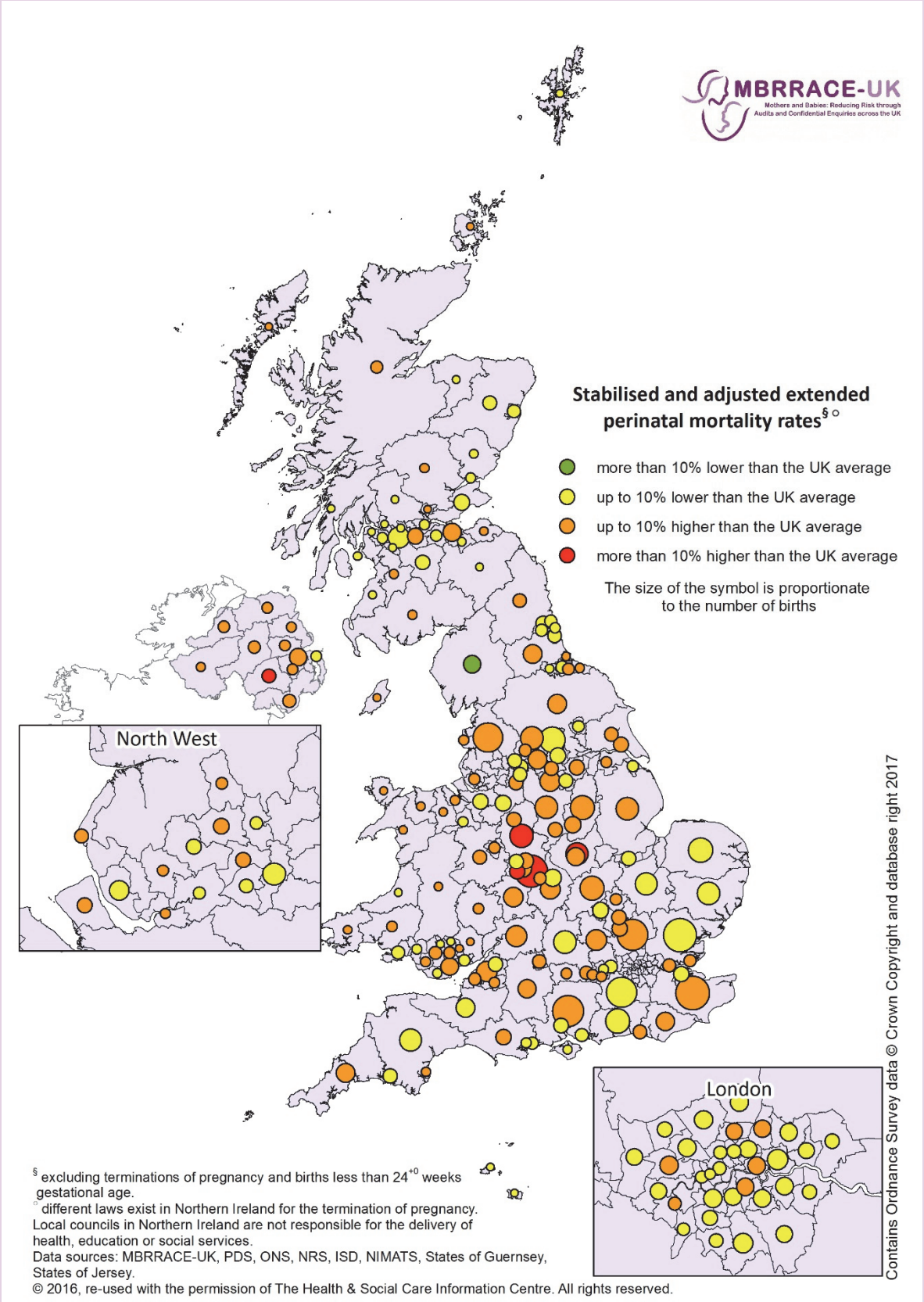


Table 40: Crude and stabilised & adjusted stillbirth, neonatal, and extended perinatal mortality rates by local authority based on postcode of mother's residence at time of delivery: United Kingdom and Crown Dependencies, for births in 2015

Local authority	Total births[§]	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 and Dagenham	3,872	4.65	3.78 (3.11 to 4.54)	1.56	1.66 (1.25 to 2.32)	6.20	5.44 (4.86 to 7.01)	
Barnet	5,287	3.40	3.78 (3.30 to 4.60)	0.76	1.50 (1.04 to 2.13)	4.16	5.28 (4.77 to 6.63)	
Barnsley	2,827	6.01	4.11 (3.50 to 4.90)	2.14	1.83 (1.36 to 2.51)	8.14	5.93 (5.32 to 7.23)	
Bath and North East Somerset	1,816	4.96	3.99 (3.40 to 4.82)	1.66	1.83 (1.14 to 2.72)	6.61	5.82 (5.10 to 7.17)	
Bedford	2,169	5.07	3.96 (3.32 to 4.61)	2.32	1.92 (1.28 to 2.92)	7.38	5.86 (5.08 to 7.44)	
Bexley	3,173	2.52	3.70 (2.88 to 5.01)	1.58	1.76 (1.19 to 2.57)	4.10	5.44 (4.46 to 7.06)	
Birmingham	16,899	5.74	4.12 (3.60 to 5.01)	3.45	2.47 (1.87 to 3.27)	9.17	6.60 (6.05 to 8.08)	
Blackburn with Darwen	2,133	7.50	4.09 (3.45 to 5.18)	1.42	1.71 (1.13 to 2.79)	8.91	5.78 (5.14 to 7.28)	
Blackpool	1,670	2.40	3.79 (3.03 to 4.59)	3.00	1.84 (1.22 to 2.68)	5.39	5.65 (4.67 to 7.04)	
Bolton	3,805	5.52	4.03 (3.49 to 5.05)	2.11	1.81 (1.22 to 2.47)	7.62	5.83 (5.02 to 7.65)	
Bournemouth	2,270	2.64	3.81 (3.24 to 4.71)	1.33	1.71 (1.17 to 2.52)	3.96	5.52 (4.81 to 6.68)	
Bracknell Forest	1,492	2.01	3.80 (3.13 to 4.39)	3.36	1.93 (1.21 to 2.90)	5.36	5.78 (4.85 to 7.45)	
Bradford	7,973	6.02	4.15 (3.39 to 4.89)	2.15	1.80 (1.39 to 2.33)	8.15	5.93 (4.98 to 7.33)	
Brent	5,236	3.82	3.71 (3.16 to 4.74)	1.15	1.52 (1.08 to 2.32)	4.97	5.23 (4.78 to 6.58)	
Brighton and Hove	2,959	3.38	3.85 (3.14 to 4.74)	2.03	1.86 (1.35 to 2.90)	5.41	5.71 (4.98 to 7.26)	
Bristol, City of	6,295	5.08	4.10 (3.49 to 5.08)	1.28	1.62 (1.12 to 2.25)	6.35	5.71 (5.03 to 7.29)	
Bromley	4,114	3.65	3.86 (3.10 to 4.68)	1.71	1.77 (1.24 to 2.45)	5.35	5.62 (4.89 to 6.76)	
Buckinghamshire	6,168	3.24	3.81 (3.34 to 4.63)	2.11	1.94 (1.30 to 2.79)	5.35	5.76 (4.92 to 7.07)	
Bury	2,365	2.11	3.75 (2.94 to 4.55)	1.27	1.71 (1.11 to 2.37)	3.38	5.45 (4.79 to 6.78)	
Calderdale	2,452	6.12	4.07 (3.24 to 5.31)	1.64	1.73 (1.33 to 2.47)	7.75	5.78 (5.02 to 7.50)	
Cambridgeshire	7,495	2.54	3.71 (3.16 to 4.42)	0.94	1.62 (1.13 to 2.29)	3.47	5.33 (4.59 to 6.56)	
Camden	2,721	*	3.92 (3.38 to 4.82)	*	1.59 (1.07 to 2.35)	5.51	5.51 (4.69 to 7.08)	
Central Bedfordshire	3,323	3.91	3.95 (3.47 to 4.93)	1.51	1.82 (1.28 to 2.63)	5.42	5.76 (5.12 to 7.02)	
Cheshire East	3,853	2.34	3.76 (3.32 to 4.55)	1.56	1.82 (1.27 to 2.76)	3.89	5.57 (5.08 to 7.32)	
Cheshire West and Chester	3,576	3.08	3.85 (3.29 to 4.94)	1.68	1.77 (1.10 to 2.28)	4.75	5.61 (4.86 to 6.96)	
Cornwall	5,426	3.50	3.90 (3.40 to 4.61)	1.85	1.88 (1.25 to 2.62)	5.34	5.78 (5.15 to 7.28)	
County Durham	5,376	3.16	3.80 (3.22 to 4.75)	2.24	1.91 (1.49 to 2.61)	5.39	5.72 (5.24 to 6.88)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Coventry	4,535	4.63	3.91 (3.18 to 4.60)	1.33	1.54 (1.04 to 2.19)	5.95	5.41 (4.77 to 6.50)	
Croydon	5,858	4.10	3.75 (3.14 to 4.39)	1.03	1.47 (0.93 to 2.16)	5.12	5.23 (4.71 to 6.40)	
Cumbria	4,802	*	3.75 (3.21 to 4.57)	*	1.39 (0.91 to 2.24)	2.92	5.08 (4.56 to 6.37)	
Darlington	1,218	*	3.79 (3.18 to 4.66)	*	1.79 (1.20 to 2.85)	3.28	5.56 (5.12 to 6.92)	
Derby	3,398	3.24	3.77 (3.18 to 4.47)	3.54	2.07 (1.34 to 2.96)	6.77	5.88 (5.08 to 7.16)	
Derbyshire	7,882	3.04	3.80 (3.22 to 4.47)	1.65	1.90 (1.37 to 2.53)	4.69	5.69 (5.18 to 6.91)	
Devon	7,104	1.97	3.61 (2.85 to 4.35)	1.41	1.69 (1.19 to 2.30)	3.38	5.30 (4.58 to 6.59)	
Doncaster	3,569	3.08	3.79 (3.24 to 4.50)	2.81	1.89 (1.20 to 2.53)	5.88	5.72 (4.60 to 7.08)	
Dorset	3,485	4.02	3.98 (3.37 to 5.25)	2.59	1.98 (1.47 to 3.22)	6.60	5.97 (5.21 to 7.89)	
Dudley	3,694	4.87	3.99 (3.35 to 4.57)	4.35	2.34 (1.61 to 3.78)	9.20	6.41 (5.45 to 8.44)	
Ealing	5,249	5.72	4.04 (3.35 to 4.82)	1.34	1.60 (1.12 to 2.25)	7.05	5.64 (5.05 to 6.71)	
East Riding of Yorkshire	2,911	4.12	3.96 (3.13 to 4.99)	1.38	1.71 (1.28 to 2.50)	5.50	5.66 (4.92 to 7.11)	
East Sussex	5,066	3.36	3.85 (3.21 to 4.52)	2.18	1.92 (1.36 to 2.87)	5.53	5.78 (5.15 to 7.25)	
Enfield	5,053	4.75	3.85 (3.34 to 4.61)	1.19	1.55 (0.96 to 2.32)	5.94	5.40 (4.90 to 6.74)	
Essex	16,431	2.98	3.70 (3.15 to 4.30)	1.40	1.71 (1.30 to 2.36)	4.38	5.40 (4.95 to 6.51)	
Gateshead	2,220	2.70	3.80 (2.90 to 4.51)	1.81	1.73 (1.17 to 2.13)	4.50	5.53 (4.49 to 6.43)	
Gloucestershire	6,733	3.56	3.93 (3.43 to 4.80)	1.64	1.72 (1.28 to 2.20)	5.20	5.63 (4.96 to 6.88)	
Greenwich	4,668	4.07	3.75 (3.14 to 4.64)	1.08	1.58 (1.19 to 2.44)	5.14	5.35 (4.77 to 6.49)	
Hackney	4,590	3.92	3.72 (3.07 to 4.50)	1.97	1.79 (1.19 to 2.45)	5.88	5.50 (4.88 to 6.79)	
Halton	1,498	5.34	3.97 (3.16 to 5.14)	3.36	1.93 (1.33 to 2.82)	8.68	5.91 (5.12 to 7.58)	
Hammersmith and Fulham	2,358	*	3.77 (3.12 to 4.37)	*	1.56 (1.13 to 2.63)	3.39	5.33 (4.85 to 6.60)	
Hampshire	14,411	4.09	4.22 (3.51 to 5.28)	1.25	1.60 (1.15 to 2.25)	5.34	5.78 (5.06 to 6.97)	
Haringey	4,137	4.11	3.81 (3.11 to 4.68)	2.67	1.96 (1.37 to 2.94)	6.77	5.77 (4.67 to 7.26)	
Harrow	3,612	4.71	3.91 (3.29 to 4.75)	1.11	1.54 (1.11 to 2.28)	5.81	5.42 (5.00 to 6.48)	
Hartlepool	1,084	3.69	3.86 (3.23 to 4.88)	2.78	1.84 (1.31 to 2.72)	6.46	5.71 (5.12 to 7.17)	
Havering	3,295	3.95	3.87 (3.33 to 4.66)	0.91	1.66 (1.07 to 2.25)	4.86	5.54 (5.01 to 6.62)	
Herefordshire, County of	1,741	2.30	3.81 (3.41 to 4.48)	4.61	2.14 (1.48 to 2.90)	6.89	6.03 (5.27 to 7.52)	
Hertfordshire	14,778	4.40	4.24 (3.64 to 5.20)	1.36	1.64 (1.16 to 2.20)	5.75	5.85 (5.35 to 7.05)	
Hillingdon	4,415	4.53	3.86 (3.38 to 4.63)	1.14	1.60 (1.09 to 2.37)	5.66	5.46 (4.94 to 6.55)	
Hounslow	4,475	3.80	3.76 (3.12 to 4.53)	0.90	1.54 (1.03 to 2.25)	4.69	5.31 (4.67 to 6.39)	
Isle of Wight	1,299	*	3.86 (3.04 to 4.71)	*	1.77 (1.22 to 2.70)	4.62	5.62 (4.62 to 7.47)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Islington	2,958	*	3.74 (3.14 to 4.59)	*	1.59 (1.02 to 2.41)	4.06	5.34 (4.63 to 6.70)	
Kensington and Chelsea	1,833	*	3.73 (3.02 to 4.45)	*	1.69 (1.01 to 2.44)	2.73	5.42 (4.65 to 6.57)	
Kent	17,369	4.03	4.08 (3.46 to 4.84)	1.62	1.71 (1.29 to 2.32)	5.64	5.77 (5.17 to 7.12)	
Kingston Upon Hull, City of	3,600	6.39	4.18 (3.61 to 5.11)	2.80	2.01 (1.37 to 2.95)	9.17	6.19 (5.55 to 7.40)	
Kingston upon Thames	2,355	2.55	3.79 (3.10 to 4.36)	1.28	1.72 (1.05 to 2.58)	3.82	5.51 (4.84 to 6.75)	
Kirklees	5,399	2.96	3.67 (3.02 to 4.49)	3.16	2.24 (1.44 to 3.20)	6.11	5.91 (4.83 to 7.10)	
Knowsley	1,936	4.65	3.93 (3.24 to 4.70)	3.11	1.91 (1.32 to 3.03)	7.75	5.86 (5.15 to 7.93)	
Lambeth	4,634	3.24	3.63 (2.93 to 4.30)	1.52	1.68 (1.26 to 2.31)	4.75	5.30 (4.47 to 6.78)	
Lancashire	13,267	4.30	4.08 (3.35 to 4.92)	2.20	1.92 (1.49 to 2.60)	6.48	6.01 (5.44 to 7.52)	
Leeds	10,214	2.55	3.47 (2.83 to 4.22)	2.26	1.95 (1.42 to 2.52)	4.80	5.42 (4.71 to 6.46)	
Leicester	5,183	4.63	3.83 (3.11 to 4.65)	2.33	1.89 (1.30 to 2.61)	6.95	5.71 (4.93 to 6.98)	
Leicestershire	7,337	4.23	4.09 (3.49 to 5.19)	2.46	2.09 (1.56 to 3.00)	6.68	6.21 (5.49 to 7.59)	
Lewisham	4,824	5.80	4.01 (3.28 to 4.64)	1.04	1.53 (1.01 to 2.12)	6.84	5.52 (4.87 to 6.78)	
Lincolnshire	7,819	4.09	4.04 (3.48 to 5.00)	1.41	1.63 (1.16 to 2.22)	5.50	5.63 (5.04 to 7.26)	
Liverpool	5,904	4.40	3.95 (3.25 to 4.65)	1.19	1.54 (1.09 to 2.31)	5.59	5.46 (4.79 to 6.67)	
Luton	3,559	3.93	3.75 (3.15 to 4.58)	2.54	1.94 (1.54 to 2.67)	6.46	5.66 (5.16 to 7.06)	
Manchester	8,088	5.19	3.92 (3.39 to 4.54)	1.49	1.64 (1.24 to 2.25)	6.68	5.57 (4.91 to 6.70)	
Medway	3,615	3.04	3.78 (3.20 to 4.99)	1.11	1.58 (1.15 to 2.35)	4.15	5.34 (4.76 to 6.55)	
Merton	3,431	*	3.99 (3.34 to 4.68)	*	1.54 (1.06 to 2.52)	5.54	5.53 (4.87 to 6.70)	
Middlesbrough	1,936	5.17	3.93 (3.21 to 4.70)	2.08	1.80 (1.20 to 2.31)	7.23	5.72 (4.94 to 6.97)	
Milton Keynes	3,887	2.57	3.68 (2.98 to 4.45)	1.03	1.64 (1.13 to 2.33)	3.60	5.32 (4.75 to 6.46)	
Newcastle upon Tyne	3,342	*	3.77 (3.10 to 4.67)	*	1.54 (0.95 to 2.38)	3.89	5.30 (4.46 to 6.39)	
Newham	6,268	4.95	3.76 (3.12 to 4.51)	1.92	1.64 (1.27 to 2.28)	6.86	5.40 (4.90 to 6.74)	
Norfolk	9,121	3.73	3.95 (3.44 to 4.66)	1.43	1.68 (1.28 to 2.23)	5.15	5.62 (5.00 to 6.93)	
North East Lincolnshire	1,929	*	3.94 (3.29 to 5.03)	*	1.61 (1.11 to 2.55)	5.70	5.50 (4.96 to 7.27)	
North Lincolnshire	1,882	5.31	3.99 (3.35 to 4.81)	2.14	1.84 (1.20 to 2.92)	7.44	5.82 (5.17 to 7.63)	
North Somerset	2,243	3.12	3.86 (3.07 to 4.54)	3.58	2.13 (1.44 to 3.66)	6.69	6.01 (5.16 to 8.27)	
North Tyneside	2,212	*	3.78 (3.04 to 4.27)	*	1.59 (1.11 to 2.21)	3.16	5.33 (4.59 to 6.46)	
North Yorkshire	5,660	3.18	3.88 (3.24 to 4.53)	1.60	1.82 (1.24 to 2.60)	4.77	5.69 (4.97 to 7.00)	
Northamptonshire	9,096	4.51	4.13 (3.55 to 5.07)	2.10	1.93 (1.47 to 2.61)	6.60	6.06 (5.44 to 7.35)	
Northumberland	2,843	4.22	3.95 (3.41 to 4.75)	2.12	1.93 (1.40 to 2.81)	6.33	5.87 (5.25 to 7.15)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Nottingham	4,318	4.40	3.83 (3.19 to 4.45)	2.56	1.91 (1.33 to 2.78)	6.95	5.74 (5.08 to 6.92)	
Nottinghamshire	8,829	3.85	3.98 (3.46 to 4.63)	1.82	1.89 (1.39 to 2.74)	5.66	5.87 (5.17 to 7.31)	
Oldham	3,355	5.07	3.93 (3.32 to 4.83)	1.20	1.66 (1.18 to 2.49)	6.26	5.58 (5.07 to 6.90)	
Oxfordshire	7,911	3.03	3.80 (3.08 to 4.34)	0.76	1.46 (1.02 to 2.07)	3.79	5.25 (4.49 to 6.13)	
Peterborough	3,184	*	3.87 (3.00 to 4.63)	*	1.56 (1.08 to 2.18)	4.71	5.44 (4.54 to 6.87)	
Plymouth	3,169	2.21	3.73 (3.11 to 4.55)	1.58	1.77 (1.15 to 2.69)	3.79	5.49 (4.82 to 7.26)	
Poole	1,573	*	3.83 (3.17 to 4.48)	*	1.67 (1.22 to 2.40)	3.18	5.49 (4.70 to 6.63)	
Portsmouth	2,687	*	3.66 (2.88 to 4.45)	*	1.52 (1.08 to 2.09)	1.86	5.18 (4.47 to 6.48)	
Reading	2,543	8.26	4.25 (3.50 to 5.39)	1.19	1.72 (1.23 to 2.45)	9.44	5.98 (5.10 to 7.58)	
Redbridge	4,826	3.73	3.71 (3.07 to 4.54)	1.46	1.64 (1.23 to 2.37)	5.18	5.34 (4.70 to 6.74)	
Redcar and Cleveland	1,440	4.86	3.94 (3.14 to 5.20)	2.09	1.81 (1.27 to 2.76)	6.94	5.74 (4.79 to 7.29)	
Richmond upon Thames	2,620	*	4.11 (3.50 to 5.20)	*	1.67 (1.11 to 2.64)	6.49	5.77 (5.02 to 7.43)	
Rochdale	2,898	2.76	3.72 (3.01 to 4.34)	1.73	1.74 (1.19 to 2.68)	4.49	5.45 (4.58 to 6.70)	
Rotherham	3,072	2.28	3.72 (2.86 to 4.36)	2.28	1.83 (1.28 to 2.61)	4.56	5.56 (4.70 to 6.95)	
Salford	3,581	6.14	4.14 (3.17 to 5.48)	1.69	1.74 (1.14 to 2.50)	7.82	5.85 (5.06 to 7.40)	
Sandwell	4,814	6.86	4.19 (3.38 to 5.46)	2.51	1.86 (1.17 to 2.70)	9.35	6.03 (5.24 to 7.96)	
Sefton	2,790	3.94	3.92 (2.95 to 4.60)	2.16	1.88 (1.30 to 2.77)	6.09	5.80 (4.91 to 7.40)	
Sheffield	6,617	4.68	3.98 (3.44 to 5.03)	2.58	2.01 (1.55 to 3.22)	7.25	6.00 (5.36 to 8.03)	
Shropshire	2,801	2.86	3.83 (3.27 to 4.63)	1.79	1.83 (1.17 to 2.60)	4.64	5.65 (4.96 to 7.17)	
Slough	2,609	*	3.98 (3.12 to 5.07)	*	1.57 (1.03 to 2.49)	6.52	5.55 (4.67 to 6.98)	
Solihull	2,276	4.83	3.98 (3.52 to 5.30)	1.32	1.69 (1.27 to 2.63)	6.15	5.64 (5.11 to 7.29)	
Somerset	5,637	2.84	3.80 (3.16 to 4.47)	1.60	1.71 (1.13 to 2.39)	4.43	5.50 (4.87 to 6.90)	
South Gloucestershire	3,167	*	3.83 (3.18 to 4.69)	*	1.58 (1.01 to 2.38)	3.47	5.39 (4.62 to 6.72)	
South Tyneside	1,652	*	3.83 (2.98 to 4.60)	*	1.54 (0.99 to 2.37)	3.03	5.35 (4.78 to 6.49)	
Southampton	3,315	3.92	3.89 (3.24 to 4.54)	1.21	1.60 (1.05 to 2.37)	5.13	5.46 (4.55 to 6.78)	
Southend-on-Sea	2,244	5.35	4.00 (3.05 to 4.69)	1.34	1.72 (1.25 to 2.69)	6.68	5.71 (4.82 to 7.01)	
Southwark	4,613	6.07	3.98 (3.26 to 4.72)	1.74	1.71 (1.32 to 2.42)	7.80	5.69 (5.04 to 7.01)	
St Helens	1,980	1.52	3.72 (2.94 to 4.58)	3.03	1.97 (1.33 to 2.93)	4.55	5.69 (4.90 to 7.38)	
Staffordshire	8,535	3.28	3.84 (3.36 to 4.71)	2.94	2.36 (1.63 to 3.33)	6.21	6.28 (5.58 to 7.97)	
Stockport	3,393	4.72	4.02 (3.39 to 4.71)	2.67	2.02 (1.46 to 2.94)	7.37	6.06 (5.32 to 7.41)	
Stockton-on-Tees	2,278	*	3.89 (3.24 to 4.95)	*	1.64 (1.12 to 2.56)	4.83	5.53 (4.97 to 7.09)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Stoke-on-Trent	3,390	3.54	3.81 (3.18 to 4.48)	2.66	1.97 (1.45 to 2.63)	6.19	5.78 (5.21 to 6.93)	
Suffolk	8,081	3.46	3.90 (3.21 to 4.81)	1.24	1.67 (1.15 to 2.64)	4.70	5.56 (4.79 to 7.10)	
Sunderland	2,903	3.44	3.84 (3.16 to 5.01)	1.73	1.68 (1.28 to 2.29)	5.17	5.50 (4.90 to 6.93)	
Surrey	13,610	2.72	3.68 (3.05 to 4.25)	1.33	1.64 (1.18 to 2.18)	4.04	5.32 (4.91 to 6.30)	
Sutton	2,771	2.17	3.73 (2.94 to 4.56)	1.81	1.74 (1.15 to 2.53)	3.97	5.47 (4.75 to 6.96)	
Swindon	2,851	1.75	3.70 (3.01 to 4.49)	2.81	2.06 (1.41 to 3.17)	4.56	5.74 (5.15 to 7.20)	
Tameside	2,878	2.08	3.70 (3.01 to 4.44)	1.04	1.55 (1.13 to 2.28)	3.13	5.22 (4.74 to 6.50)	
Telford And Wrekin	2,080	3.37	3.84 (3.05 to 4.64)	4.82	2.18 (1.55 to 3.19)	8.17	6.09 (5.28 to 7.62)	
Thurrock	2,538	3.94	3.87 (3.20 to 4.61)	2.37	1.90 (1.35 to 3.20)	6.30	5.76 (5.01 to 7.25)	
Torbay	1,382	2.17	3.80 (3.19 to 4.54)	2.18	1.85 (1.31 to 2.98)	4.34	5.63 (4.94 to 7.08)	
Tower Hamlets	4,596	5.22	3.84 (3.44 to 4.60)	2.41	1.87 (1.27 to 2.88)	7.62	5.69 (5.15 to 7.07)	
Trafford	2,837	*	3.80 (3.10 to 4.37)	*	1.47 (0.91 to 2.17)	3.17	5.23 (4.57 to 6.72)	
Wakefield	4,001	4.00	3.93 (3.52 to 4.78)	1.25	1.65 (1.11 to 2.36)	5.25	5.56 (5.02 to 6.85)	
Walsall	3,771	5.04	3.95 (3.26 to 4.74)	2.67	1.91 (1.41 to 2.60)	7.69	5.86 (5.21 to 7.13)	
Waltham Forest	4,687	5.97	4.07 (3.36 to 4.80)	1.07	1.63 (1.06 to 2.34)	7.04	5.72 (5.00 to 6.99)	
Wandsworth	5,065	4.34	3.94 (3.38 to 4.60)	0.79	1.51 (1.07 to 2.19)	5.13	5.45 (4.87 to 6.65)	
Warrington	2,400	2.92	3.84 (3.17 to 4.46)	1.25	1.66 (1.13 to 2.40)	4.17	5.48 (4.82 to 7.08)	
Warwickshire	6,096	2.46	3.71 (2.91 to 4.50)	2.14	1.97 (1.48 to 2.99)	4.59	5.70 (5.10 to 7.33)	
West Berkshire	1,733	4.62	3.97 (3.34 to 4.78)	1.74	1.75 (1.19 to 2.57)	6.35	5.70 (4.99 to 6.97)	
West Sussex	9,072	3.53	3.93 (3.34 to 4.68)	1.22	1.60 (1.08 to 2.19)	4.74	5.50 (4.78 to 6.60)	
Westminster	2,749	4.37	3.86 (3.38 to 4.82)	1.10	1.57 (0.99 to 2.33)	5.46	5.41 (4.80 to 6.72)	
Wigan	3,587	2.79	3.79 (3.11 to 4.50)	1.40	1.63 (1.06 to 2.26)	4.18	5.39 (4.76 to 6.58)	
Wiltshire	5,070	4.73	4.13 (3.44 to 5.58)	0.99	1.61 (1.21 to 2.18)	5.72	5.73 (4.87 to 7.39)	
Windsor and Maidenhead	1,625	*	3.86 (3.21 to 4.63)	*	1.68 (1.04 to 2.63)	3.69	5.54 (4.91 to 7.24)	
Wirral	3,583	3.63	3.88 (3.22 to 4.53)	1.96	1.80 (1.29 to 2.95)	5.58	5.68 (5.08 to 7.55)	
Wokingham	1,798	5.56	4.03 (3.46 to 5.44)	2.24	1.88 (1.20 to 2.67)	7.79	5.91 (5.33 to 7.31)	
Wolverhampton	3,396	3.24	3.72 (2.91 to 4.46)	2.36	1.76 (1.14 to 2.56)	5.59	5.48 (4.59 to 6.88)	
Worcestershire	6,037	3.98	3.98 (3.28 to 4.80)	2.33	1.98 (1.51 to 2.88)	6.29	5.98 (5.44 to 7.28)	
York	2,026	1.97	3.79 (3.07 to 4.73)	1.48	1.80 (1.23 to 3.02)	3.46	5.58 (4.86 to 7.21)	
SCOTLAND								
Aberdeen City	2,607	*	4.02 (3.47 to 4.83)	*	1.60 (1.06 to 2.25)	5.75	5.59 (4.75 to 6.84)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
Aberdeenshire	2,901	*	3.85 (3.32 to 4.57)	*	1.63 (1.10 to 2.53)	3.45	5.47 (4.96 to 6.95)	
Angus	1,069	*	3.78 (3.06 to 4.71)	*	1.78 (1.28 to 2.88)	2.81	5.56 (4.65 to 7.72)	
Argyll and Bute	703	*	3.86 (3.22 to 4.84)	*	1.68 (1.19 to 2.66)	*	5.54 (4.93 to 6.96)	
City of Edinburgh	5,267	5.51	4.22 (3.56 to 5.43)	0.57	1.46 (0.90 to 2.18)	6.08	5.65 (5.00 to 7.15)	
Clackmannanshire	558	*	3.83 (3.22 to 4.67)	*	2.04 (1.37 to 3.46)	8.96	5.91 (4.91 to 7.89)	
Dumfries and Galloway	1,295	*	3.90 (3.13 to 4.75)	*	1.75 (1.23 to 2.52)	5.41	5.64 (5.13 to 7.09)	
Dundee City	1,568	4.46	3.91 (3.31 to 4.79)	1.92	1.72 (1.23 to 2.50)	6.38	5.61 (5.04 to 6.86)	
East Ayrshire	1,315	6.08	4.00 (3.21 to 5.21)	2.30	1.81 (1.20 to 2.73)	8.37	5.80 (4.95 to 7.45)	
East Dunbartonshire	973	*	3.87 (3.27 to 4.65)	*	1.67 (1.02 to 2.42)	3.08	5.54 (4.86 to 6.84)	
East Lothian	1,064	*	3.86 (3.09 to 4.53)	*	1.79 (1.20 to 2.91)	4.70	5.64 (4.76 to 7.19)	
East Renfrewshire	858	*	3.89 (2.96 to 5.04)	*	1.72 (1.25 to 2.46)	4.66	5.60 (4.57 to 7.23)	
Falkirk	1,585	*	3.83 (2.91 to 4.57)	*	1.67 (1.08 to 2.51)	3.15	5.50 (4.71 to 6.91)	
Fife	3,767	2.92	3.80 (3.07 to 4.34)	1.33	1.69 (1.25 to 2.51)	4.25	5.49 (4.70 to 6.77)	
Glasgow City	7,055	3.26	3.72 (3.02 to 4.44)	1.56	1.66 (1.10 to 2.27)	4.82	5.37 (4.63 to 6.58)	
Highland	2,222	1.80	3.76 (2.85 to 4.24)	3.16	2.07 (1.38 to 3.49)	4.95	5.84 (5.15 to 7.64)	
Inverclyde	721	*	3.89 (3.07 to 4.83)	*	1.68 (1.25 to 2.55)	5.55	5.52 (4.71 to 6.94)	
Midlothian	1,067	*	3.81 (3.04 to 4.45)	*	1.70 (1.16 to 2.61)	2.81	5.51 (4.87 to 6.93)	
Moray	921	*	3.92 (3.31 to 4.77)	*	1.65 (1.02 to 2.60)	4.34	5.56 (4.79 to 7.16)	
Na H Eileanan Siar	228	*	3.92 (3.21 to 5.12)	*	1.80 (1.12 to 2.69)	13.16	5.72 (4.73 to 7.49)	
North Ayrshire	1,240	*	3.81 (3.20 to 4.62)	*	1.59 (1.02 to 2.46)	2.42	5.39 (4.67 to 7.06)	
North Lanarkshire	3,746	3.47	3.88 (3.15 to 4.75)	2.41	1.98 (1.48 to 2.72)	5.87	5.86 (4.95 to 7.71)	
Orkney Islands	191	*	3.85 (3.30 to 4.64)	*	1.80 (1.36 to 2.60)	*	5.67 (4.95 to 7.17)	
Perth and Kinross	1,347	*	3.94 (3.13 to 4.86)	*	1.78 (1.19 to 2.82)	5.94	5.71 (4.62 to 7.26)	
Renfrewshire	1,728	*	3.77 (3.18 to 4.49)	*	1.55 (0.92 to 2.23)	1.74	5.29 (4.59 to 6.46)	
Scottish Borders	956	*	3.98 (3.27 to 4.76)	*	1.64 (1.08 to 2.39)	6.28	5.60 (4.89 to 6.92)	
Shetland Islands	232	*	3.85 (3.34 to 4.59)	*	1.73 (1.13 to 2.42)	*	5.58 (4.90 to 7.05)	
South Ayrshire	1,029	*	3.89 (3.13 to 4.72)	*	1.71 (1.11 to 2.61)	4.86	5.59 (4.69 to 7.18)	
South Lanarkshire	3,195	2.50	3.78 (3.12 to 4.63)	1.57	1.72 (1.20 to 2.73)	4.07	5.50 (4.82 to 7.03)	
Stirling	807	*	3.89 (3.23 to 4.56)	*	1.66 (1.21 to 2.65)	3.72	5.53 (4.97 to 6.98)	
West Dunbartonshire	927	*	3.86 (3.08 to 4.73)	*	1.61 (1.01 to 2.49)	3.24	5.43 (4.79 to 6.72)	
West Lothian	1,958	*	3.85 (3.23 to 4.56)	*	1.59 (1.10 to 2.41)	3.58	5.41 (4.70 to 6.78)	

Local authority	Total births§	Rate per 1,000 births§						
		Stillbirth†		Neonatal‡		Extended perinatal†		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)#	
WALES								
Blaenau Gwent	758	*	3.84 (3.25 to 4.69)	*	1.75 (1.11 to 2.57)	3.96	5.58 (4.83 to 7.20)	
Bridgend	1,511	3.97	3.89 (3.18 to 4.71)	2.66	1.89 (1.21 to 2.88)	6.62	5.78 (5.06 to 7.26)	
Caerphilly	2,061	6.31	4.08 (3.52 to 5.07)	1.46	1.77 (1.13 to 2.71)	7.76	5.84 (5.23 to 7.66)	
Cardiff	4,583	7.20	4.37 (3.62 to 5.59)	1.76	1.77 (1.34 to 2.98)	8.95	6.12 (5.53 to 8.18)	
Carmarthenshire	1,864	4.29	3.92 (3.33 to 4.53)	1.62	1.74 (1.23 to 2.57)	5.90	5.65 (4.94 to 6.99)	
Ceredigion	635	*	3.87 (3.12 to 4.77)	*	1.67 (1.07 to 2.58)	*	5.53 (4.49 to 6.95)	
Conwy	1,123	5.34	3.95 (3.13 to 4.84)	2.69	1.82 (1.22 to 2.77)	8.01	5.78 (5.02 to 7.46)	
Denbighshire	1,051	*	3.85 (3.10 to 5.06)	*	1.80 (1.34 to 2.47)	4.76	5.64 (4.83 to 7.13)	
Flintshire	1,579	2.53	3.83 (3.13 to 4.50)	3.17	1.94 (1.25 to 3.36)	5.70	5.78 (4.97 to 7.95)	
Gwynedd	1,160	*	3.80 (3.21 to 5.03)	*	1.92 (1.40 to 3.21)	5.17	5.74 (5.03 to 7.63)	
Isle of Anglesey	697	*	3.94 (3.19 to 4.99)	*	1.77 (1.21 to 2.92)	7.17	5.70 (4.94 to 7.44)	
Merthyr Tydfil	749	*	3.81 (3.16 to 4.59)	*	1.80 (1.23 to 2.83)	4.01	5.61 (4.81 to 7.37)	
Monmouthshire	786	*	3.93 (3.20 to 4.91)	*	1.82 (1.31 to 2.62)	7.63	5.75 (5.11 to 6.94)	
Neath Port Talbot	1,491	*	3.86 (3.24 to 4.71)	*	1.73 (1.06 to 2.56)	4.69	5.58 (4.82 to 6.87)	
Newport	1,988	2.52	3.77 (3.10 to 4.29)	2.52	1.83 (1.24 to 2.53)	5.03	5.60 (4.97 to 7.00)	
Pembrokeshire	1,192	*	3.98 (3.44 to 5.36)	*	1.69 (1.12 to 2.41)	6.71	5.65 (5.09 to 7.36)	
Powys	1,129	*	3.93 (3.17 to 4.93)	*	1.74 (1.10 to 2.73)	5.31	5.66 (4.94 to 7.24)	
Rhondda Cynon Taf	2,701	1.48	3.67 (2.76 to 4.36)	3.71	2.14 (1.45 to 3.23)	5.18	5.86 (5.12 to 7.25)	
Swansea	2,533	3.55	3.86 (3.26 to 4.56)	1.58	1.68 (1.12 to 2.63)	5.13	5.52 (4.88 to 6.77)	
Torfaen	1,008	2.98	3.84 (3.12 to 4.58)	5.97	2.11 (1.40 to 2.94)	8.93	6.01 (5.02 to 7.44)	
Vale of Glamorgan	1,338	*	3.89 (3.17 to 4.90)	*	1.67 (1.16 to 2.58)	4.48	5.54 (4.93 to 7.01)	
Wrexham	1,505	*	3.90 (3.18 to 4.71)	*	1.67 (1.04 to 2.36)	5.32	5.53 (4.48 to 6.85)	
NORTHERN IRELAND○ ^								
Antrim and Newtownabbey ^ ○	1,794	1.67	3.76 (3.15 to 4.69)	3.35	1.97 (1.39 to 3.11)	5.02	5.78 (5.16 to 7.46)	
Ards And North Down○ ^	1,770	*	3.73 (2.92 to 4.46)	*	1.66 (1.06 to 2.41)	1.69	5.39 (4.78 to 6.52)	
Armagh City, Banbridge and Craigavon○ ^	3,014	4.98	4.04 (3.36 to 4.97)	3.33	2.16 (1.42 to 3.69)	8.29	6.23 (5.29 to 8.14)	
Belfast○ ^	4,590	3.49	3.81 (3.02 to 4.40)	3.28	2.27 (1.73 to 3.36)	6.75	6.06 (5.36 to 7.53)	
Causeway Coast and Glens○ ^	1,723	2.90	3.84 (3.26 to 4.59)	2.91	1.89 (1.32 to 2.84)	5.80	5.75 (5.01 to 7.09)	
Derry City And Strabane○ ^	2,118	2.83	3.79 (3.03 to 4.59)	3.31	2.08 (1.30 to 3.66)	6.14	5.84 (4.61 to 7.71)	

Local authority	Total births[§]	Rate per 1,000 births[§]						
		Stillbirth[†]		Neonatal[‡]		Extended perinatal[†]		
		Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)	Crude	Stabilised & adjusted (95% CI)[#]	
Fermanagh and Omagh[◦] ^	1,436	2.09	3.81 (3.25 to 4.41)	3.49	2.04 (1.28 to 3.41)	5.57	5.83 (5.16 to 7.42)	●
Lisburn and Castlereagh[◦] ^	1,740	3.45	3.89 (3.25 to 4.76)	2.88	2.03 (1.30 to 3.12)	6.32	5.89 (5.16 to 7.22)	●
Mid and East Antrim[◦] ^	1,493	2.68	3.83 (3.13 to 4.53)	4.03	2.12 (1.55 to 3.44)	6.70	5.93 (5.25 to 7.31)	●
Mid Ulster[◦] ^	2,197	4.55	3.97 (3.28 to 4.96)	3.66	2.07 (1.42 to 3.53)	8.19	6.09 (5.16 to 8.00)	●
Newry, Mourne and Down[◦] ^	2,505	3.59	3.88 (3.29 to 4.58)	4.01	2.31 (1.41 to 3.82)	7.58	6.16 (5.12 to 8.00)	●
CROWN DEPENDENCIES								
Bailiwick of Guernsey	587	*	3.84 (3.28 to 4.86)	*	1.69 (1.06 to 2.59)	*	5.52 (4.81 to 7.04)	●
Bailiwick of Jersey	1,021	*	3.75 (3.06 to 4.60)	*	1.73 (1.19 to 3.00)	*	5.48 (4.60 to 7.42)	●
Isle of Man	780	*	3.89 (3.26 to 4.69)	*	1.84 (1.27 to 3.00)	6.41	5.72 (4.91 to 7.24)	●

[§] excluding terminations of pregnancy and births <24^{+0} weeks gestational age
[†] per 1,000 total births
[‡] per 1,000 live births
[#] colours represent variation from UK average extended perinatal mortality rate
[◦] different laws exist in Northern Ireland for the termination of pregnancy
^ local councils in Northern Ireland are not responsible for the delivery of health, education or social services
Data sources: MBRRACE-UK, PDS, ONS, NRS, ISD, NIMATS, States of Guernsey, States of Jersey

MBRRACE-UK

Department of Health Sciences
University of Leicester
Centre for Medicine
University Road
Leicester
LE1 7RH

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