

Perinatal Mortality 2006

April 2008

England, Wales and Northern Ireland

Sponsored by

PHILIPS


Cardiac
services
SISK GROUP

CEMACH Mission statement

Our aim is to improve the health of mothers, babies and children by carrying out confidential enquiries on a nationwide basis and by widely disseminating our findings and recommendations.

Please cite this work as: Confidential Enquiry into Maternal and Child Health (CEMACH) Perinatal Mortality 2006: England, Wales and Northern Ireland. CEMACH: London, 2008.

Disclaimers

This work was undertaken by CEMACH. The work was funded by the National Patient Safety Agency and by the Department of Health, Social Services and Public Safety of Northern Ireland. The views expressed in this publication are those of the Enquiry and not necessarily those of its funding bodies. Further, CEMACH is grateful for the support of sponsors of its enquiry programmes but this does not imply any specific endorsements.

The recommendations contained in this report represent the view of CEMACH, which was arrived at after a careful consideration of the available evidence. They do not override healthcare professionals' individual responsibility to make appropriate decisions in the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Published April 2008

CEMACH, Chiltern Court, 188 Baker Street, London, NW1 5SD

Tel: **0207 486 1191** Fax: **0207 486 6543**

Email: info@cemach.org.uk Website: www.cemach.org.uk

Designed and produced by Interface. Bristol Tel 0117 923 2235.

Printed by Henry Ling Ltd, at the Dorset Press, Dorchester, DT1 1HD.



ISBN: 978-0-9533536-6-8

The production of this report has
kindly been sponsored by Philips
and Cardiac Services.

PHILIPS



Perinatal Mortality 2006

Author and Editor:

Dominique Acolet

Co-authors:

Anna Springett

Shona Golightly

April 2008

England, Wales and Northern Ireland

Contents

Preface	vi
Acknowledgments.....	vii
Definitions	ix
Summary of Key Findings	x
Introduction.....	1
Chapter 1: Stillbirth, perinatal and neonatal mortality rates	2
1.1 Stillbirths, perinatal and neonatal deaths	2
1.2 Trends in stillbirths, perinatal and neonatal deaths.....	3
1.3 Stillbirths, perinatal and neonatal deaths using the FIGO classification	6
1.4 Stillbirths, perinatal and neonatal deaths in singleton and multiple births.....	7
Chapter 2: Variations in mortality	9
2.1 Variations in stillbirths, perinatal and neonatal deaths by Strategic Health Authority (SHA).....	9
2.2 Variations in stillbirths, perinatal and neonatal deaths by NHS Trust.....	14
2.3 Variations in stillbirths, perinatal and neonatal deaths by Neonatal Networks	20
Chapter 3: Maternal and neonatal risk factors for stillbirths, perinatal and neonatal deaths.....	26
3.1 Maternal risk factors.....	26
3.2 Neonatal risk factors	31
Chapter 4: Cause of death for stillbirths and neonatal deaths	34
4.1 Causes of stillbirths	34
4.2 Causes of neonatal deaths	39
4.3 Post mortem examinations.....	44
Chapter 5: Focus issues in perinatal mortality surveillance.....	49
5.1 All deaths of intrapartum origin.....	49
5.2 Deliveries at home: stillbirths and neonatal deaths.....	62
5.3 Deliveries at freestanding midwifery units: stillbirths and neonatal deaths	67
5.4 New CEMACH perinatal deaths classification system: a preliminary report.....	69
Chapter 6: Feedback on 2005 report	72
6.1 Introduction	72
6.2 Response rate and general findings	72
6.3 How the individual Trust, Neonatal Network or SHA reports are used in organisations	73
6.4 What aspects of the individual report are most useful	73
6.5 Areas for development and improvement	73
6.6 Additional comments	74
6.7 Summary and next steps	75

The CEMACH work programme	76
CEMACH Reports, published articles, editorials & abstracts (2006-2007)	78
References	80
Index of tables	84
Index of figures	86
Appendix A.....	88
Appendix B.....	89
Appendix C.....	90
Appendix D - Methodology	91
i Data sources	91
ii Data validation and cleaning	91
iii Data reporting and analysis	91
iv Classification of stillbirths and neonatal deaths.....	92
v Additional methodology	92
Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)	94
Appendix F - The CEMACH 2006 Perinatal Death Notification Form (PDN).....	101

Preface



Understanding perinatal mortality is central to being able to improve outcomes before and after birth. As in all areas of clinical practice, the key process underlying this is audit. This 2006 CEMACH perinatal report is an important part of that process. Few perinatal datasets have national coverage, and the ability to do so makes reports such as this particularly valuable. Of course, we all want more and more information from processes such as this, but the provision of high quality, if restricted, data is still of great value. Neonatal mortality is low, but it is important not to relax; the persisting high stillbirth rates and the high prematurity rates in the UK need to be understood and addressed nationally. These issues can only really be evaluated in populations hence the multilevel reporting in the CEMACH report is very welcome.

This report continues the excellent evolutionary work outlined in previous reports and steadily, and cautiously, increases the value of its annual analysis. Understanding variation in health outcomes is helpful to clinicians and to healthcare planners. For my own Network and Trust, the CEMACH report gives us real opportunity to benchmark against others, and helps with the process of understanding what needs to be done.

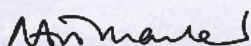
Casemix correction is certainly controversial, and simply put, it is critical in understanding these results. Sadly, the sort of detailed correction provided by Clinical Risk Index for Babies (CRIB), for example, is not available, but to be able to use indices of deprivation, maternal age and gestation are equally important as these are key markers of outcome in our population. Assessment by Network and PCT populations is now critical as transfers cloud the assessment of single unit results.

It is also important that we recommence the collection of data on late fetal losses from 22 weeks of gestation: this is one of the WHO recommendations for reporting perinatal data and will ensure international comparability for the CEMACH data.

One of the unsung achievements of the CEMACH team in 2006 was the collaboration with the Medical Research Council (MRC) funded EPICure2 study, led by Professor Kate Costeloe. This has enabled data for the whole extremely preterm population to be collected and collated; EPICure2 has taken advantage of the established network of CEMACH coordinators to collect detailed data about what happens in the delivery room – this would not have been possible in any other way. These data are being linked to neonatal outcome data and results will be available during 2008. We will then have valuable detail on how survival and outcome have changed at a national level since the first EPICure study in 1995 and on our management in pregnancy and delivery for this most vulnerable group.

The ability of the CEMACH team to add value to their mortality report with focussed studies is really important and this year's focussed studies are no exception. The studies of intrapartum deaths, mortality outside obstetric units and a new attempt to classify perinatal deaths all point to important directions in research so we can understand the variation reported in more enlightened ways. These will also interdigitate with national funded studies such as the important "Birthplace" programme.

The CEMACH team are to be congratulated on this comprehensive and valuable report. This and its sister report on maternal mortality represent a huge and important effort to provide us with up to date information on the state of the nation's maternity services.

A handwritten signature in black ink, appearing to read 'Neil Marlow'.

Professor Neil Marlow

President, British Association of Perinatal Medicine

Acknowledgments

Author and editor

Dominique Acolet

Clinical Director (Perinatal Epidemiology), CEMACH

Data analyst

Anna Springett

CEMACH

Contributing authors

Jessica Berentson-Shaw

Assistant Director of Research & Development, CEMACH (until October 2007)

Shona Golightly

Director of Research & Development, CEMACH

Steve Gould

Consultant Perinatal Pathologist

The CEMACH programme is only possible because of the commitment and involvement of practising health professionals throughout the nations covered by the enquiry. They provide data, participate as assessors and advocate the implementation of recommendations into NHS Trusts' practice. CEMACH cannot thank enough the many clinicians and staff who continue to provide this support for our work.

With special thanks to:

- The hospital unit coordinators, clinicians and staff throughout England, Wales, Northern Ireland, Channel Islands and the Isle of Man, without whose commitment and continued support we would not have had the data to enable us to produce this report.
- All CEMACH regional managers and regional administrative assistants for the collection and validation of all data provided for this report.
- Richard Congdon, CEMACH Chief Executive; Rachael Davey, CEMACH R&D Administrative Assistant; Rosie Houston, CEMACH Projects Manager; Alison Miller, CEMACH Programme Director and Midwifery Lead and Dharmishta Parmar, CEMACH Data Manager and all other staff at Central Office for their support and advice during the development of this report.
- Professor Michael Weindling, Professor of Perinatal Medicine, University of Liverpool, for his valuable comments on this report.
- Audrey Lawrence for her valuable statistical advice.
- Rachel Rowe from the 'Birthplace' project.
- Professor Kate Costeloe, Dr Liz Draper and all other EPICure2 staff for contributing to the data.
- The National Patient Safety Agency (NPSA) and the Department of Health, Social Services and Public Safety of Northern Ireland for funding this work.

The following organisations that provided additional subsets of their data:

- All Wales Perinatal Survey (AWPS)
- The Perinatal Institute (PI) in the West Midlands
- Regional Maternity Survey Office (RMSO) North East.

The following individuals and organisations that have provided CEMACH with denominator data for this report:

- Gillian Fegan from Northern Ireland Statistics and Research Agency (NISRA)
- Valerie Doyle, Ruth Johnston, Jackie Hamilton and Maria Monaghan the Child Health System Managers for Northern Ireland
- Nirupa Dattani, Anne Loveday, Emma Gordon, Nicola Tromans, Claudia Breakwell and Julie Jefferies from the Office for National Statistics (ONS)
- Louise James from National Community Child Health Database (NCHHD)
- Victoria May from The Information Centre for Health & Social Care.

The mortality surveillance advisory group for their contribution to the report:

- Professor Peter Brocklehurst, Director of the National Perinatal Epidemiology Unit (NPEU)
- Professor Ian Greer, Chair of the CEMACH National Advisory Committee for Enquiries into Maternal and Perinatal Health and Professor of Obstetric Medicine and Dean, Hull York Medical School
- Dr Steve Gould, Consultant Perinatal Pathologist, John Radcliffe Hospital, Oxford
- Professor Neil Marlow, Professor of Neonatal Medicine, Nottingham University and President of the British Association of Perinatal Medicine (BAPM).

The external reviewers for their valuable comments on the report:

- Professor Zarko Alfirevic, Professor of Fetal and Maternal Medicine, Liverpool Women's Hospital
- Professor David Field, Professor of Neonatal Medicine, University of Leicester and Consultant Paediatrician, Leicester Royal Infirmary
- Dr Bryan Gill, Consultant Neonatologist, Leeds Teaching Hospitals and Lead Clinician for the Yorkshire Network. Honorary secretary BAPM and Chair of RCPCH. Specialist Advisory Committee for Neonatal Medicine.

Definitions

Late fetal loss	An in utero death delivered between 22+0 and 23+6 weeks' gestation.
Stillbirth	A baby delivered with no signs of life after 24 completed weeks of pregnancy.
Early neonatal death	Death of a live born baby occurring less than seven completed days from the time of birth.
Late neonatal death	Death of a live born baby occurring after the seventh day and before 28 completed days from the time of birth.
Stillbirth rate	Number of stillbirths per 1000 live births and stillbirths.
Stillbirth rate (WHO)	Number of late fetal losses and stillbirths per 1000 live births, stillbirths and late fetal losses.
Perinatal mortality rate (UK)	Number of stillbirths and early neonatal deaths per 1000 live births and stillbirths.
Perinatal mortality rate (WHO)	Number of late fetal losses, stillbirths and early neonatal deaths per 1000 live births and stillbirths.
Neonatal mortality rate	Number of neonatal deaths per 1000 live births.
Live birth	The complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or any definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached ¹ .

Summary of Key Findings

CEMACH provides information on perinatal deaths at a local, regional and national level for healthcare providers, commissioners and policy makers. This national report complements the perinatal mortality reports which CEMACH produces for Strategic Health Authorities, Neonatal Networks and NHS Trusts.

Key Finding 1

In 2006, in England, Wales and Northern Ireland, the stillbirth rate was 5.3 [95% confidence interval (CI) 5.1, 5.5] per 1000 total births, the neonatal mortality rate was 3.4 [3.3, 3.6] per 1000 total births and the perinatal mortality rate was 7.9 [7.7, 8.1] per 1000 total births.

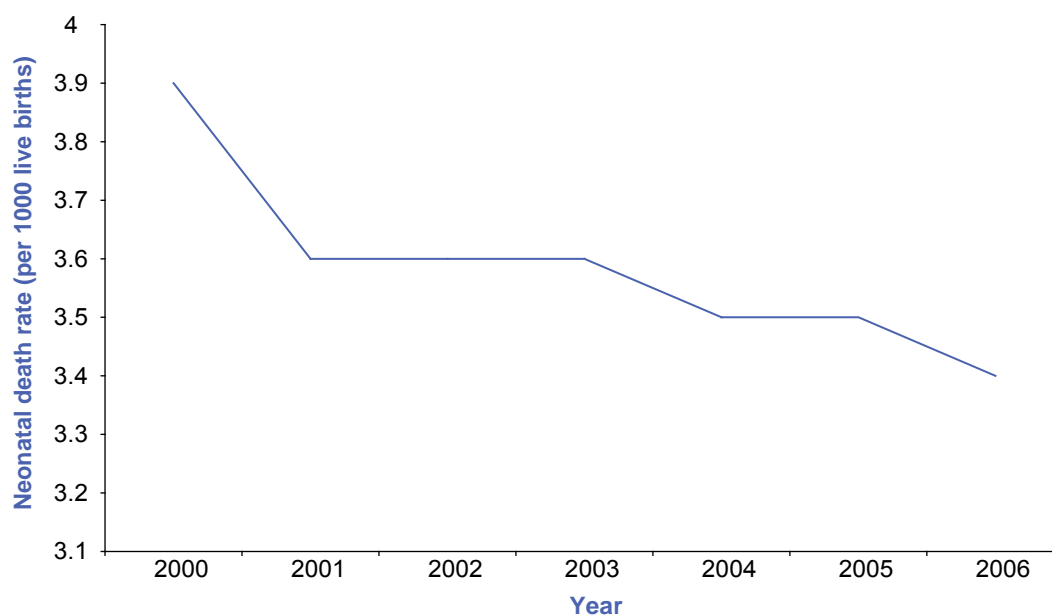
Key Finding 2

Since 2000, the neonatal mortality rate has declined significantly.

Although the neonatal mortality rate has not significantly changed since 2005, the reduction from 3.9 [3.7, 4.0] per 1000 live births in 2000 to 3.4 [3.3, 3.6] per 1000 live births in 2006 is statistically significant (Cochran-Armitage test for linear trends $p < 0.001$).

Figure i

Trend in neonatal deaths; England and Wales: 2000-2006.



Sources: CEMACH 2005-2007, ONS 2000-2006

Key Finding 3

Since 2000, there has been no significant change in the stillbirth rate.

In contrast to neonatal mortality, there has been no significant decline in the stillbirth rate since 2000. The stillbirth rate was 5.4 [5.2, 5.6] per 1000 total births in 2000 and 5.3 [5.1, 5.5] per 1000 total births in 2006. The findings from this report suggest that demographic factors known to be associated with stillbirths such as obesity, ethnicity, deprivation and maternal age may be contributing to this lack of progress. In addition, over one-third (40%) of unexplained stillbirths had a birth weight below the 10th centile for gestation, and a quarter (26%) of them were below the 3rd centile. This suggests that being small for gestational age may be an important factor.

Key Finding 4

Half of stillbirths were classified as 'unexplained' using the existing Wigglesworth classification system.

The revision of the deaths classification system and notification form for 2008 (see appendix) will allow us to improve understanding of the causes of stillbirths and neonatal deaths by providing more detailed information on these cases.

Key Finding 5

Since 2000, the stillbirth, perinatal and neonatal mortality rates in twin pregnancies have declined significantly in England and Wales.

The stillbirth rate in twin pregnancies has declined from 17.7 [15.8, 19.8] per 1000 total births in 2000 to 12.5 [11.0, 14.1] per 1000 total births in 2006 ($p<0.001$). The perinatal death rate in twin pregnancies has decreased from 35.3 [32.6, 38.3] per 1000 total births in 2000 to 27.2 [25.0, 29.5] per 1000 total births in 2006 ($p<0.001$). The neonatal death rate in twin pregnancies has also decreased from 22.3 [20.2, 24.7] per 1000 total births in 2000 to 19.3 [17.5, 21.4] per 1000 total births in 2006 ($p=0.02$).

There has not been a similar trend amongst higher order (multiparity greater than 2) births. There have been no significant trends in stillbirth, perinatal or neonatal mortality rates amongst higher order births.

Key Finding 6

There is a wide variation of practice in reporting neonatal deaths below 22 weeks' gestation to CEMACH.

The WHO definition of the perinatal period is from 22 weeks' gestation. Below 22 weeks' gestation, the Nuffield Council on Bioethics recommend that no baby should be resuscitated. However some babies born below 22 weeks' gestation may show 'signs of life' and in some, but not all regions, are recorded as neonatal deaths in their reporting to CEMACH. This difference in reporting by Neonatal Networks in England resulted in a variation of early neonatal deaths delivered at less than 22 weeks' gestation, between 40% in one Network to none in another.

This might have implications for parents, registration authorities and coroners. CEMACH suggests that guidance be issued to achieve greater consistency. The implementation of such guidance would involve a number of parties including the Department of Health (DH), Office for National Statistics (ONS), Royal College of Obstetricians and Gynaecologists (RCOG) and the British Association of Perinatal Medicine (BAPM).

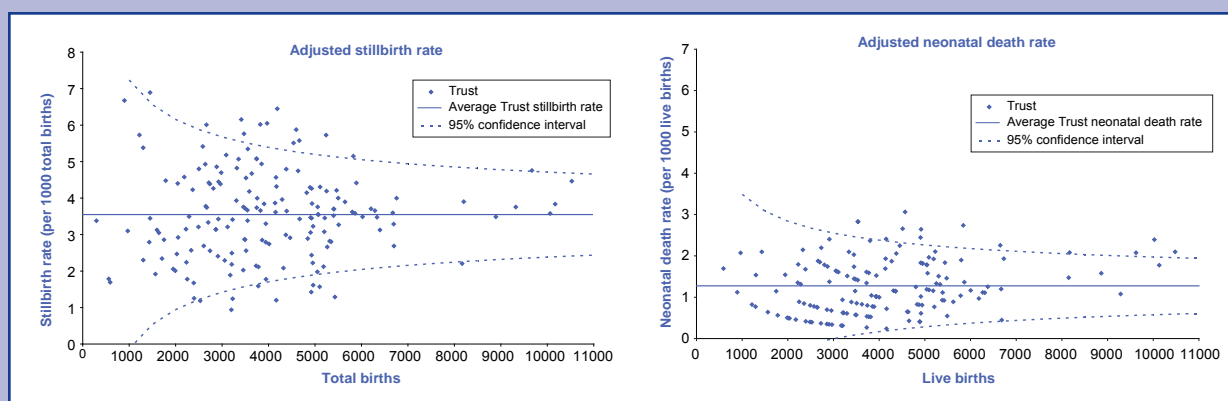
Key Finding 7

There were marked variations in mortality rates between Trusts and Neonatal Networks after adjustments for: terminations of pregnancy; lethal malformations; babies born below 22 weeks' gestation; babies with birth weight below 500g; and, babies transferred into Trusts or Neonatal Networks (Figures ii and iii).

These differences should not be interpreted as direct indicators of the quality of care as it is not yet possible to adjust for case-mix or the socio-demographic characteristics of the population.

Figures ii and iii

Adjusted stillbirth and neonatal death rates by Trust against average Trust stillbirth and neonatal death rates and associated 95% confidence intervals for all cases that booked and died at the Trust; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007

Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Key Finding 8

Maternal age, obesity, social deprivation and ethnicity remain important factors for perinatal mortality.

- Mothers aged less than 20 and above 40 had the highest rates of stillbirth (5.6 and 8.1 per 1000 total births respectively), the highest rates of perinatal deaths (8.3 and 11.7 per 1000 total births respectively) and the highest rates of neonatal deaths (3.7 and 4.5 per 1000 live births respectively).
- Of the women who had a stillbirth and a recorded BMI, 26% (761/2924) were obese (BMI >30), and for neonatal deaths, 22% (356/1609) were obese. Unfortunately, there are no national denominator data available for obese pregnant women that would provide an estimation of this increased risk. CEMACH has commenced work on a project on obesity in pregnancy that will provide demographic and clinical information on a sample of women with obesity in pregnancy delivering in the UK.
- Just over one-third of all stillbirths and neonatal deaths were born to mothers in the most deprived quintile (compared with the expected 20%). Stillbirth and neonatal mortality rates for mothers resident in the most deprived areas were 1.7 times higher than those in the least deprived area.
- Compared with women of White ethnicity, the ethnic-specific mortality rates showed significantly higher stillbirth, perinatal and neonatal death rates for women of Black ethnicity (2.4, 2.4 and 2.2 times higher respectively) and Asian ethnicity (2.0, 1.9 and 1.8 times higher respectively). CEMACH aims to further explore these differences by developing further analysis of specific causes of deaths by ethnic groups.

Key Finding 9

Post mortem examination uptake has continued to decline from 48% of all deaths in 2000 to 38% in 2006. This remains largely unchanged from 2005 where the uptake was 39%.

Concerted efforts should be made to try to re-establish perinatal pathology centres.

Key Finding 10

The incidence of intrapartum-related deaths has not changed significantly since 2000.

Half of the intrapartum deaths were classified as 'unexplained' using the Aberdeen Obstetric classification, however, the proportion of post mortems performed in this group was low. The main identifiable causes related to catastrophic events at delivery, such as placental abruption (20% for stillbirths and 15% for neonatal deaths) or cord prolapse and compression (8% for stillbirths and 4% for neonatal deaths). There was a malpresentation or a ruptured uterus in 3% of stillbirths and 12% neonatal deaths. Maternal infection was identified as a cause of intrapartum related stillbirths (8%). Women of Black ethnicity were twice as likely to have an intrapartum-related stillbirth as women of White ethnicity.

The burden of intrapartum related deaths was in fetuses and babies born at term with a birth weight between 2.5kg and 4kg.

Intrapartum-related deaths are planned to be the subject of the next CEMACH perinatal enquiry. In addition, the NPSA is working with the RCOG and Royal College of Midwives (RCM) on a project that involves the development and testing of two safety packages using care bundle methodology developed by the Institute of Healthcare Improvement in the USA. One of the care bundles is around the care of women for whom electronic fetal monitoring is clinically indicated. Evidence from the NPSA's National Reporting and Learning System and other sources suggest that problems associated with fetal monitoring contribute to intrapartum related deaths and other poor outcomes (including cerebral palsy). Both the CEMACH and NPSA studies will help to improve knowledge about possible avoidable factors and the quality of care received in the intrapartum period as highlighted in the Chief Medical Officer's 2006 report.

Key Finding 11

Most deaths resulting from homebirths were not planned as home deliveries.

There were 95 deaths notified to CEMACH that were delivered at home. Of these 95 deaths, 61% were booked to deliver in hospital but delivered at home and a further 29% were unbooked. Approximately 10% of these 95 deaths (3 stillbirths and 6 neonatal deaths) were planned home deliveries.

In 2006, CEMACH also collected data on perinatal mortality both at home and in hospital where at onset of labour the intention was to deliver at home. Absolute numbers of stillbirths and neonatal deaths were low in these circumstances, with 10 perinatal deaths at home and 11 in hospital. There are no denominator data available to enable calculations of mortality rates for this situation.

Key Finding 12

There were few deliveries in a freestanding maternity unit that resulted in a stillbirth (n=2) or neonatal death (n=8).

Since choice of birth place is considered important, CEMACH will continue to monitor the place of birth for the deaths notified to CEMACH.

The Birthplace in England Research Programme led by the National Perinatal Epidemiology Unit will provide more information about denominators of births occurring at home or in freestanding maternity units, which will allow us to interpret these findings.

Key Finding 13

In a survey on the usefulness of CEMACH's perinatal mortality reports tailored to individual Strategic Health Authorities, Neonatal Networks and NHS Trusts, 97% of the 215 responders found their individual report either useful or very useful.

The findings of the survey also indicated that the bespoke perinatal mortality reports have been well received and are being used locally to discuss and review perinatal deaths. Many of the suggestions for development have been incorporated into the 2006 reports such as excluding congenital anomalies for comparative purposes and further improving the comparability of the data. Adjustment by type of providers will be developed next year. The feedback exercise will be repeated for the 2006 reports, as we strive to continue to develop and improve the perinatal mortality surveillance system.



One in a hundred pregnancies ends as a late fetal loss, a stillbirth or a neonatal death each year in England, Wales and Northern Ireland. Everything possible should be done to reduce these tragedies.

CEMACH provides surveillance of fetal and neonatal deaths and is able to produce national, regional and Trust-specific reports from the same data system. CEMACH collects basic data on all these deaths using a specific notification form, the Perinatal Death Notification (PDN), and conducts confidential enquiries and other in-depth analyses of defined subsets. The CEMACH perinatal mortality surveillance system is an integral part of its confidential enquiry programme. This national report describes the results of CEMACH's perinatal mortality surveillance for 2006.

CEMACH's first perinatal mortality surveillance report covered 2000-2003. In the surveillance reports for 2004 and 2005, CEMACH expanded the analysis and for the first time considered the outcome for Strategic Health Authorities (SHAs), Neonatal Networks and NHS Trusts by comparing crude mortality rates with the national average using a "funnel plot", which allowed for the identification of "outliers". This benchmarking of hospitals and Neonatal Networks was a first step in the development of a fully-informed comparison of NHS Trust-level perinatal mortality rates.

The report for 2006 provides a more detailed epidemiological description of national perinatal deaths adjusting for a number of factors known to influence local variation in mortality. It can now assist hospital Trusts, Neonatal Networks, Primary Care Trusts (PCTs) and Strategic Health Authorities (SHAs) to monitor their performance.

In addition to the ongoing surveillance reported in 2005, this year's report describes more fully:

- Intrapartum-related deaths, recognised by the Chief Medical Officer as a major perinatal public health issue in 2006.
- Perinatal deaths and deliveries occurring at home, including planned home births and freestanding midwifery units.
- A pilot study using a new CEMACH classification of perinatal causes of death. This was developed to improve our understanding of the causes of stillbirths, half of which were classified as 'unexplained' by the previous system.

A handwritten signature in black ink, appearing to read 'Dominique Acolet'.

Dr Dominique Acolet,
Author and Editor

Clinical Director (Perinatal Epidemiology), CEMACH

Chapter 1 Stillbirth, perinatal and neonatal mortality rates

1.1 Stillbirths, perinatal and neonatal deaths

In 2006, 7237 deaths were notified to CEMACH through maternity units in England, Wales and Northern Ireland. Of these notifications, 1151 were late fetal losses, 3692 were stillbirths and 2380 were neonatal deaths. The stillbirth rate was 5.3 per 1000 total births and the perinatal mortality rate was 7.9 per 1000 total births (Table 1.1).

In comparison to the 2006 published data for Scotland², the stillbirth rate is identical. However the perinatal death rate in Scotland was 7.4 [6.7, 8.2] per 1000 total births and although this rate is lower than the rate reported here, the difference is not statistically significant.

Table 1.1
Summary mortality rates; England, Wales and Northern Ireland: 2006.

	Number	Rate [95% CI]
Live births	693,366	..
Total births	697,058	..
Total notifications ^a	7,237	..
Late fetal losses	1,151	..
Stillbirths (UK) ^b	3,692	5.3 [5.1, 5.5]
Stillbirths (WHO) ^c	4,843	6.9 [6.7, 7.1]
Perinatal deaths (UK) ^b	5,531	7.9 [7.7, 8.1]
Perinatal deaths (WHO) ^c	6,682	9.6 [9.3, 9.8]
Neonatal deaths ^d	2,380	3.4 [3.3, 3.6]
Early neonatal deaths ^d	1,839	2.7 [2.5, 2.8]
Late neonatal deaths ^d	541	0.8 [0.7, 0.8]

a Includes late fetal losses, stillbirths (UK), neonatal deaths and 14 cases where case definition is uncertain.

b Rate per 1000 total births (live births and stillbirths).

c Rate per 1000 live births, stillbirths and late fetal losses.

d Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NISRA-GRO 2006

1.2 Trends in stillbirths, perinatal and neonatal deaths

Table 1.2 shows mortality trends for 2000 to 2006. Following an increase in the stillbirth rate in 2002 (from 5.4 in 2000 to 5.7 in 2002), the rate remained largely unchanged in 2003 (5.8) and in 2004 (5.7). In 2006, the stillbirth rate was 5.3 per 1000 (nearly one in every 200 babies born), the same as in 2005, and the perinatal mortality rate was 7.9, decreasing from 8.1 in 2005. The perinatal mortality rate was lower than in the previous six years while the total number of live births has increased steadily since 2002: 617,299 in 2002 and 693,366 in 2006. The neonatal mortality rate at 3.4 per 1000 live births in 2006 was similar to that of the previous two years (3.4 per 1000 live births in 2004 and 3.5 per 1000 live births in 2005).

Table 1.2

Stillbirth, perinatal and neonatal death trends; England, Wales and Northern Ireland: 2000-2006.

	Rate [95% CI]						
	2000	2001	2002	2003	2004	2005 ^c	2006 ^c
Live births	625,642	616,322	617,299	642,899	662,039	668,681	693,366
Stillbirths ^a	5.4 [5.2, 5.6]	5.4 [5.2, 5.6]	5.7 [5.5, 5.9]	5.8 [5.6, 6.0]	5.7 [5.5, 5.9]	5.3 [5.2, 5.5]	5.3 [5.1, 5.5]
Perinatal deaths (UK) ^a	8.3 [8.1, 8.5]	8.1 [7.9, 8.3]	8.5 [8.2, 8.7]	8.6 [8.4, 8.8]	8.4 [8.2, 8.6]	8.1 [7.8, 8.3]	7.9 [7.7, 8.1]
Neonatal deaths ^b	3.9 [3.7, 4.0]	3.7 [3.6, 3.9]	3.6 [3.5, 3.8]	3.7 [3.6, 3.9]	3.4 [3.3, 3.5]	3.5 [3.4, 3.7]	3.4 [3.3, 3.6]

a Rate per 1000 total births

b Rate per 1000 live births

c 2005 and 2006 stillbirths defined using the RCOG guidance³

Sources: CEMACH 2000-2007

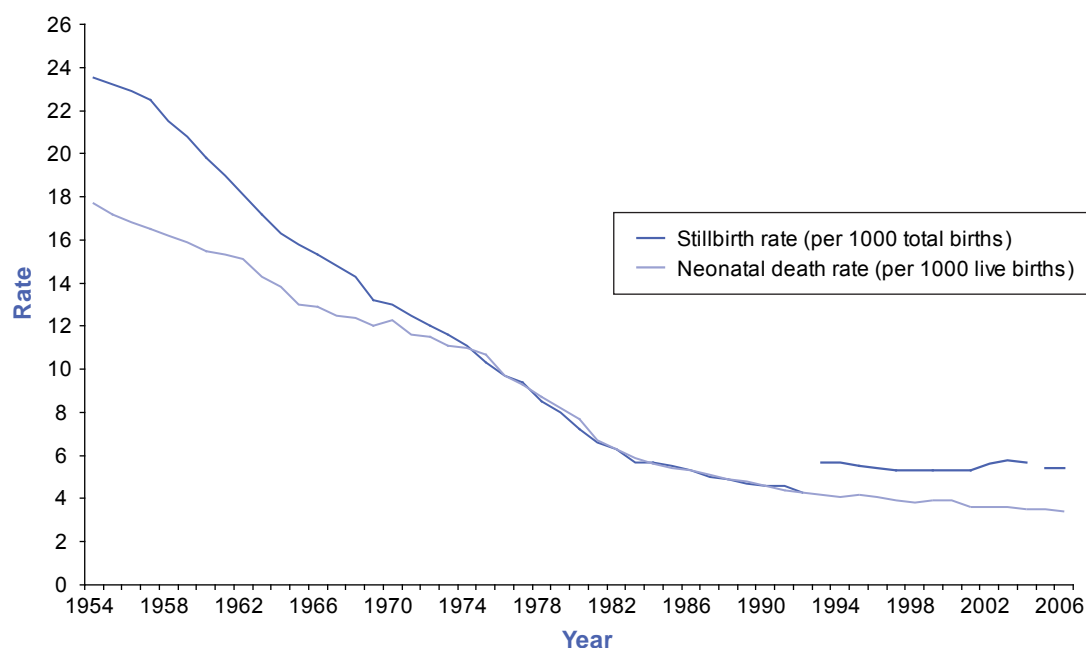
ONS 2000-2006

NISRA-GRO 2000-2006

Figure 1.1 shows the trend in rates of stillbirths and neonatal deaths since 1954. From 1954 until the mid 1990s, stillbirth and neonatal death rates in England and Wales fell steadily. In 1954, the stillbirth rate was 23 per 1000 total births and the neonatal mortality rate was 18 per 1000 live births. In 1997, the stillbirth rate had reduced to 5.3 per 1000 total births and the neonatal mortality rate was 3.9 per 1000 live births. Figure 1.2 shows that since 2000 the stillbirth and perinatal death rates have remained largely unchanged while the neonatal mortality rates have declined significantly (Cochran-Armitage test for linear trends $p < 0.001$).

Figure 1.1

Stillbirths and neonatal deaths; England and Wales: 1954-2006.

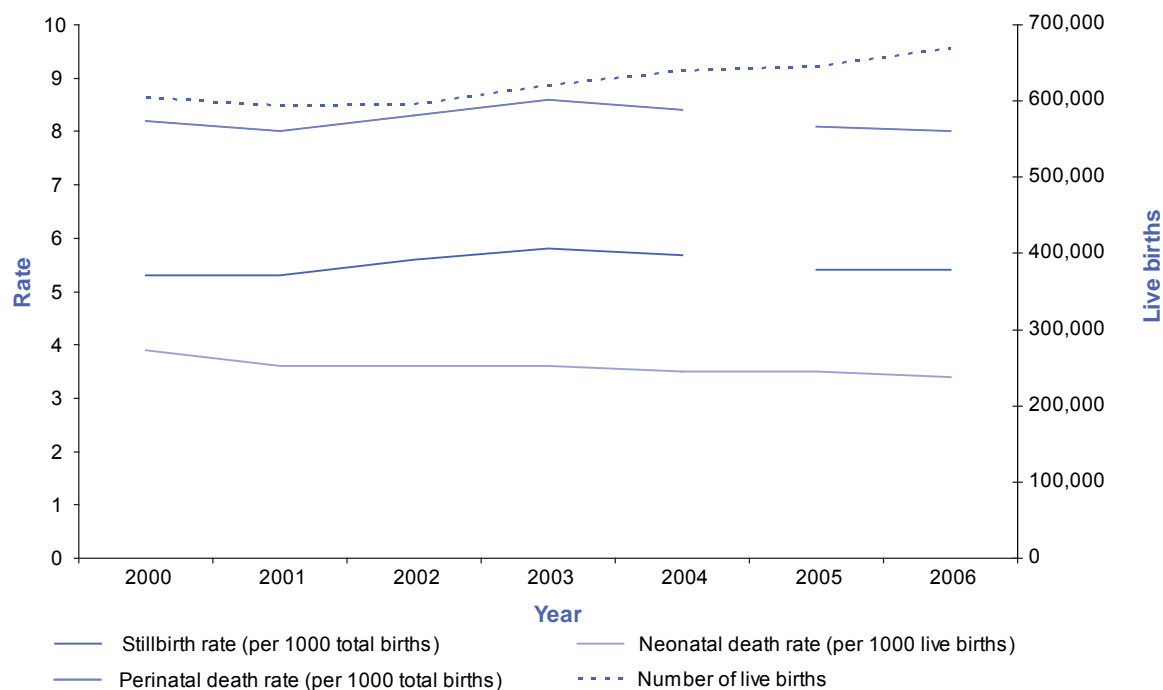


Sources: CEMACH 2005-2007, ONS 1954-2006

Note: The definition of stillbirth changed in 1992 and stillbirths were defined using the RCOG guidance³ from 2005.

Figure 1.2

Stillbirths, perinatal and neonatal deaths; England and Wales: 2000-2006.



Sources: CEMACH 2005-2007, ONS 2000-2006

Note: Stillbirths were defined using the RCOG guidance³ from 2005.

In January 2005, the Royal College of Obstetricians and Gynaecologists (RCOG) published guidance stating that a baby born without any sign of life after 24 completed weeks of pregnancy and known to have died before 24 completed weeks did not require registration as a stillbirth³. In order to examine the effect this may have on registration statistics, CEMACH collected information based on all births according to the previous definition, but additionally asked for the gestation at which death was confirmed. This has allowed CEMACH to calculate stillbirth and perinatal mortality rates according to both definitions. The data for 2006 shows that 67 stillbirths (i.e. delivering at 24+0 weeks' gestation onwards) did not require registration under the new RCOG guidelines. This led to a decrease of 0.1 per 1000 total births in the stillbirth rate [95% confidence intervals] from 5.4 [5.2, 5.6] to 5.3 [5.1, 5.5]. Gestation at death started being collected in 2005, so from this year onwards we are reporting stillbirths using the new RCOG definition³.

1.3 Stillbirths, perinatal and neonatal deaths using the FIGO classification

To produce internationally comparable stillbirth and neonatal death rates we used the International Federation of Gynaecology and Obstetrics (FIGO) classification⁴. This classification derives a rate for 'normally formed' fetuses and newborn babies by removing those with lethal malformations, to facilitate the evaluation of the effectiveness of perinatal care. It also derives a rate for fetuses and newborn babies weighing more than 1000g to allow international comparison⁴. The FIGO rates were then calculated by dividing the FIGO numbers by the total number of births in the case of stillbirths or total number of live births in the case of neonatal deaths. For the FIGO numbers please see Appendix A. For 2006, the FIGO stillbirth rate for England and Wales was 3.1 per 1000 total births in comparison to the general stillbirth rate of 5.3 per 1000 total births. The FIGO neonatal death rate was 0.8 per 1000 in comparison to 3.4 per 1000 live births. The FIGO perinatal mortality rate was 3.7 per 1000 versus the general perinatal mortality rate of 7.9 per 1000 (Table 1.1 and 1.3). These figures were comparable to those cited in the 2006 report for Scotland although the lethal malformation rate was higher than the data for Scotland².

Table 1.3

Stillbirth, perinatal and neonatal death rates using FIGO classification; England, Wales and Northern Ireland: 2006.

	Rates [95% CI]
Excluding all births <500g	
<i>Major malformation rate ^a</i>	1.7 [1.6, 1.8]
<i>Stillbirth rate ^a</i>	4.8 [4.6, 5.0]
<i>Perinatal death rate ^a</i>	6.7 [6.5, 6.9]
<i>Neonatal death rate ^b</i>	2.6 [2.5, 2.7]
Excluding all major malformations and other births <500g	
<i>Stillbirth rate ^a</i>	4.1 [3.9, 4.2]
<i>Perinatal death rate ^a</i>	5.5 [5.3, 5.6]
<i>Neonatal death rate ^b</i>	1.9 [1.8, 2.0]
Excluding all births <1000g	
<i>Major malformation rate ^a</i>	1.0 [1.0, 1.1]
<i>Stillbirth rate ^a</i>	3.6 [3.4, 3.7]
<i>Perinatal death rate ^a</i>	4.6 [4.4, 4.8]
<i>Neonatal death rate ^b</i>	1.4 [1.3, 1.5]
Excluding all major malformations and other births <1000g	
<i>Stillbirth rate ^a</i>	3.1 [3.0, 3.3]
<i>Perinatal death rate ^a</i>	3.7 [3.6, 3.9]
<i>Neonatal death rate ^b</i>	0.8 [0.7, 0.9]

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NI CHS 2006

1.4 Stillbirths, perinatal and neonatal deaths in singleton and multiple births

Multiple births are at greater risk of an adverse perinatal outcome compared to singleton births⁵. Table 1.4 shows the trend of stillbirth, perinatal and neonatal mortality rates by plurality between the years 2000 and 2006. The stillbirth rate in twin pregnancies has declined from 17.7 [15.8, 19.8] per 1000 total births in 2000 to 12.5 [11.0, 14.1] per 1000 total births in 2006 ($p<0.001$). The perinatal death rate in twin pregnancies has decreased from 35.3 [32.6, 38.3] per 1000 total births in 2000 to 27.2 [25.0, 29.5] per 1000 total births in 2006 ($p<0.001$). The neonatal death rate in twin pregnancies has also decreased from 22.3 [20.2, 24.7] per 1000 total births in 2000 to 19.3 [17.5, 21.4] per 1000 total births in 2006 ($p=0.02$).

There has not been a similar trend amongst higher order (multiparity greater than 2) births. There have been no significant trends in stillbirth, perinatal or neonatal mortality rates amongst higher order births.

Overall, the stillbirth rate for multiple births was 2.5 [0.9, 7.2] times that for singleton births. This ratio has fallen progressively because of the association, over the recent years, of unchanged stillbirth mortality rates in singletons and a steady reduction in stillbirth mortality rates in multiples. An even greater disparity was seen in neonatal deaths; the neonatal mortality rate for multiple births was 7.6 [2.1, 27.6] times that for singleton births.

Despite a continuing upward trend in twin maternities, recent data shows that the rate of triplet and higher order multiple births in England and Wales has declined since 1998⁶. Therefore, the perinatal mortality improvement seen in multiple births may be explained by an increase in the proportion of multiple births that were twins and also the significant decrease in twin mortality rates.

Table 1.4

Stillbirth, perinatal and neonatal death rates by multiplicity: England, Wales and Northern Ireland: 2000-2006.

	Rate [95% CI]							P-value
	2000	2001	2002	2003	2004	2005 ^c	2006 ^c	
Stillbirths^a	5.4 [5.2, 5.5]	5.4 [5.2, 5.5]	5.7 [5.5, 5.9]	5.8 [5.6, 6.0]	5.7 [5.5, 5.9]	5.3 [5.2, 5.5]	5.3 [5.1, 5.5]	..
Singletons	5.0 [4.8, 5.2]	5.0 [4.8, 5.1]	5.3 [5.1, 5.5]	5.3 [5.1, 5.5]	5.3 [5.1, 5.5]	5.0 [4.8, 5.2]	4.9 [4.7, 5.0]	0.49
Multiples	17.6 [15.8, 19.6]	18.4 [16.6, 20.5]	19.0 [17.1, 21.1]	20.2 [18.3, 22.3]	17.1 [15.4, 19.1]	13.8 [12.3, 15.6]	12.2 [10.8, 13.8]	<0.001
<i>Twins^d</i>	17.7 [15.8, 19.8]	18.3 [16.4, 20.5]	18.5 [16.6, 20.6]	19.6 [17.7, 21.8]	16.9 [15.2, 18.9]	15.5 [13.8, 17.4]	12.5 [11.0, 14.1]	<0.001
<i>Triplets and higher order multiples^d</i>	28.4 [18.8, 42.7]	40.7 [27.9, 59.4]	55.9 [39.1, 79.9]	60.9 [40.8, 90.9]	50.2 [33.4, 75.6]	42.4 [27.1, 66.5]	20.5 [10.6, 39.3]	0.94
Perinatal deaths^a	8.3 [8.1, 8.5]	8.1 [7.9, 8.3]	8.5 [8.2, 8.7]	8.6 [8.4, 8.8]	8.4 [8.2, 8.6]	8.1 [7.8, 8.3]	7.9 [7.7, 8.1]	..
Singletons	7.5 [7.2, 7.7]	7.2 [7.0, 7.4]	7.6 [7.4, 7.8]	7.7 [7.5, 7.9]	7.6 [7.4, 7.8]	7.2 [7.0, 7.4]	6.9 [6.7, 7.1]	<0.001
Multiples	35.9 [33.3, 38.8]	36.7 [34.1, 39.6]	35.2 [32.6, 38.0]	36.5 [33.9, 39.3]	32.9 [30.5, 35.5]	31.5 [29.1, 34.1]	27.5 [25.3, 29.8]	<0.001
<i>Twins^d</i>	35.3 [32.6, 38.3]	36.3 [33.6, 39.3]	34.8 [32.1, 37.7]	35.3 [32.6, 38.1]	32.2 [29.7, 34.9]	32.9 [30.4, 35.6]	27.2 [25.0, 29.5]	<0.001
<i>Triplets and higher order multiples^d</i>	77.7 [60.7, 99.4]	84.5 [65.0, 109.8]	83.8 [62.6, 112.2]	129.4 [98.4, 170.3]	104.8 [79.0, 139.1]	96.0 [71.2, 129.4]	81.8 [59.0, 113.4]	0.23
Neonatal deaths^b	3.9 [3.7, 4.1]	3.7 [3.5, 3.8]	3.6 [3.4, 3.7]	3.7 [3.6, 3.9]	3.4 [3.3, 3.6]	3.5 [3.4, 3.7]	3.4 [3.3, 3.6]	..
Singletons	3.3 [3.2, 3.5]	3.1 [2.9, 3.2]	3.0 [2.9, 3.2]	3.1 [3.0, 3.2]	2.9 [2.7, 3.0]	2.9 [2.8, 3.0]	2.6 [2.5, 2.7]	<0.001
Multiples	23.2 [21.1, 25.5]	23.4 [21.3, 25.7]	20.6 [18.7, 22.8]	20.9 [18.9, 23.1]	20.1 [18.2, 22.2]	21.9 [19.9, 24.1]	20.0 [18.1, 22.0]	0.02
<i>Twins^d</i>	22.3 [20.2, 24.7]	23.0 [20.8, 25.4]	20.8 [18.7, 23.0]	19.8 [17.8, 22.0]	19.8 [17.9, 21.9]	21.6 [19.6, 23.8]	19.3 [17.5, 21.4]	0.02
<i>Triplets and higher order multiples^d</i>	67.3 [51.4, 88.0]	58.2 [42.2, 80.3]	39.4 [25.4, 61.1]	97.3 [70.2, 134.9]	71.3 [50.1, 101.3]	65.3 [45.1, 94.5]	78.9 [56.4, 110.4]	0.20

^a Rate per 1000 total births.

^b Rate per 1000 live births.

^c 2005 and 2006 stillbirths defined using the RCOG guidance³.

^d Rates and 95% CIs for England and Wales only.

Sources: CEMACH 2006 & 2007
ONS 2006
NI CHS 2006

Note: Total number of live births by multiplicity has been obtained from ONS and Northern Ireland Child Health System. There are 137 cases recorded by NI Child Health System and not by NI General Registrar Office, and so the rates have been calculated using an increased number of total live births to those stated in earlier tables in this report.

Chapter 2 Variations in mortality

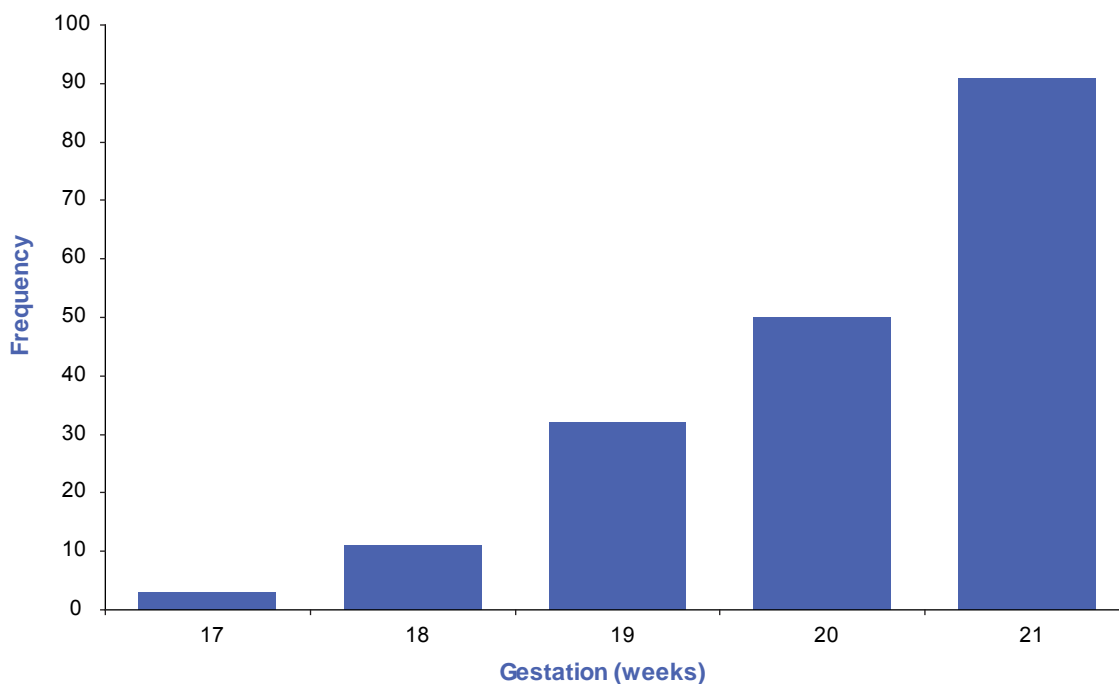
2.1 Variations in stillbirths, perinatal and neonatal deaths by Strategic Health Authority (SHA)

Using the postcode of the mother's residential address, stillbirth, perinatal and neonatal mortality rates are presented by NHS Strategic Health Authority (SHA) boundaries as applied during 2006 for England. Data used to create these figures are shown in Appendix B. The incidence of severe congenital anomalies varies between regions⁷ and removing these cases are likely to allow a more meaningful comparison between SHAs⁴. Last year's report presented crude mortality data. This year, the rates have been adjusted by removing all notified terminations of pregnancy and all lethal or severe malformations. Deaths with birth weight < 500g have also been removed as recommended by the new FIGO classification⁴. CEMACH perinatal mortality 2005⁸ also identified that 11% of the notified neonatal deaths had a gestation between 17 and 22 weeks. Adjustments for these deaths <22+0 weeks' gestation are also likely to allow a reduction in the variation between regions⁹ and a better evaluation of neonatal care. The mortality rates for 2006 are therefore presented excluding deaths of less than 22 weeks' gestation.

In 2006, 11.2% (187/1674) of early neonatal deaths with a reported gestation at delivery were in fetuses < 22 weeks' gestation. The earliest neonatal death reported to CEMACH was at 17 weeks' gestation. The number of these deaths increased at each additional week of gestation; over half (91) of those deaths of infants born below 22 weeks' occurred at 21 weeks' gestation (Figure 2.1). Figure 2.2 shows the regional variations in reporting these deaths. England reported proportionately fewer babies (10.0%) below 22 weeks' gestation than Wales (11.9%) and Northern Ireland (11.3%). Yorkshire and Humberside and London reported proportionally fewer babies (2.1%, 5.1% respectively) below 22 weeks' gestation than all other SHAs.

Figure 2.1

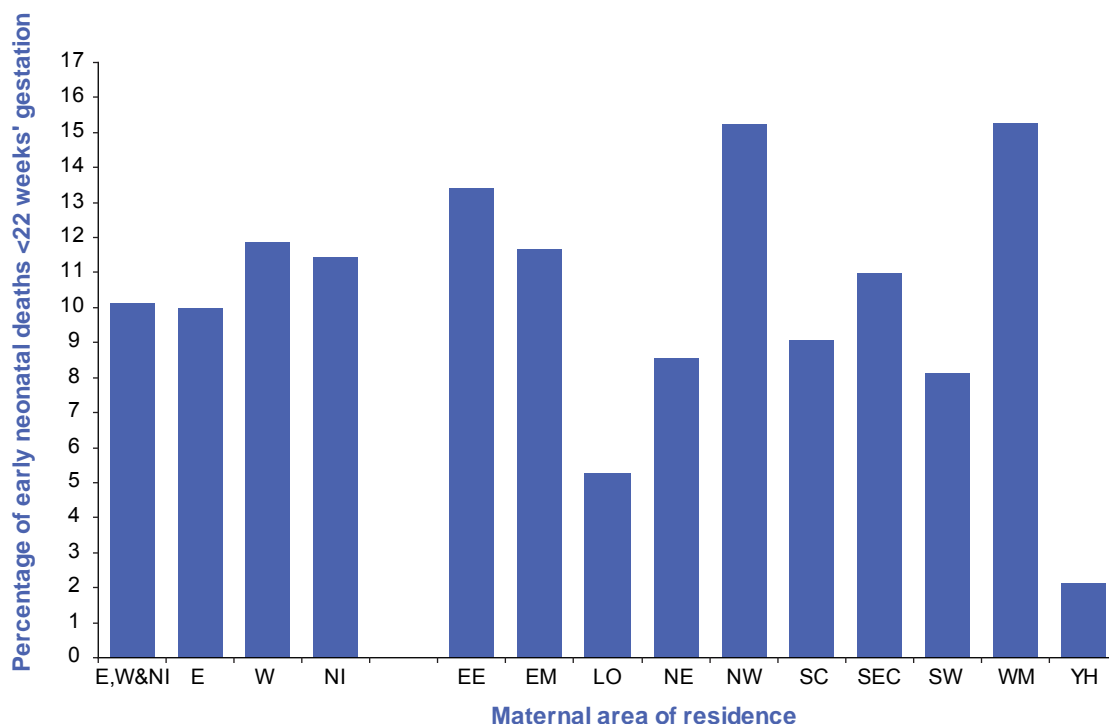
Distribution of early neonatal deaths delivered at less than 22 weeks' gestation; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007

Figure 2.2

Distribution of early neonatal deaths delivered at less than 22 weeks' gestation by SHA; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007

Note: The North West region includes cases from the Isle of Man and the South East Coast includes cases from the Channel Islands.

Stillbirth, perinatal and neonatal mortality rates are presented by NHS SHA boundaries as applied during 2006 for England (Figures 2.3, 2.4 & 2.5). Most of these variations are not significantly different. The adjusted stillbirth rate in London (4.7 per 1000 total births) was the highest and was statistically significantly higher than that observed in Northern Ireland, East of England, South East Coast and South West (Figure 2.3). The stillbirth rates in the East of England, South Central, South East Coast, South West and West Midlands were lower than that of the population of England, Wales and Northern Ireland as a whole but only East of England was statistically lower.

Figure 2.3

Adjusted stillbirth rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.



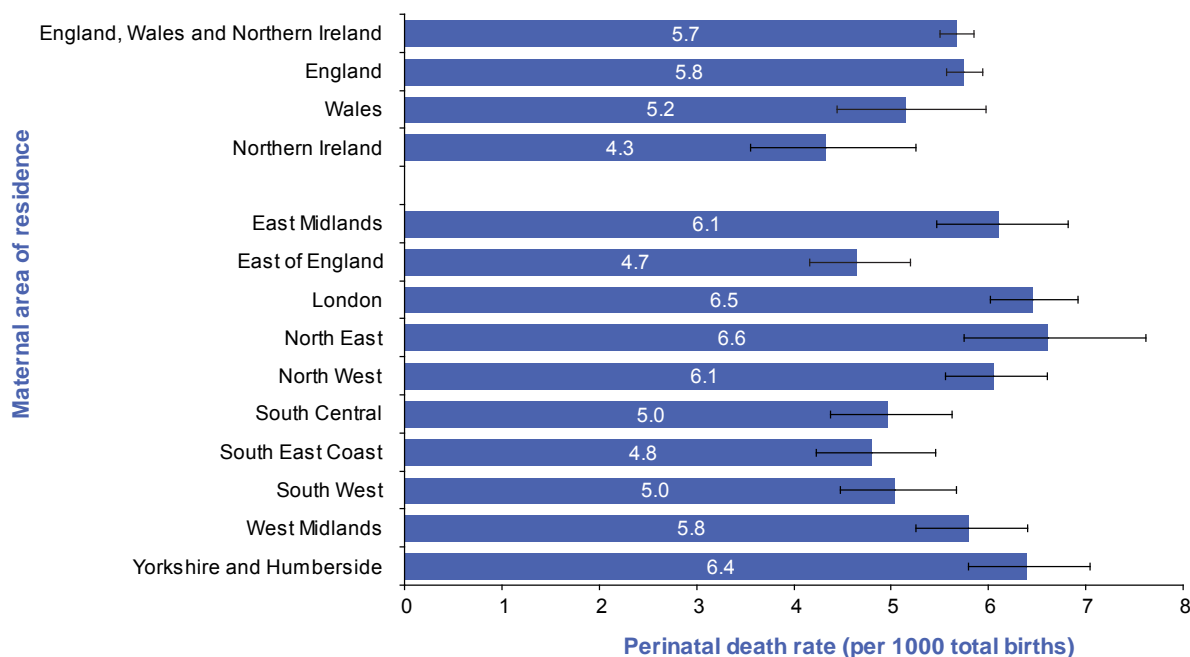
Sources: CEMACH 2006 & 2007, ONS 2006, NISRA-GRO 2006

Note: The North West region includes cases from the Isle of Man and the South East Coast includes cases from the Channel Islands. Also the rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figure 2.4 shows that the adjusted perinatal death rate in the North East (6.6 per 1000 total births) was the highest and was statistically significantly higher than that observed in Northern Ireland, East of England, South Central and South East Coast. The perinatal death rates in the East of England, South Central, South East Coast, and South West were lower than that of the population of England, Wales and Northern Ireland as a whole but only East of England is statistically lower.

Figure 2.4

Adjusted perinatal death rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.



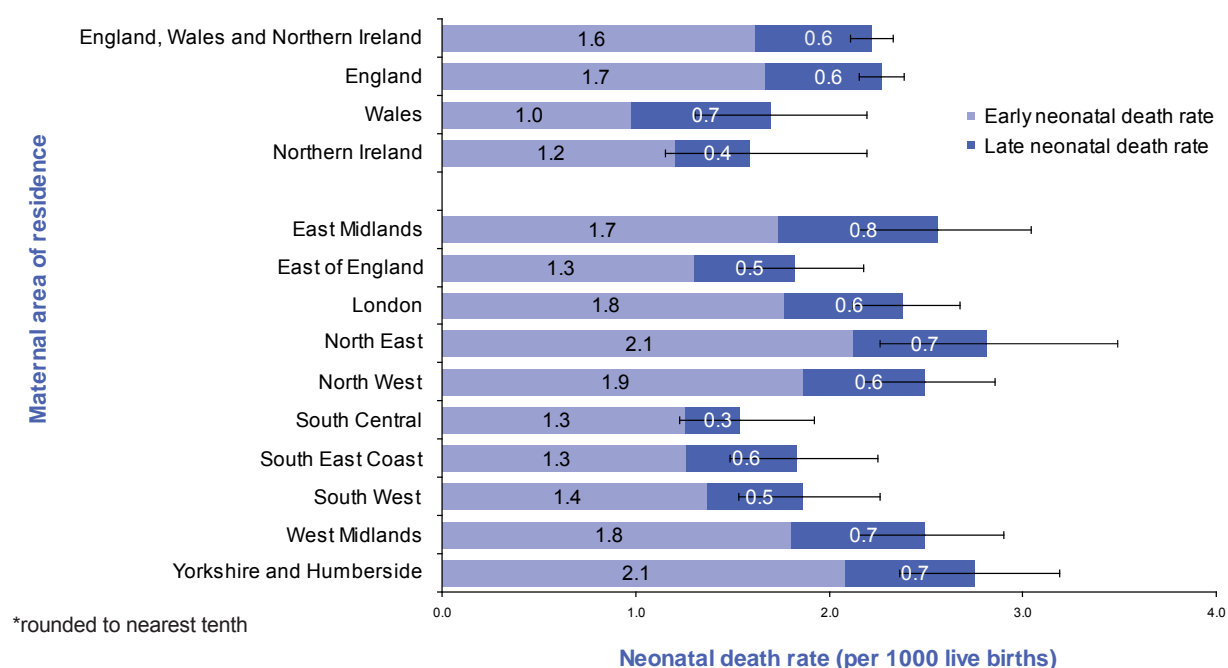
Sources: CEMACH 2006 & 2007, ONS 2006, NISRA-GRO 2006

Note: The North West region includes cases from the Isle of Man and the South East Coast includes cases from the Channel Islands. Also the rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figure 2.5 shows that the highest adjusted neonatal mortality rate was in the North East (2.8 per 1000 live births). This was statistically significantly higher than that observed in Wales, Northern Ireland, East of England and South Central. The lowest adjusted neonatal mortality rate was in the South Central area (1.5 per 1000 live births). This was statistically significantly lower than that observed in East Midlands, London, North East, North West, West Midlands and Yorkshire and Humberside. The early neonatal death rate ranged from 1.0 in Wales to 2.1 in the North East and Yorkshire and Humberside. The South Central area had the lowest late neonatal mortality rate at 0.3 per 1000 live births, whereas the highest late neonatal mortality rate of 0.8 per 1000 live births was in the East Midlands.

Figure 2.5

Adjusted early and late neonatal death rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.*



Sources: CEMACH 2006 & 2007, ONS 2006, NISRA-GRO 2006

Note: The North West region includes cases from the Isle of Man and the South East Coast includes cases from the Channel Islands. Also the rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

The mortality rates in 2006 are a step towards being able to understand regional variations better. This has been possible by removing the effect of a regional disparity in reporting deaths of non-viable infants and by taking into account regional variations in the incidence of severe/lethal congenital malformations. These results should nevertheless not be interpreted as direct indicators of the quality of care in one region compared to another. Other factors may influence outcomes such as: a) social and demographic factors; and b) random variation¹⁰. These issues may explain in part the high mortality rates in some regions known to have greater social deprivation and differences in ethnicity. In the future, CEMACH hopes to obtain appropriate Primary Care Trusts (PCTs) data on live births. This is likely to allow further demographic adjustments for mortality by region.

2.2 Variations in stillbirths, perinatal and neonatal deaths by NHS Trust

Stillbirth and neonatal mortality rates were presented only for NHS Trusts with 1000 live births or more in 2005. This year we have included seven more Trusts with live births <1000 a year. Mortality rate variations by Trust are presented in figures 2.7 to 2.12. These funnel plots show each individual Trust's mortality rate plotted against the total number of births in that Trust, the average mortality rate (solid line) and associated 95% confidence intervals (dotted lines). Each marker represents one Trust. If a Trust lies within the 95% confidence limits, it has a mortality rate that is statistically consistent with the average rate. If a Trust lies outside the 95% confidence limits, then it has a rate that is significantly different from the average rate. The further the point is outside the confidence limits, the less likely the rate is due to be by chance and the more likely it is to be truly different from the national average¹¹.

Crude mortality data for Trusts need to be interpreted carefully and adjusted for factors that make the population of one Trust different from another. Neonatal death notifications of < 22 weeks' gestation were adjusted in the 2005 CEMACH report⁸ to allow comparison between regions with different methods of reporting⁹ and a similar adjustment was made this year. Variation between Trusts may be linked to either:

- a) The incidence of severe and lethal congenital anomalies¹² and babies of extremely low birth weight (< 500g).
- b) The pattern of transfer in and out of a Trust (which to some extent may influence the case mix).
- c) The socio-demographic characteristics of the population served¹³.
- d) Random variation.

Compared to last year's report, when we presented crude mortality data, the rates have been adjusted by removing all notified terminations of pregnancy, all lethal malformations and by taking into account the deaths occurring because of the pattern of transfers between hospitals. Deaths with birth weight < 500g have also been removed to allow a more meaningful comparison between Trusts as recommended by the FIGO classification⁴. In analysing the 2006 data we have taken a step towards the exploration of variations in Trust specific mortality rates by removing the effect of local disparity in reporting deaths in non-viable infants and by taking into account local variations in the incidence of severe/lethal congenital malformations and numbers of extremely low birth weight infants. To start trying to address differences of pattern of transfer between hospitals, and therefore some of the differences in case mix, (i.e. bigger hospitals receiving severe cases more likely to die), stillbirths and neonatal deaths where the mothers had booked for antenatal care at the Trust were separated from those deaths where the mothers booked elsewhere but the deaths occurred at the Trust.

Mortality rate variations between Trusts should nevertheless still not be interpreted as direct indicators of the quality of care in one hospital compared to another. There remain demographic differences between the populations served by individual hospitals and bias introduced in the pattern of booking: for example women with a poor obstetric history are more likely to have a baby that will die in this pregnancy and to be transferred for booking at a larger hospital. Adjustments for socio-demographic factors are not yet possible because of the lack of appropriate denominator data. It may be possible in future years to enhance further the understanding of these variations by using information generated by the PCTs supporting each hospital.

Regarding neonatal mortality, the UK Neonatal Staffing Study¹⁴ reported that "crude mortality rates were significantly higher in high volume neonatal units but that following risk-adjustment, the observed mortality by patient volume was not significantly different to that expected given the illness severity of their populations". It is one of the aims of the annual CEMACH mortality surveillance system to follow these principles by giving feedback to individual Trusts in the context of their region and Network. Case mix or chance does not entirely explain variations in outcome¹⁵. Information about clinical variables that can predict the severity of the illness of each individual baby may be required to determine the expected number of deaths at each unit for future comparisons. Adjustment using disease severity such as the Clinical Risk Index for Babies (CRIB) score² are

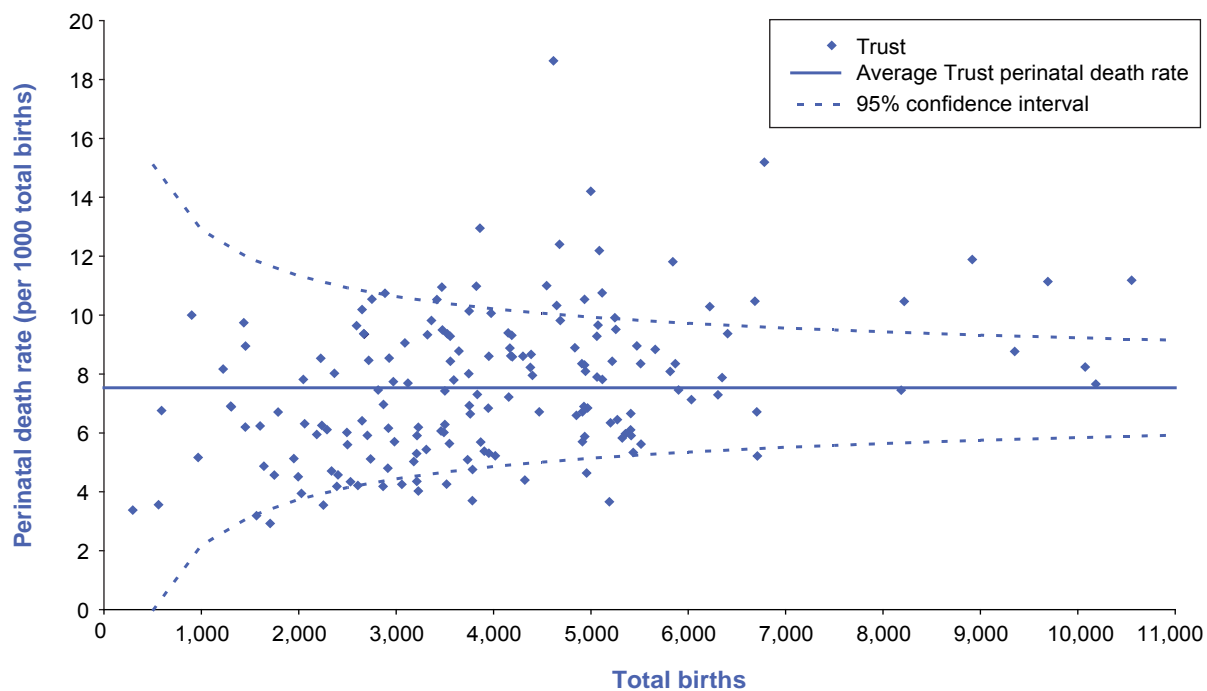
well validated and widely used¹². Data needed for the CRIB score may be difficult to capture for surveillance purposes because of the amount of information required¹¹. CEMACH has successfully used simple measures of illness severity for adjustment in a previous study by using the baby's sex, birth weight and clinical condition within five minutes of birth^{6, 11}. The fields required will be added to the notification forms from 2008 and should allow better case mix adjustment in the future.

At present, the current adjusted-mortality rates should nevertheless allow organisations to compare their mortality rates with those of other organisations in a more meaningful way than in previous reports⁸. CEMACH will analyse the Trusts separately for tertiary and non-tertiary centres for future reports.

The CEMACH Report for 2005⁸ showed variations in crude perinatal mortality rates between Trusts. For 2006, crude perinatal mortality shows a very similar pattern of variation as in 2005 (Figure 2.6).

Figure 2.6

Crude perinatal death rates by Trust against average Trust perinatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007

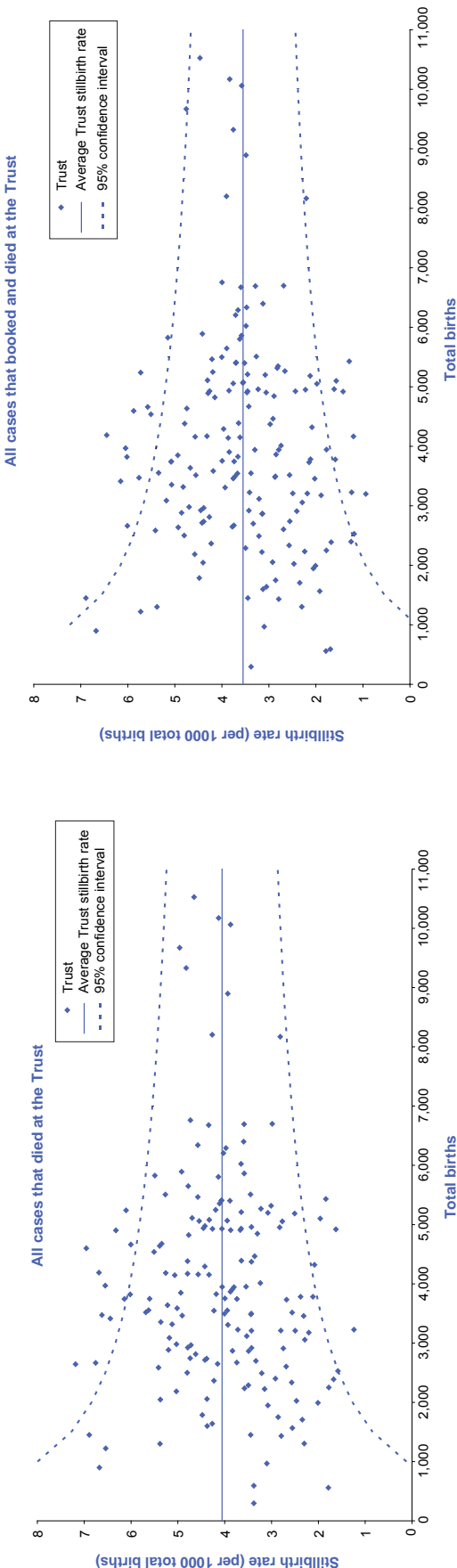
Figures 2.7 to 2.12 show the adjusted stillbirths, perinatal and neonatal mortality rates by Trusts in England, Wales and Northern Ireland in 2006. For each of these, two funnel plots are displayed:

- i) the first includes all cases that died in each Trust which will include cases that transferred in, and
- ii) the second includes only those cases that booked and died within a specific Trust.

These funnel plots seem to illustrate three points:

- a. The adjustments mentioned above seem to have moved some of the outliers into the 95% confidence interval.
- b. The average Trusts' death rate changes after adjustment:
 - i. cases that booked and died within a specific Trust have a lower mean death rate than all cases that died within a Trust and
 - ii. transfers in have a higher mortality rate which affects the overall mean.
- c. There seems to be a moderate effect on the pattern of adjusted mortality when taking into consideration deaths occurring inside and outside of a specific Trust with regards to stillbirths' rates but a marked effect for perinatal and neonatal mortality rates. From next year we will be collecting information on admission to neonatal units from the denominator request forms sent to each Trust. This will allow us to stratify the data more accurately by neonatal units profile and activity rather than the current self-reported unit level system.

Figures 2.7 and 2.8
Adjusted stillbirth rates by Trust against average Trust stillbirth rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.

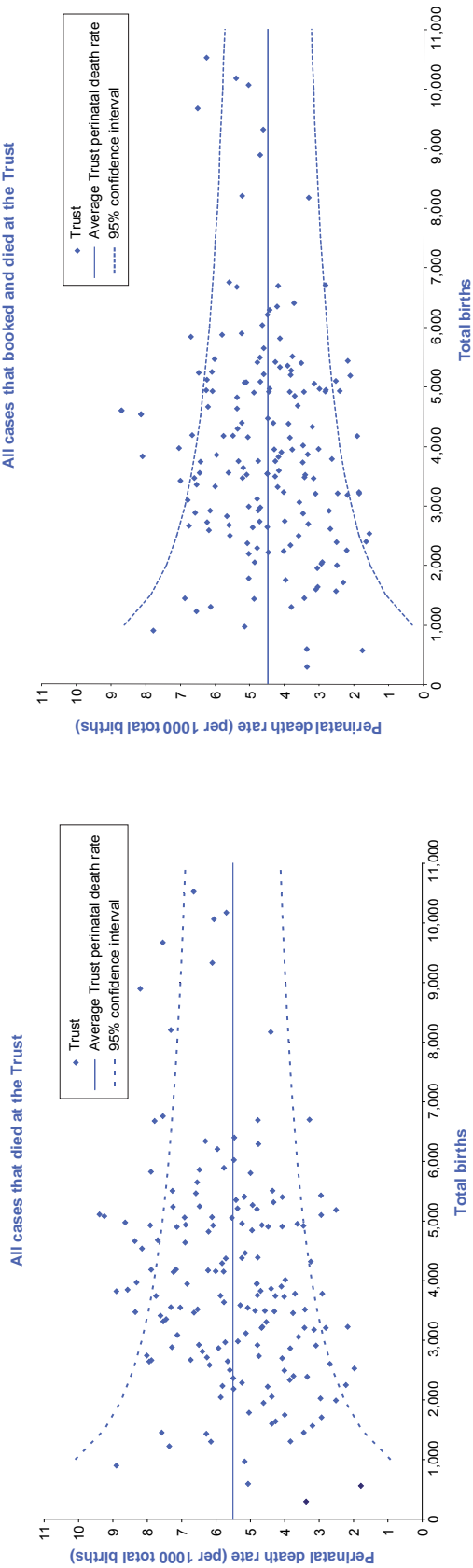


Sources: CEMACH 2006 & 2007

Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figures 2.9 and 2.10

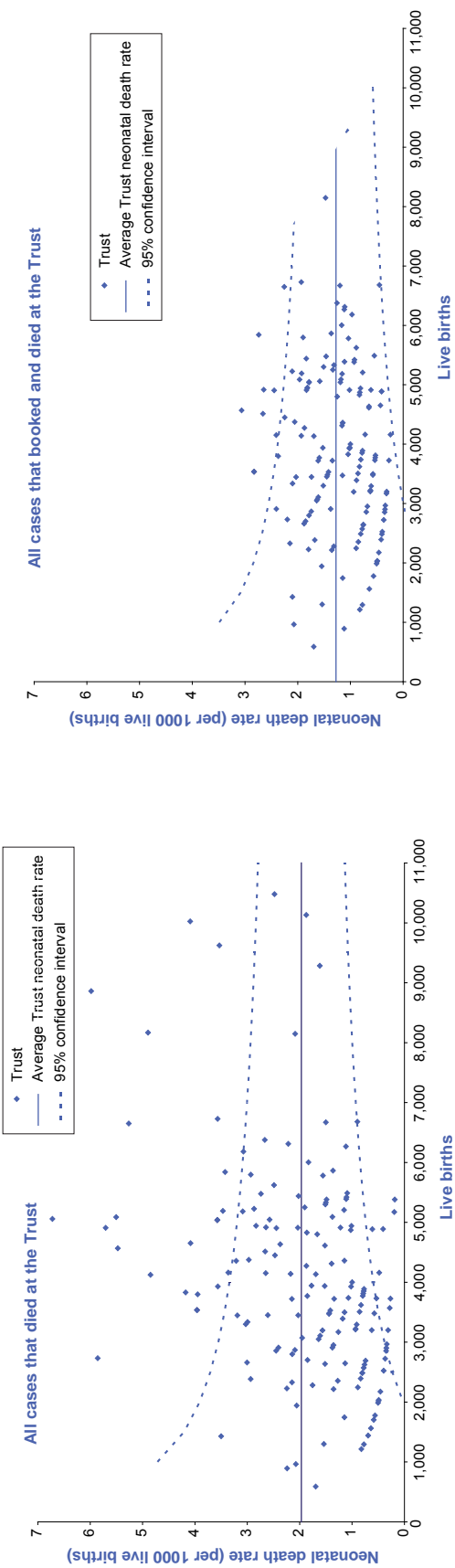
Adjusted perinatal death rates by Trust against average Trust perinatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007

Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figures 2.11 and 2.12
Adjusted neonatal death rates by Trust against average Trust neonatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007
Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

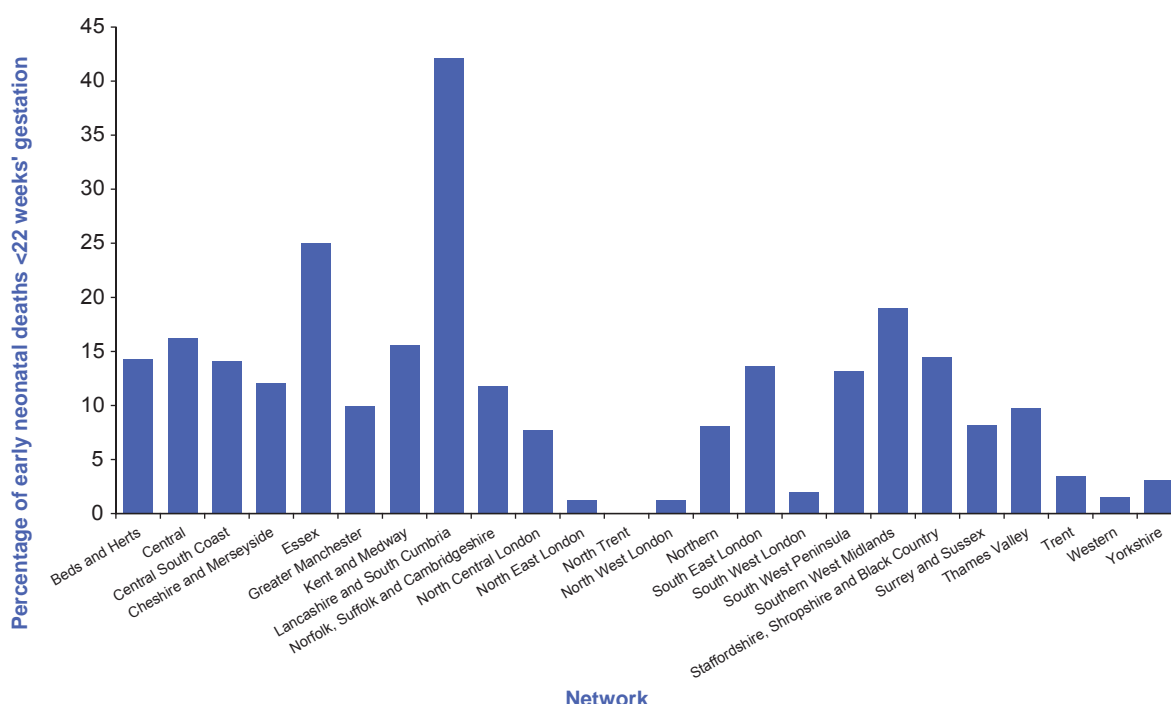
2.3 Variations in stillbirths, perinatal and neonatal deaths by Neonatal Networks

The UK neonatal staffing study 2000¹⁴ indicated that “infants in the UK have an equal chance of survival irrespective of the type of unit in which they were born”. The study also concluded that “transfer arrangements suggest that hierarchical networks of care are already operating where infants are transferred to other larger or even tertiary units according to their illness severity”. However, a national project by the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI) that looked at standards of care of premature babies at 27 and 28 weeks’ gestation, highlighted deficiencies in the organisation of national perinatal services^{17,18}, including problems related to transfer arrangements. Managed clinical Neonatal Networks with different types of neonatal units, working together to deliver perinatal care to a defined geographical area with a shared referral pattern were implemented recently in England. These Networks are still in their infancy and have never been audited before on a national basis. It would be useful to monitor the potential success of the implementation of Neonatal Networks¹⁹. CEMACH is reporting this year on adjusted mortality by Neonatal Networks in England.

Adjustment for neonatal death notifications of < 22 weeks’ gestation had already been made in the 2005 CEMACH report⁸ to allow comparison between regions with different methods of reporting⁹. As described above for mortality rates by SHAs, there were also marked variations in the way these neonatal deaths were reported to CEMACH in different Neonatal Networks. Figure 2.13 shows how different the reporting is between the Networks: from over 40% of early neonatal deaths being less than 22 weeks’ gestation in Lancashire and South Cumbria Neonatal Network to none in North Trent Neonatal Network.

Figure 2.13

Distribution of early neonatal deaths delivered at less than 22 weeks’ gestation by Network; England: 2006.



Sources: CEMACH 2006 & 2007

Note: After completion of the final dataset, additional data was identified to CEMACH from the South West London Neonatal Network. Therefore, the proportion for that Network may be underestimated.

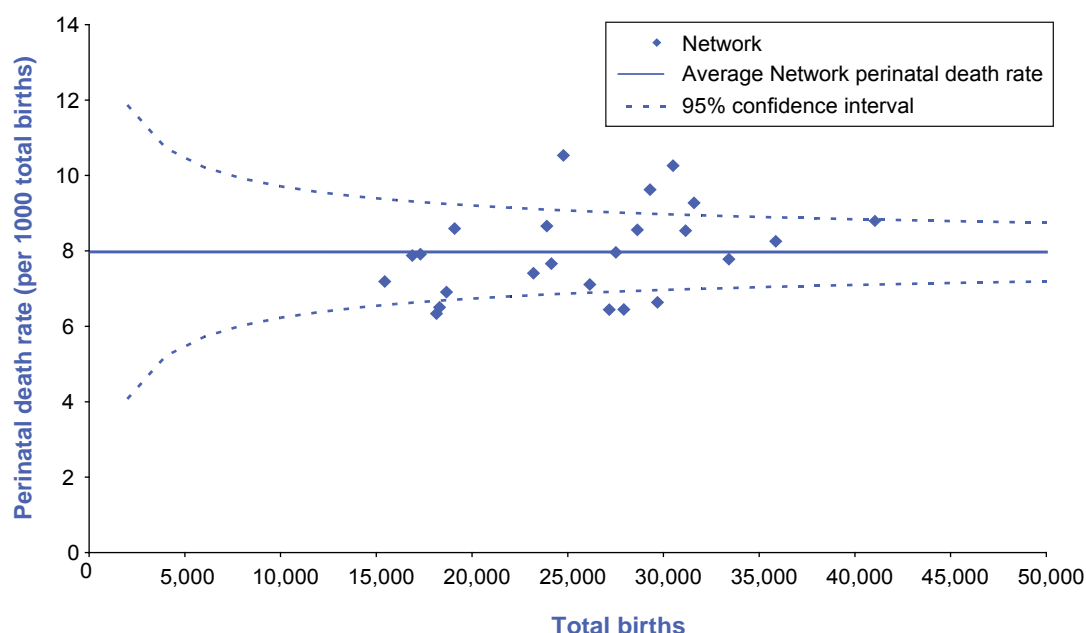
We do not know whether these large variations of local practice in the reporting of neonatal deaths to CEMACH below 22 weeks’ gestation are also reflected in local variations of practice in registration of deaths. This is not a straightforward area. While babies born at below 22 weeks’ gestation are usually considered non-viable,

they can nevertheless show signs of life. Differences in practice with regard to death registration in these circumstances could have a number of consequences. Infant mortality rates, an area included in government targets, can be distorted. There can also be implications for families, registration authorities and, potentially, Coroners. This suggests that it may be appropriate to, first of all, identify whether the differences in reporting practice to CEMACH are also reflected in differences in local registration practice. If they are, it may be beneficial for the appropriate authorities to develop further guidance in this area with a view to achieving greater clarity and consistency.

CEMACH report 2005⁸ showed variations in crude perinatal mortality rates between Neonatal Networks recently established in England. This year crude perinatal mortality shows the same pattern of variation (Figure 2.14) as last year.

Figure 2.14

Crude perinatal death rates by Network against average Network perinatal death rate and associated 95% confidence intervals; England: 2006.



Sources: CEMACH 2006 & 2007

Crude mortality for Neonatal Networks should not need to be adjusted for case mix, as each Network should deal with all levels of complexity. Variation may, however, be linked to either a) the socio demographic characteristics of the population served¹³, b) the pattern of transfer in and out of a Network (which to some extent may influence the case mix) and c) the incidence of severe and lethal congenital anomalies¹². Compared to last year's report, which presented crude mortality data, the rates have now been adjusted by removing all notified terminations of pregnancy, all lethal malformations and by taking into account the deaths occurring inside and outside each Network. Deaths with birth weight < 500g have also been removed to allow a more meaningful comparison between Networks as recommended by the FIGO classification⁴. The mortality rates presented in 2006 are a step towards exploring Neonatal Networks' mortality rate variations by removing the effect of a local variation in reporting deaths in non-viable infants and by taking into account local variations in the incidence of severe/ lethal congenital malformations and extremely low birth weight infants. We have also taken account of deaths occurring inside and outside a specific Network by looking at a) stillbirths and neonatal deaths occurring in the same Network where the mothers had booked for antenatal care and b) stillbirths and neonatal deaths where the mothers booked in a different Network from where the death occurred.

Mortality rate variations between Networks should nevertheless still not be interpreted as direct indicators of the quality of care in one Network compared to another. Adjustments for socio-demographic factors are not yet possible because of the lack of denominator data for these factors. It may be possible in future years to enhance further the understanding of these variations by using information generated by the PCTs supporting each Network.

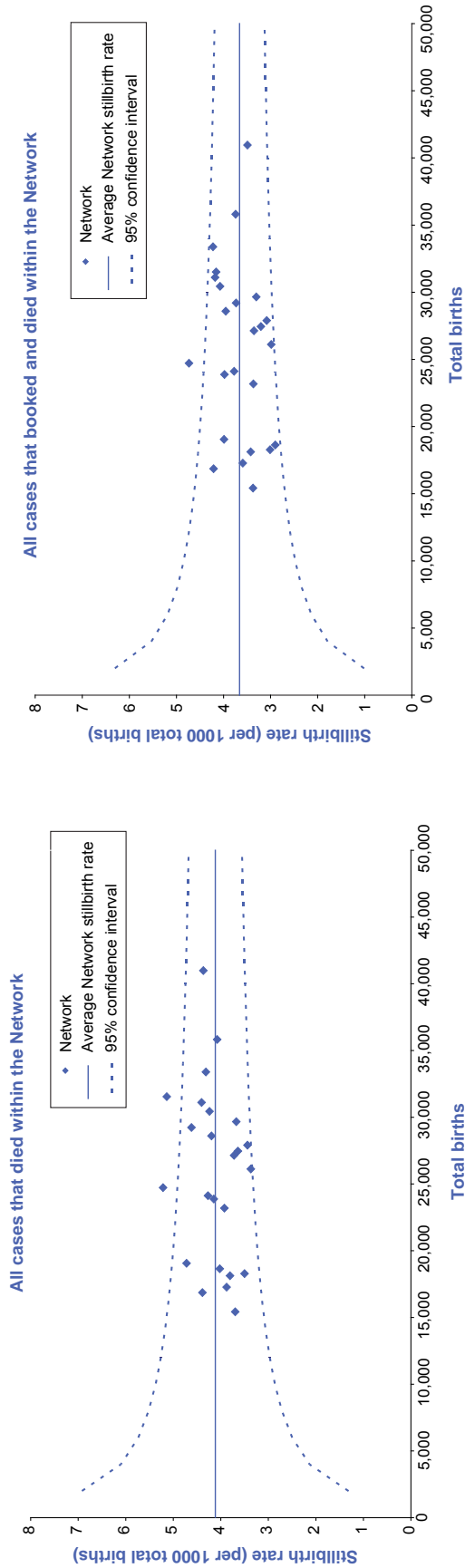
Figures 2.15 to 2.20 show the adjusted stillbirths, perinatal and neonatal mortality rates. For each of these, two funnel plots are displayed:

- i. the first one includes all cases that died in a Network including out of Network transfers, and
- ii. the second one includes only those cases that booked and died within a Network.

These funnel plots illustrate three points:

- a. The adjustments mentioned above seem to have moved some of the outliers into the 95% confidence interval.
- b. The average Network's death rate changes after adjustment:
 - i. cases that booked and died within a specific Network have a lower mean death rate than all cases that died within a network and
 - ii. transfers in from another Network have a higher mortality rate which affects the overall mean.
- c. There seems to be a moderate effect on the pattern of adjusted mortality when taking into consideration deaths occurring inside and outside of a specific Network with regards to stillbirths rates but a more marked effect for perinatal (base rate of 4.9/1000 versus 5.7/1000) and neonatal mortality rates (base rate of 1.6/1000 versus 2.1/1000).

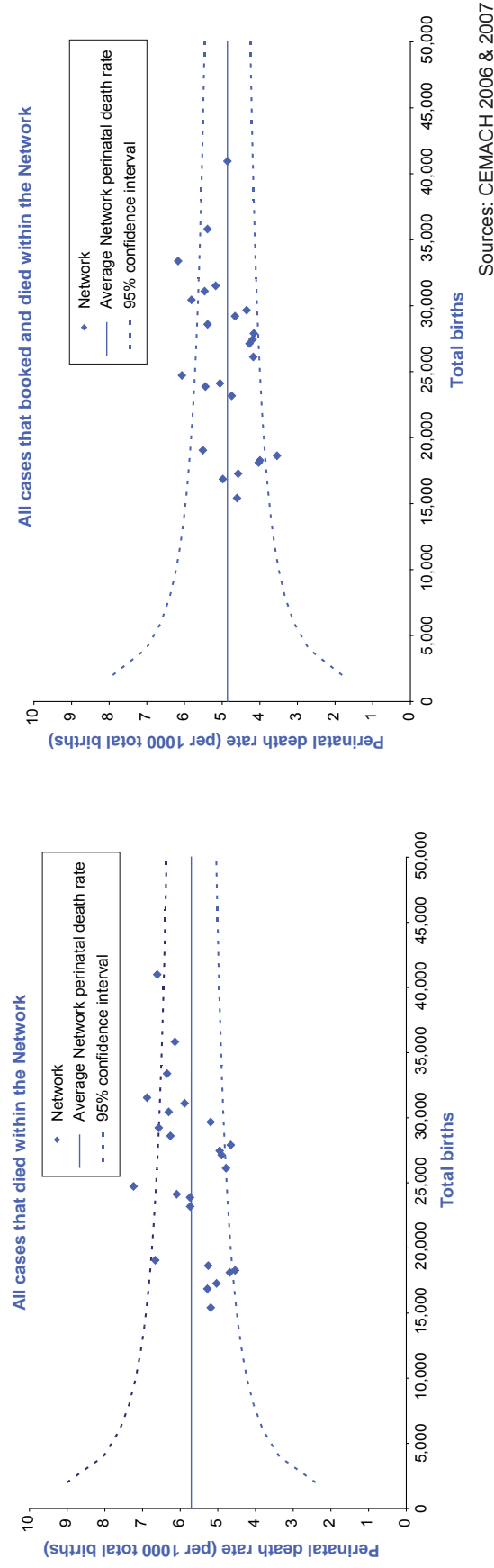
Figures 2.15 and 2.16
Adjusted stillbirth rates by Network against average Network stillbirth rate and associated 95% confidence intervals; England: 2006.



Sources: CEMACH 2006 & 2007

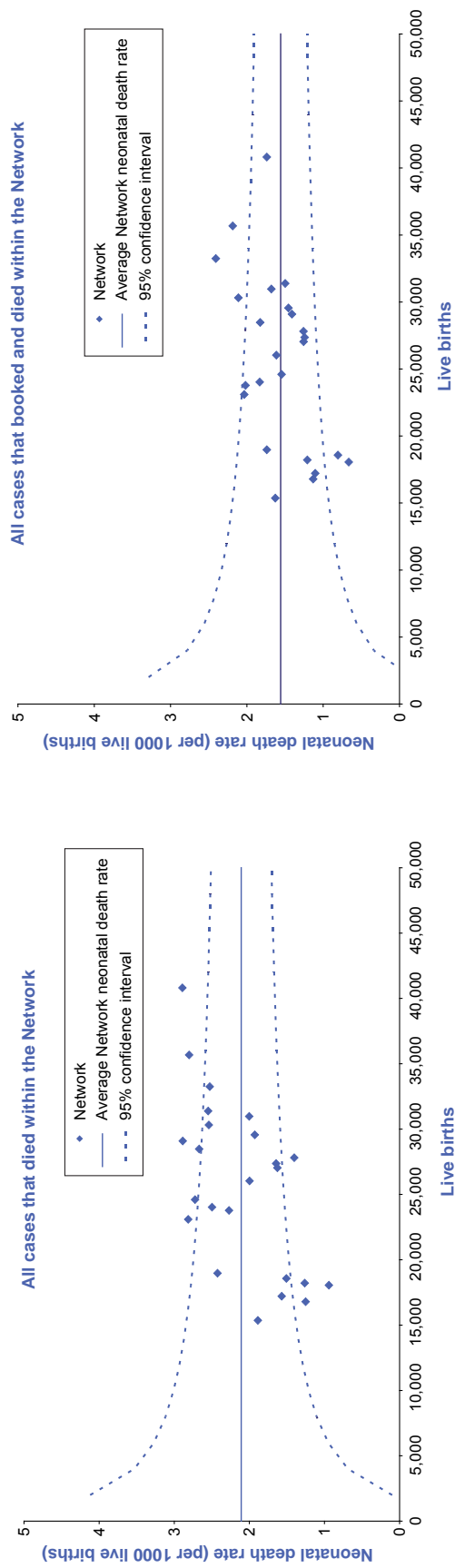
Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figures 2.17 and 2.18
Adjusted perinatal death rates by Network against average Network perinatal death rate and associated 95% confidence intervals; England: 2006.



Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Figures 2.19 and 2.20
Adjusted neonatal death rates by Network against average Network neonatal death rate and associated 95% confidence intervals; England: 2006.



Sources: CEMACH 2006 & 2007

Note: The rates have been adjusted by removing all terminations of pregnancy, all lethal malformations, all babies <22 weeks' gestation and all babies with birth weight below 500g.

Chapter 3 Maternal and neonatal risk factors for stillbirths, perinatal and neonatal deaths

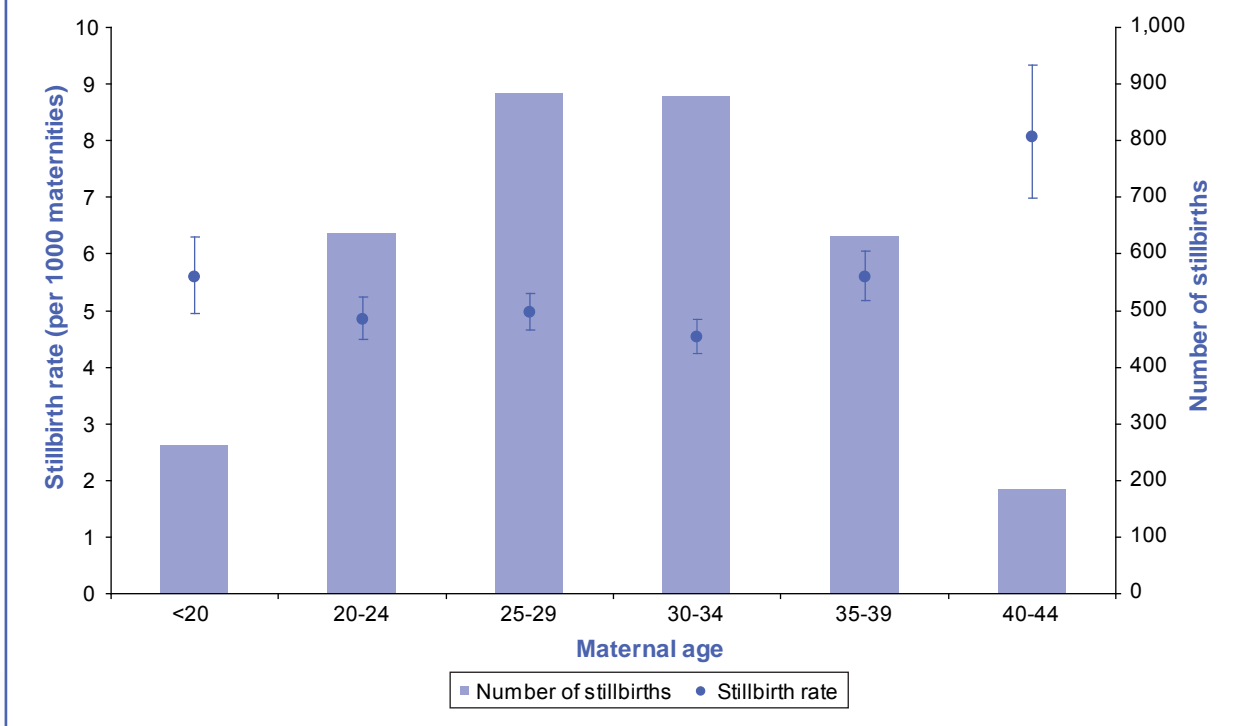
3.1 Maternal risk factors

3.1.1 Age

During 2006, the youngest mother with a perinatal death was aged 13 and the oldest was 54. The median maternal age was 29, interquartile range (IQR) [24-34]. The effect of maternal age on perinatal deaths is described by a U-shaped curve with the highest death rates in very young and older mothers, although the highest mortality rate is for babies with mothers in their teens²⁰. This is not shown in the 2006 CEMACH data: figures 3.1 to 3.3 show that stillbirths, perinatal and neonatal death rates are highest in the 40-44 years age group. The stillbirth and perinatal death rates for this age group are statistically significantly higher than all others. Figures 3.1 to 3.3 also show that even though the age groups 25-29 and 30-34 years are more represented than the other age groups, because they are also more represented in the general maternity population, they have lower rates of stillbirths, perinatal and neonatal deaths. Appendix C shows that mothers aged less than 20 and above 40 had the highest rates of stillbirth (5.6 and 8.1 per 1000 total births respectively), the highest rates of perinatal deaths (8.3 and 11.7 per 1000 total births respectively) and the highest rates of neonatal deaths (3.7 and 4.5 per 1000 live births respectively). The lowest perinatal mortality rate was observed in mothers aged between 30 and 34 years (6.5 per 1000) (Figure 3.2 and Appendix C). These are nevertheless crude data that are not adjusted for factors that may influence these results such as the possible effect of social deprivation.

Figure 3.1

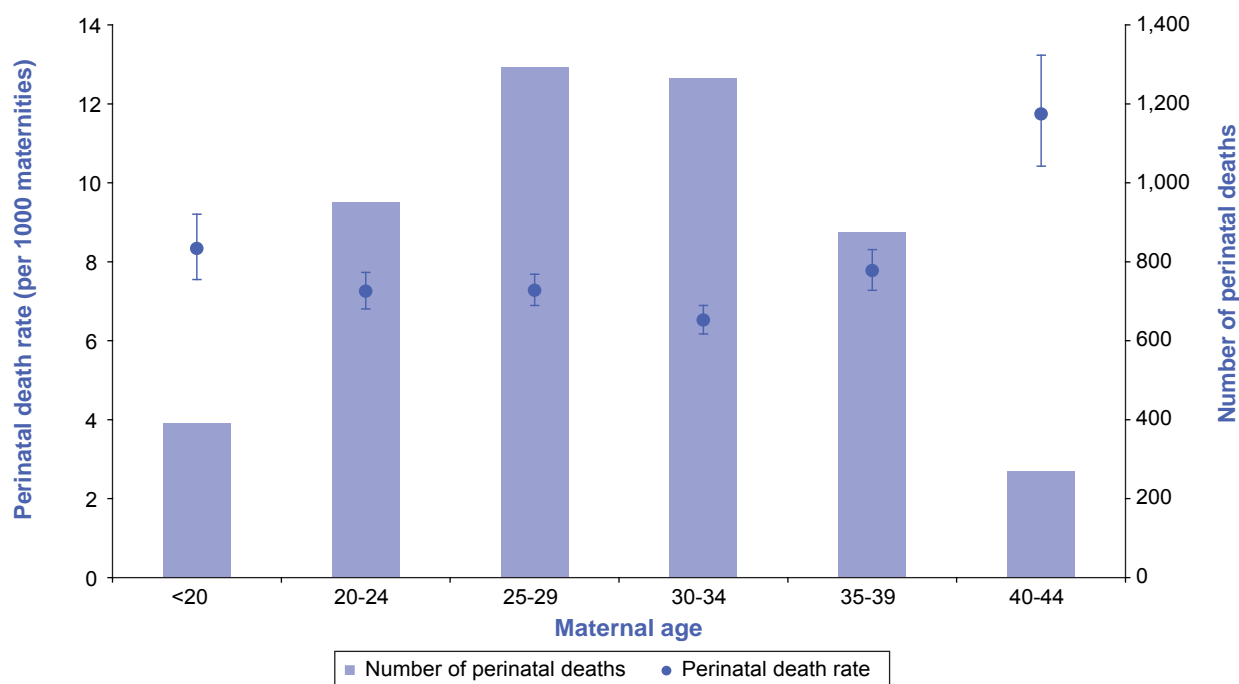
Age specific stillbirth rates; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

Figure 3.2

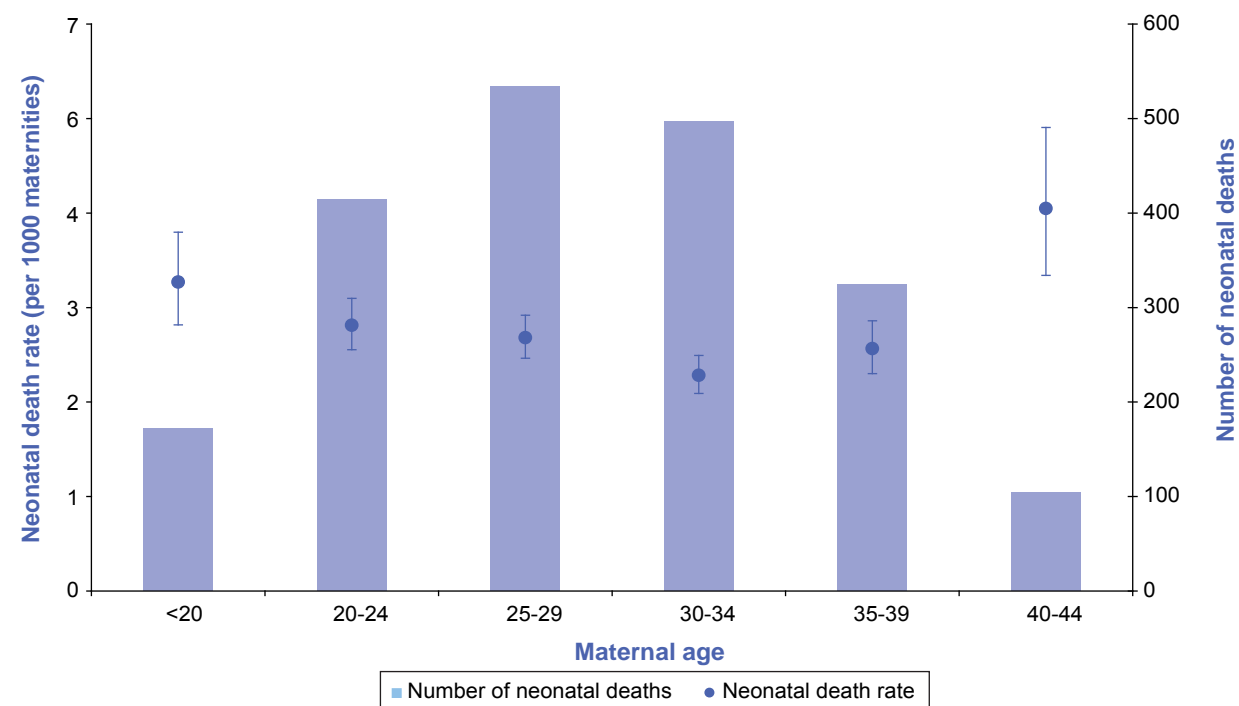
Age specific perinatal death rates; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

Figure 3.3

Age specific neonatal death rates; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

3.1.2 Body mass index (BMI)

The Health Survey for England, Department of Health report, “Forecasting obesity in 2010”²¹ observed that 23% of women over the age of 16 were obese (BMI > 30) in 2003. There are recent published data on obesity by different women’s age group in England in 2003²¹ that shows a significant increase in obesity amongst this population in recent years. One regional UK study showed an increasing incidence of maternal obesity (9.9% to 16% between 1990 and 2004) in Middlesbrough, UK²². In CEMACH’s 2006 dataset, of the women who had a stillbirth and a recorded BMI, 26% (761/2924) were obese (BMI >30), and for neonatal deaths, 22% (356/1609) were obese (Table 3.1). Unfortunately, there are no national denominator data available for mortality amongst obese pregnant women that would allow information that is more definitive. CEMACH has commenced work on a project on obesity in pregnancy that will soon provide demographic and clinical information on a sample of women with obesity in pregnancy delivering in the UK.

Table 3.1

Percentage distribution of stillbirths, perinatal and neonatal deaths and rates by mother’s BMI; England, Wales and Northern Ireland: 2006.

Body Mass Index (BMI)	Stillbirths		Perinatal deaths		Neonatal deaths	
	Number	%	Number	%	Number	%
Total	3,493	..	5,075	..	2,070	..
<18.5	80	2.7	127	3.0	58	3.6
18.5-24.9	1,273	43.5	1,820	43.5	724	45.0
25-29.9	810	27.7	1,197	28.6	471	29.3
30+	761	26.0	1,040	24.9	356	22.1
Missing	569	..	891	..	461	..

Note 1: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007

Note 2: Second or subsequent deaths from pregnancies with multiple losses excluded from this table.

3.1.3 Social deprivation

The relationship between perinatal deaths and social deprivation was explored by the application of an Index of Multiple Deprivation score²³, a measure of deprivation at the small area level (see Appendix D – Methodology, section v.iii). Just over one third of all stillbirths and neonatal deaths were born to mothers resident in the most deprived quintile (compared with the expected 20%). Social deprivation-specific mortality rates were calculated for England using maternity denominators from ONS. Stillbirth and neonatal mortality rates for mothers resident in the most deprived area were both 1.7 [95% CI for stillbirths: 0.5, 6.2, and neonatal deaths: 0.3, 8.8] times higher when compared with rates in the least deprived area (Table 3.2). This appears to substantiate previous work showing that deprivation is associated with adverse perinatal outcome²⁴. For future reports, CEMACH proposes looking at individual level occupation and social class data by linkage with registration data collected by the ONS for England and Wales and the Northern Ireland GRO.

Table 3.2

Stillbirth, perinatal and neonatal deaths and rates by quintiles of deprivation; England: 2006.

Quintiles of deprivation	Maternities	Stillbirths		Perinatal deaths		Neonatal deaths	
		Number	Rate [95% CI] ^a	Number	Rate [95% CI] ^a	Number	Rate [95% CI] ^a
Total	629,364	3,245	5.2 [5.0, 5.3]	4,708	7.5 [7.3, 7.7]	1,913	3.0 [2.9, 3.2]
1 (least deprived)	101,515	372	3.7 [3.3, 4.1]	539	5.3 [4.9, 5.8]	226	2.2 [2.0, 2.5]
2	103,969	418	4.0 [3.7, 4.4]	640	6.2 [5.7, 6.7]	276	2.7 [2.4, 3.0]
3	114,363	554	4.8 [4.5, 5.3]	783	6.8 [6.4, 7.3]	292	2.6 [2.3, 2.9]
4	135,005	758	5.6 [5.2, 6.0]	1,069	7.9 [7.5, 8.4]	424	3.1 [2.9, 3.5]
5 (most deprived)	174,486	1,108	6.4 [6.0, 6.7]	1,622	9.3 [8.9, 9.8]	668	3.8 [3.5, 4.1]
Missing	..	35	..	55	..	27	..

^a Rate per 1000 maternities.Sources: CEMACH 2006 & 2007
ONS 2006

Note: Second or subsequent deaths from pregnancies with multiple losses excluded from this table.

3.1.4 Ethnicity

CEMACH collected self-reported maternal ethnicity in order to explore the association between ethnicity and perinatal death. The breakdown of maternal ethnicity for all reported stillbirths and neonatal deaths is shown in Table 3.3. The calculation of ethnic-specific mortality rates is hindered by the fact that neither registration statistics for England and Wales nor those for Northern Ireland collect information on maternal ethnicity. We have attempted however to estimate rates using the information on maternal ethnicity collected in England as part of the maternity tail of the Hospital Episodes Statistics (HES)²⁵ as described in the 'Methodology' (Appendix D). There are limitations with doing this, for example, HES's coverage of hospital deliveries is incomplete with only 74% of units submitting data for the period 2005-06 and the data are for finished delivery episodes²⁶. The resulting rates should therefore be considered as approximate only. Within the limits of the methodology used, estimated maternal ethnic-specific mortality rates (Table 3.3) show significantly higher stillbirth, perinatal and neonatal death rates for women of Black ethnicity (2.3, 2.2 and 2.0 times higher respectively for 2005 and 2.4, 2.4 and 2.2 times higher respectively for 2006), Asian ethnicity (2.1, 2.0 and 1.8 times higher respectively for 2005 and 2.0, 1.9 and 1.8 times higher respectively for 2006) when compared with those for women of White ethnicity.

Table 3.3

Stillbirth, perinatal and neonatal death rates by ethnicity: England: 2006.

Ethnicity	2005					2006				
	Maternities	Stillbirth rate [95% CI] ^a	Perinatal death rate [95% CI] ^a	Neonatal death rate [95% CI] ^a	Maternities	Stillbirth rate [95% CI] ^a	Perinatal death rate [95% CI] ^a	Neonatal death rate [95% CI] ^a		
Total	607,089	5.0 [4.8, 5.2]	7.2 [7.0, 7.4]	2.9 [2.7, 3.0]	629,339	5.2 [5.0, 5.3]	7.5 [7.3, 7.7]	3.0 [2.9, 3.2]		
White	494,718	4.2 [4.0, 4.4]	6.1 [5.9, 6.3]	2.5 [2.3, 2.6]	506,844	4.3 [4.2, 4.5]	6.3 [6.1, 6.6]	2.6 [2.5, 2.7]		
Black	31,661	9.8 [8.8, 11.0]	13.5 [12.3, 14.8]	4.9 [4.2, 5.8]	34,518	10.5 [9.4, 11.6]	14.9 [13.7, 16.3]	5.8 [5.0, 6.7]		
<i>Black African</i>	18,425	11.1 [9.7, 12.8]	14.6 [13.0, 16.5]	4.3 [3.5, 5.4]	20,761	12.0 [10.6, 13.6]	17.0 [15.3, 18.9]	6.4 [5.4, 7.5]		
<i>Black Caribbean</i>	7,085	11.7 [9.4, 14.5]	18.3 [15.5, 21.8]	9.5 [7.4, 12.0]	7,179	13.4 [10.9, 16.3]	19.2 [16.3, 22.7]	7.8 [6.0, 10.1]		
<i>Black Other</i>	6,151	3.7 [2.5, 5.6]	4.6 [3.1, 6.6]	1.5 [0.8, 2.8]	6,578	2.4 [1.5, 4.0]	3.8 [2.6, 5.6]	1.8 [1.0, 3.2]		
Asian	48,253	8.9 [8.1, 9.8]	12.3 [11.4, 13.4]	4.4 [3.9, 5.0]	50,473	8.5 [7.8, 9.4]	12.1 [11.2, 13.1]	4.7 [4.2, 5.4]		
<i>Indian</i>	15,862	8.3 [7.0, 9.8]	11.7 [10.1, 13.5]	4.2 [3.3, 5.4]	16,940	8.9 [7.6, 10.5]	11.7 [10.2, 13.5]	4.1 [3.3, 5.2]		
<i>Pakistani</i>	23,663	10.4 [9.2, 11.8]	14.5 [13.1, 16.2]	5.5 [4.6, 6.5]	24,331	9.5 [8.3, 10.8]	13.9 [12.5, 15.5]	5.8 [4.9, 6.8]		
<i>Bangladeshi</i>	8,728	6.2 [4.7, 8.1]	7.6 [5.9, 9.6]	1.9 [1.2, 3.1]	9,202	5.3 [4.0, 7.0]	8.0 [6.4, 10.1]	3.0 [2.1, 4.4]		
Chinese	2,753	3.3 [1.7, 6.3]	5.4 [3.3, 9.0]	2.9 [1.5, 5.8]	3,190	2.8 [1.5, 5.4]	5.3 [3.3, 8.6]	2.8 [1.5, 5.4]		
Mixed	7,429	5.5 [4.1, 7.5]	8.1 [6.3, 10.4]	3.2 [2.2, 4.8]	8,657	5.1 [3.8, 6.8]	6.9 [5.4, 8.9]	2.5 [1.7, 3.9]		
Other	22,275	5.7 [4.8, 6.7]	7.7 [6.6, 9.0]	2.8 [2.2, 3.6]	25,657	6.1 [5.2, 7.2]	8.4 [7.3, 9.6]	3.2 [2.6, 4.0]		

^a Rates per 1000 maternities.

Sources: CEMACH 2005-2007
ONS 2005 & 2006
HES 2005-2007

Note 1: Proportions of delivery episodes within each ethnic group from HES are applied to maternities from ONS to estimate the number of maternities within each group.
Note 2: Second or subsequent deaths from pregnancies with multiple losses excluded from this table.

3.2 Neonatal risk factors

3.2.1 Gestational age

As expected, death rates decrease dramatically with increasing gestational age and just under three-quarters (77%) of neonatal deaths and two-thirds (67%) of stillbirths were born preterm (Table 3.4). To calculate the rates in Table 3.4 the proportions from the 2005 data from the ONS Health Statistics Quarterly publication²⁷ have been used and applied to the live birth figure for 2006.

Table 3.4

Stillbirth, perinatal and neonatal deaths and rates by gestational age; England, Wales and Northern Ireland: 2006.

Gestation	Live births	Stillbirths			Perinatal deaths			Neonatal deaths		
		Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^b
Total	693,505	3,692	5.3	[5.1, 5.5]	5,531	7.9	[7.7, 8.1]	2,380	3.4	[3.3, 3.6]
<24	699	..	..		590	843.7	[778.3, 914.6]	628	898.1	[830.5, 971.1]
24	507	289	362.9	[323.3, 407.2]	446	560.0	[510.3, 614.4]	227	447.3	[392.8, 509.5]
25	545	248	312.9	[276.3, 354.4]	340	429.0	[385.7, 477.1]	146	268.1	[227.9, 315.3]
26	757	211	218.0	[190.5, 249.5]	292	301.7	[269.0, 338.4]	122	161.2	[135.0, 192.5]
27	821	198	194.3	[169.0, 223.3]	259	254.1	[225.0, 287.1]	89	108.4	[88.1, 133.4]
28	1,152	177	133.2	[115.0, 154.4]	219	164.8	[144.4, 188.2]	63	54.7	[42.7, 70.0]
29	1,313	176	118.2	[102.0, 137.0]	228	153.1	[134.5, 174.4]	63	48.0	[37.5, 61.4]
30	1,735	140	74.7	[63.3, 88.1]	175	93.4	[80.5, 108.3]	53	30.6	[23.3, 40.0]
31	2,081	149	66.8	[56.9, 78.5]	173	77.6	[66.9, 90.1]	37	17.8	[12.9, 24.5]
32	2,969	145	46.6	[39.6, 54.8]	174	55.9	[48.2, 64.8]	42	14.1	[10.5, 19.1]
33	4,244	152	34.6	[29.5, 40.5]	187	42.5	[36.9, 49.1]	39	9.2	[6.7, 12.6]
34	6,776	192	27.6	[23.9, 31.7]	220	31.6	[27.7, 36.0]	38	5.6	[4.1, 7.7]
35	10,064	192	18.7	[16.3, 21.6]	237	23.1	[20.3, 26.2]	54	5.4	[4.1, 7.0]
36	18,632	206	10.9	[9.5, 12.5]	253	13.4	[11.9, 15.2]	65	3.5	[2.7, 4.4]
37	39,533	239	6.0	[5.3, 6.8]	298	7.5	[6.7, 8.4]	76	1.9	[1.5, 2.4]
38	94,508	211	2.2	[1.9, 2.5]	285	3.0	[2.7, 3.4]	108	1.1	[0.9, 1.4]
39	151,755	236	1.6	[1.4, 1.8]	310	2.0	[1.8, 2.3]	106	0.7	[0.6, 0.8]
40	189,435	249	1.3	[1.2, 1.5]	325	1.7	[1.5, 1.9]	113	0.6	[0.5, 0.7]
41	136,637	199	1.5	[1.3, 1.7]	257	1.9	[1.7, 2.1]	79	0.6	[0.5, 0.7]
42+	29,342	37	1.3	[0.9, 1.7]	51	1.7	[1.3, 2.3]	15	0.5	[0.3, 0.8]
Not known	-	46	..		212	..		217	..	

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007
ONS 2005 & 2006
NI CHS 2006

During 2006 CEMACH has collaborated with the MRC EPICure studies to extend perinatal data collection to include all births between 22 and 26 completed weeks of gestation. This new cohort study will provide important comparative data with the 1995 EPICure cohort and extend our knowledge about the processes and outcomes that occur before and after birth in this high risk group. The data from this important national study of extremely preterm births in England will become available over the next 12 months.

3.2.2 Birth weight

Table 3.5 shows the stillbirths, perinatal and neonatal death rates according to birth weight for England, Wales and Northern Ireland. Over two-thirds of all stillbirths, perinatal and neonatal deaths had a birth weight of less than 2500g compared with only 7.5% of all live births in England, Wales and Northern Ireland. The neonatal mortality rate for babies with birth weight <1500g was 163 per 1000 and 349 per 1000 for babies <1000g; this was comparable to last year's CEMACH report and to 2005 data published by the ONS in 2007 (168 and 358 respectively)²⁷.

Table 3.5

Birth weight specific stillbirth, perinatal and neonatal deaths and rates; England, Wales and Northern Ireland: 2006.

Birth weight	Live births	Stillbirths			Perinatal deaths			Neonatal deaths		
		Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^b
Total	693,503	3,692	5.3	[5.1, 5.5]	5,531	7.9	[7.7, 8.1]	2,380	3.4	[3.3, 3.6]
<1000	3,374	1,154	254.9	[240.6, 270.0]	2,096	462.9	[443.5, 483.1]	1,179	349.4	[330.0, 370.0]
1000-1499	5,131	505	89.6	[82.1, 97.8]	655	116.2	[107.6, 125.5]	204	39.8	[34.7, 45.6]
1500-1999	10,553	401	36.6	[33.2, 40.4]	494	45.1	[41.3, 49.3]	127	12.0	[10.1, 14.3]
2000-2499	32,551	438	13.3	[12.1, 14.6]	540	16.4	[15.0, 17.8]	137	4.2	[3.6, 5.0]
2500-2999	115,799	491	4.2	[3.9, 4.6]	633	5.4	[5.0, 5.9]	193	1.7	[1.4, 1.9]
3000-3499	245,297	374	1.5	[1.4, 1.7]	488	2.0	[1.8, 2.2]	158	0.6	[0.6, 0.8]
3500-3999	198,426	181	0.9	[0.8, 1.1]	252	1.3	[1.1, 1.4]	92	0.5	[0.4, 0.6]
4000+	76,158	86	1.1	[0.9, 1.4]	122	1.6	[1.3, 1.9]	44	0.6	[0.4, 0.8]
Not known	6,214	62	..	..	251	..	..	246	..	..

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NI CHS 2006

Tables 3.6 and 3.7 show the mortality rates for singleton and multiple births in each birth weight category. Stillbirths and perinatal birth weight specific death rates are higher in singleton than in multiple births for all birth weight categories below 3000g. The same pattern is present for a neonatal death except for birth weight below 1000g where neonatal mortality is higher in multiples.

Table 3.6

Birth weight specific deaths and rates for singleton births; England, Wales and Northern Ireland: 2006.

Birth weight	Live births	Stillbirths			Perinatal deaths			Neonatal deaths		
		Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^b
Total	672,672	3,282	4.9	[4.7, 5]	4,643	6.9	[6.7, 7.1]	1,760	2.6	[2.5, 2.7]
<1000	2,597	971	272.1	[255.6, 289.8]	1,658	464.7	[442.8, 487.6]	853	328.5	[307.1, 351.3]
1000-1499	3,716	446	107.2	[97.7, 117.6]	565	135.8	[125.0, 147.4]	162	43.6	[37.4, 50.9]
1500-1999	7,485	357	45.5	[41.0, 50.5]	439	56.0	[51.0, 61.5]	108	14.4	[11.9, 17.4]
2000-2499	26,257	397	14.9	[13.5, 16.4]	491	18.4	[16.9, 20.1]	126	4.8	[4.0, 5.7]
2500-2999	109,204	467	4.3	[3.9, 4.7]	599	5.5	[5.0, 5.9]	182	1.7	[1.4, 1.9]
3000-3499	243,107	362	1.5	[1.3, 1.6]	475	2.0	[1.8, 2.1]	157	0.6	[0.6, 0.8]
3500-3999	198,164	175	0.9	[0.8, 1]	245	1.2	[1.1, 1.4]	91	0.5	[0.4, 0.6]
4000+	76,138	85	1.1	[0.9, 1.4]	121	1.6	[1.3, 1.9]	44	0.6	[0.4, 0.8]
Not known	6,004	22	..		50	..		37	..	

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NI CHS 2006

Table 3.7

Birth weight specific deaths and rates for multiple births; England, Wales and Northern Ireland: 2006.

Birth weight	Live births	Stillbirths			Perinatal deaths			Neonatal deaths		
		Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^a	Number	Rate	[95% CI] ^b
Total	20,831	258	12.2	[10.8, 13.8]	579	27.5	[25.3, 29.8]	416	20.0	[18.1, 22.0]
<1000	777	131	144.3	[121.6, 171.2]	385	424.0	[383.7, 468.6]	325	418.3	[375.2, 466.3]
1000-1499	1,415	44	30.2	[22.4, 40.5]	75	51.4	[41.0, 64.5]	42	29.7	[21.9, 40.2]
1500-1999	3,068	33	10.6	[7.6, 15.0]	43	13.9	[10.3, 18.7]	18	5.9	[3.7, 9.3]
2000-2499	6,294	28	4.4	[3.1, 6.4]	36	5.7	[4.1, 7.9]	11	1.7	[1.0, 3.2]
2500-2999	6,595	12	1.8	[1.0, 3.2]	21	3.2	[2.1, 4.9]	10	1.5	[0.8, 2.8]
3000-3499	2,190	2	0.9	[0.2, 3.6]	3	1.4	[0.4, 4.2]	1	0.5	[0.1, 3.2]
3500-3999	262	1	3.8	[0.5, 27.0]	2	7.6	[1.9, 30.4]	1	3.8	[0.5, 27.1]
4000+	20	-	-		-	-		-	-	
Not known	210	7	..		14	..		8	..	

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NI CHS 2006

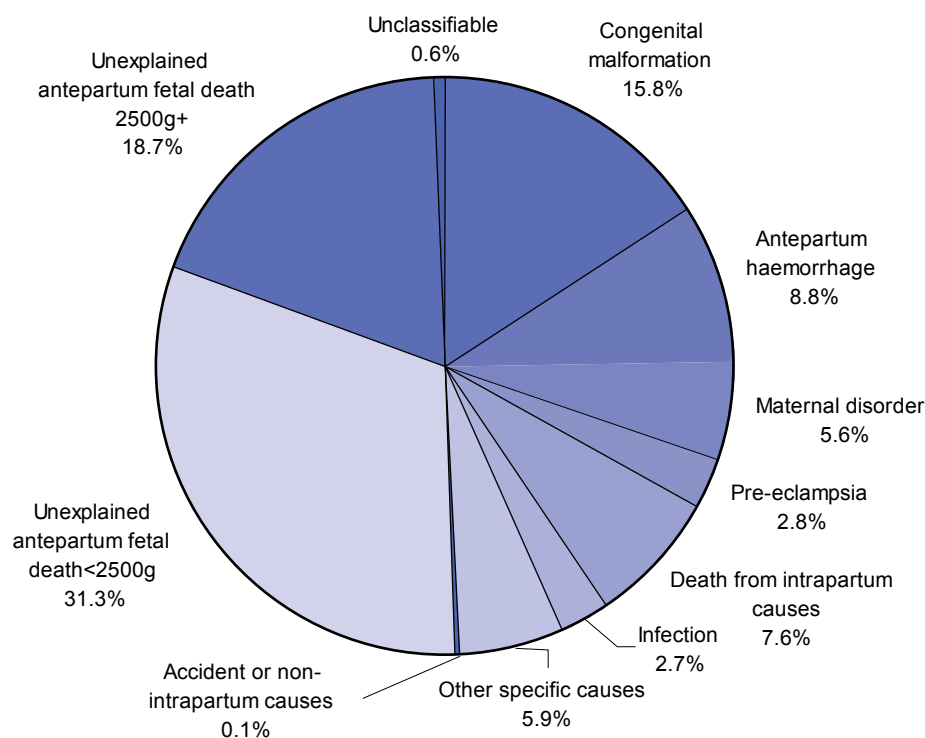
Chapter 4 Cause of death for stillbirths and neonatal deaths

4.1 Causes of stillbirths

Figure 4.1 shows the cause of death of all stillbirths. The largest identifiable groups are deaths due to: a) severe/lethal congenital anomalies (accounting for 16% of all stillbirths); b) antepartum haemorrhage (9%) and c) intrapartum causes (8%). Fifty percent of stillbirths remain unexplained using the current classification systems. The percentage distribution of causes of stillbirths is very similar to the previous year⁸.

Figure 4.1

Percentage distribution of causes of stillbirths; England, Wales and Northern Ireland: 2006.



Total stillbirths: 3,692.
Missing data: 161.

Sources: CEMACH 2006 & 2007

The corresponding cause-specific mortality rates are shown in Table 4.1. Among stillbirths that occur during labour, most deaths are described as being from intrapartum causes (0.4 per 1000 total births). Other deaths in labour relate to congenital anomalies or infection. Stillbirths occurring before labour are, as displayed above, unexplained in 50% of cases. The unexplained stillbirth rate is 2.4 per 1000 total births. Table 4.2 shows that the distribution of the causes of stillbirths has been very similar over recent years and in particular the proportion of unexplained causes has remained high at around 50%.

Table 4.1
Cause specific stillbirth rates; England, Wales and Northern Ireland: 2006.

Cause of death	Antepartum			Intrapartum			Total	
	Number	Rate [95% CI] ^a		Number	Rate [95% CI] ^a		Number	Rate [95% CI] ^a
Total	3,111	4.4 [4.3, 4.6]		314	0.5 [0.4, 0.5]		3,692	5.3 [5.1, 5.5]
Congenital malformation	507	0.7 [0.7, 0.8]		32	0.0 [0.0, 0.1]		558	0.8 [0.7, 0.9]
Antepartum haemorrhage	300	0.4 [0.4, 0.5]		5	0.0		312	0.4 [0.4, 0.5]
Maternal disorder	190	0.3 [0.2, 0.3]		-	-		196	0.3 [0.2, 0.3]
Pre-eclampsia	93	0.1 [0.1, 0.2]		1	0.0		100	0.1 [0.1, 0.2]
Death from intrapartum causes	-	-		250	0.4 [0.3, 0.4]		269	0.4 [0.3, 0.4]
Infection	76	0.1 [0.1, 0.1]		18	0.0		96	0.1 [0.1, 0.2]
Other specific causes	196	0.3 [0.2, 0.3]		7	0.0		208	0.3 [0.3, 0.3]
Accident or non intrapartum cases	3	0.0		-	-		4	0.0
Unexplained antepartum fetal death <2500g	1,070	1.5 [1.5, 1.6]		-	-		1,105	1.6 [1.5, 1.7]
Unexplained antepartum fetal death 2500g+	651	0.9 [0.9, 1.0]		-	-		662	1.0 [0.9, 1.0]
Unclassified	15	0.0		1	0.0		21	0.0
Not known	10	..		-	..		161	..

^a Rate per 1000 total births.

Sources: CEMACH 2006 & 2007
ONS 2006
NISRA-GRO 2006

Table 4.2

Trend of causes of stillbirths; England, Wales and Northern Ireland: 2000-2006.

Cause of death	Percentage					
	2000	2001	2002	2003	2004	2005
Congenital malformation	16.0	15.6	15.5	15.2	15.2	15.2
Antepartum haemorrhage					10.1	8.5
Maternal disorder					4.9	5.8
Pre-eclampsia					3.6	3.0
Death from intrapartum causes	7.1	6.9	6.8	7.6	7.4	7.7
Infection	2.3	2.1	2.0	2.0	1.8	1.9
Other specific causes	4.4	4.6	4.0	3.7	5.3	6.1
Accident or non intrapartum causes	0.1	0.2	-	0.1	0.1	0.0
Unexplained antepartum fetal deaths <2500g	69.5	70.3	71.4	70.7	32.5	31.6
Unexplained antepartum fetal deaths 2500g+					18.5	19.6
Unclassifiable	0.6	0.4	0.3	0.7	0.8	0.7

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2000-2007

Since 2000, the stillbirth and perinatal death rates have remained largely unchanged while the neonatal mortality rates has declined significantly (Figure 1.2, page 4). Whilst we know some of the risk factors involved in stillbirths, such as multiple birth and maternal age, further research is required for a better understanding of its causes. Our findings suggest that demographic factors known to be associated with stillbirths (such as an increased incidence of obesity in the maternal population, ethnicity and social deprivation) may contribute to the lack of decline of stillbirths in the UK (sections 3.1.2 - 3.1.4, pages 27-28). The high proportion of unexplained stillbirths, constant over recent years, may also mask pathological processes that could be acted upon if recognised. Undetected intrauterine growth restriction (IUGR) has been proposed as a possible explanation for sudden unexplained stillbirth and its contribution could be hidden by the present classification of deaths used by CEMACH²⁸. This possibility is supported by the observation that the rate of stillbirths has not decreased in normally-formed singleton stillbirths, while the stillbirth rate in multiple pregnancy has declined (Table 1.4, page 7). These hypotheses were explored by conducting a pilot study using a new CEMACH perinatal death classification system. The results are reported later in this report (section 5.4). This year CEMACH also reports on the percentage distribution of small for gestational age (SGA) fetuses in cases of unexplained stillbirths using birth weight centiles²⁹. Table 4.3 shows that over one-third of unexplained stillbirths have a birth weight below the 10th centile for its gestation and a quarter of them were severely restricted (birth weight below the 3rd centile for its gestation). These findings suggest that low birth weight for gestational age may be a significant factor in the unexplained stillbirths group.

Table 4.3

SGA in unexplained stillbirths; England, Wales and Northern Ireland: 2006.

	Singletons		Multiples		Total	
	Number	%	Number	%	Number	%
Unexplainable	1,666	..	101	..	1,767	..
< 10th centile	628	38.6	62	66.0	690	40.0
< 3rd centile	397	24.4	53	56.4	450	26.1
Missing SGA data	37	..	7	..	44	..

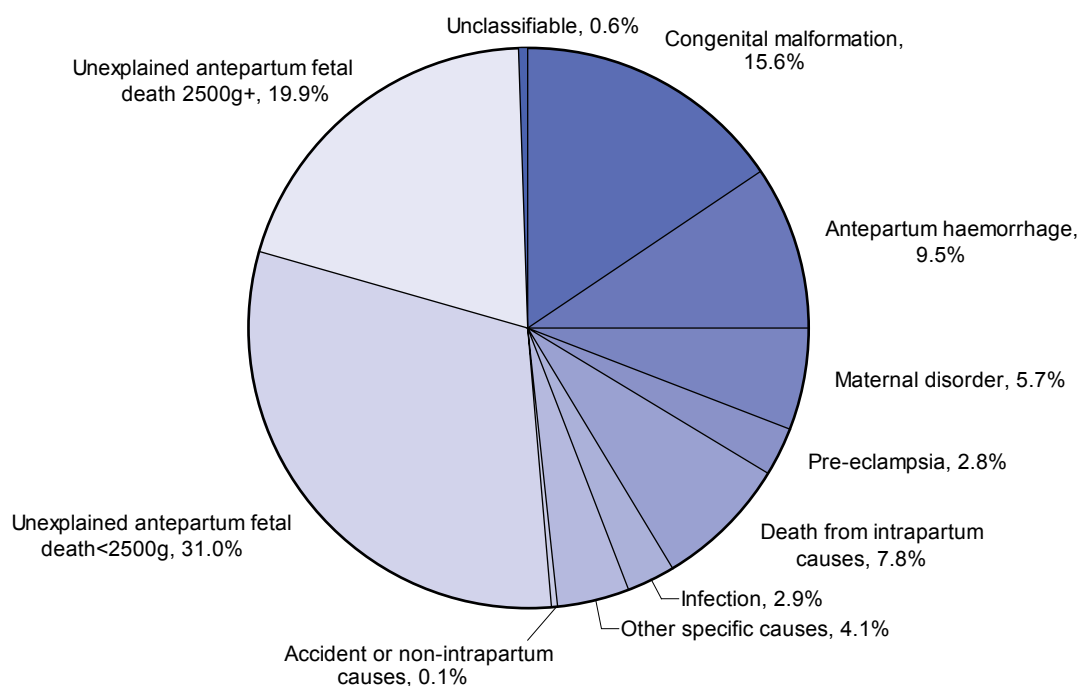
Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007
Child Growth Foundation

Figures 4.2 and 4.3 show the percentage distribution of causes of stillbirths according to singleton and multiple births. The two salient differences between singleton and multiple stillbirths are: a) a reduction in unexplained antepartum fetal deaths above 2500g from 20% in singleton stillbirths to 4% in multiple stillbirths and b) an increase in “other specific causes” from 4% to 29%. When looking at the clinical details given on the PDN form for cause of death of multiples coded as “other specific causes”, it was found that this increase was mainly explained (73%) by twin to twin transfusion syndrome (TTTS).

Figure 4.2

Percentage distribution of causes of singleton stillbirths; England, Wales and Northern Ireland: 2006.

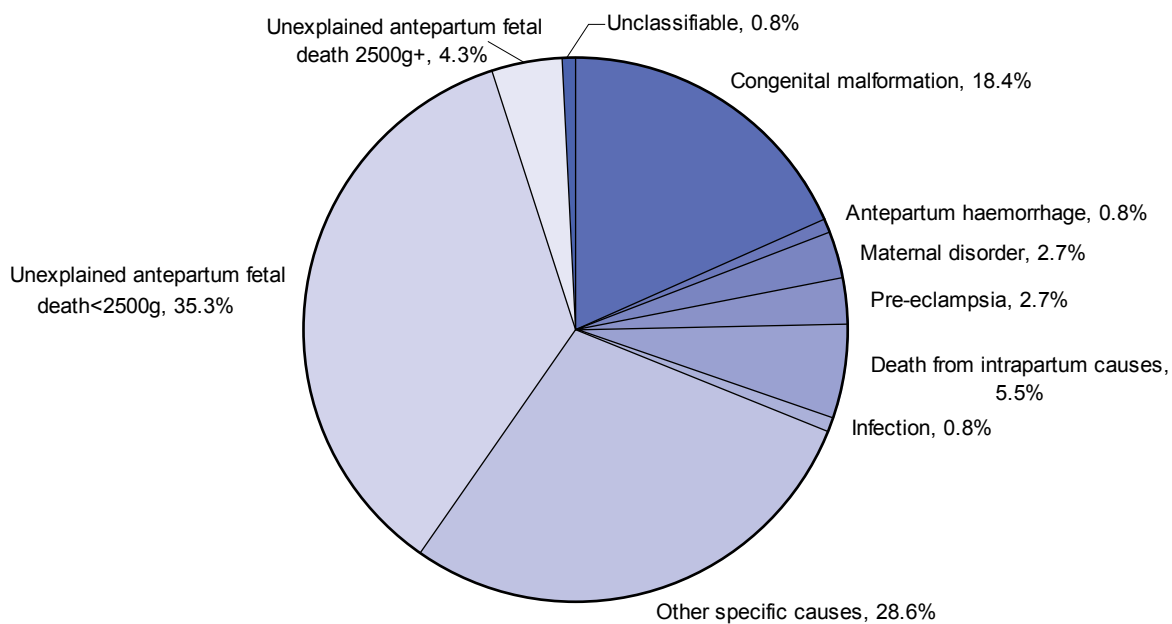


Total singleton stillbirths: 3,282.
Missing data: 8.

Sources: CEMACH 2006 & 2007

Figure 4.3

Percentage distribution of causes of multiple stillbirths; England, Wales and Northern Ireland: 2006.



Total multiple stillbirths: 258.
Missing data: 3.

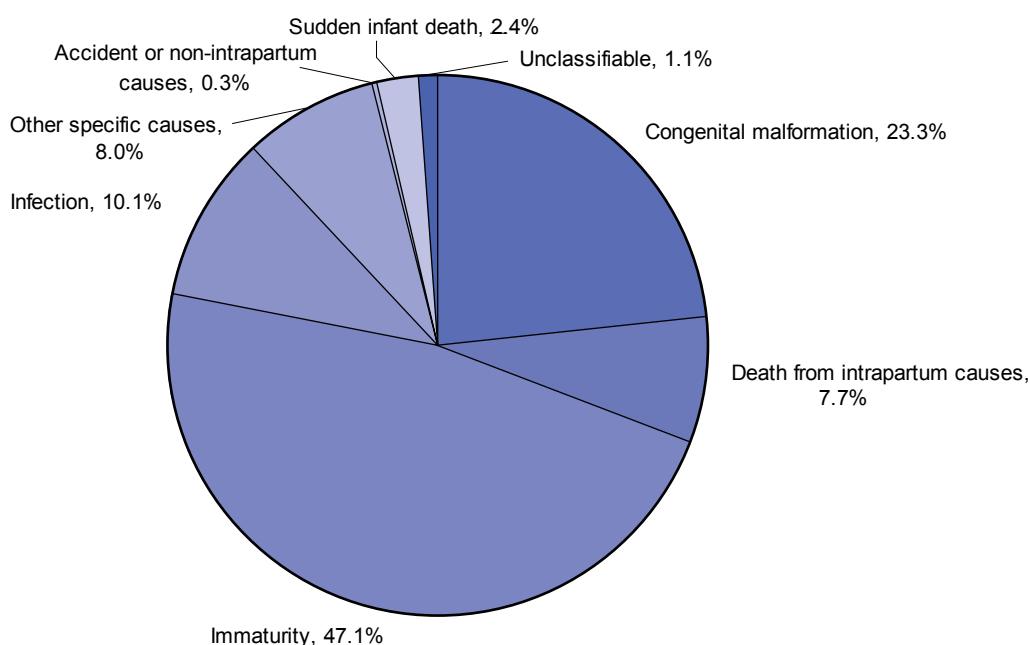
Sources: CEMACH 2006 & 2007

4.2 Causes of neonatal deaths

For 2006, the largest proportions of neonatal deaths were classified as: a) death due to immaturity (47%); b) lethal/severe congenital anomalies (23%); and c) death due to infection (10%) (Figure 4.4). The percentage distribution of causes of neonatal deaths differs from last year's CEMACH report⁸ because intrapartum causes of deaths moved from third to fifth place, behind neonatal infection and other specific causes. It is possible that this difference could be explained by a higher incidence of missing information on these deaths at the time of writing this report, but equally the missing information could be spread evenly over all the different causes and intrapartum causes could be less frequent this year.

Figure 4.4

Percentage distribution of causes of neonatal deaths; England, Wales and Northern Ireland: 2006.



Total neonatal deaths: 2,380.
Missing data: 226.

Sources: CEMACH 2006 & 2007

The corresponding cause-specific mortality rates for neonatal deaths are shown in Table 4.4. The mortality rate due to immaturity is 1.5 per 1000 live births, followed by congenital anomalies (0.7 per 1000 live births) and infection (0.3 per 1000 live births). Intrapartum causes are 0.2 per 1000 live births.

Table 4.5 shows the percentage distribution of causes of neonatal deaths over recent years. The distribution of these causes has remained unchanged⁸.

Recently, the Chief Medical Officer³⁰ highlighted both the CEMACH findings⁸ related to the high number of intrapartum-related fetal and neonatal deaths that has remained largely unchanged over recent years and the need for confidential enquiries into these deaths to inform our understanding of their causes and the extent of avoidable factors contributing to them⁸. Table 4.5 confirms that the rate of neonatal deaths from intrapartum causes has not changed over recent years. Table 4.6 shows that, using customised birth weight centiles²⁹, the percentage distribution of SGA neonates found in intrapartum-related neonatal deaths is low, making SGA an unlikely mechanism.

Table 4.4

Cause-specific neonatal deaths and rates; England, Wales and Northern Ireland: 2006.

Cause of death	Early neonatal deaths			Late neonatal deaths			All neonatal deaths		
	Number	Rate [95% CI] ^a		Number	Rate [95% CI] ^a		Number	Rate [95% CI] ^a	
Total	1,839	2.7 [2.5, 2.8]		541	0.8 [0.7, 0.8]		2,380	3.4 [3.3, 3.6]	
Congenital malformation	385	0.6 [0.5, 0.6]		117	0.2 [0.1, 0.2]		502	0.7 [0.7, 0.8]	
Death from intrapartum causes	152	0.2 [0.2, 0.3]		13	0.0		165	0.2 [0.2, 0.3]	
Immaturity	869	1.3 [1.2, 1.3]		146	0.2 [0.2, 0.2]		1,015	1.5 [1.4, 1.6]	
Infection	90	0.1 [0.1, 0.2]		127	0.2 [0.2, 0.2]		217	0.3 [0.3, 0.4]	
Other specific causes	129	0.2 [0.2, 0.2]		44	0.1 [0.0, 0.1]		173	0.2 [0.2, 0.3]	
Accident or non-intrapartum causes	5	0.0		1	0.0		6	0.0	
Sudden infant death	22	0.0		30	0.0 [0.0, 0.1]		52	0.1 [0.1, 0.1]	
Unclassified	17	0.0		7	0.0		24	0.0 [0.0, 0.1]	
Not known	170	..		56	..		226	..	

^a Rate per 1000 live births.

Sources: CEMACH 2006 & 2007
ONS 2006
NISRA-GRO 2006

Table 4.5
Trend of causes of neonatal deaths; England, Wales and Northern Ireland: 2000-2006.

Cause of death	Percentage					
	2000	2001	2002	2003	2004	2005
Congenital malformation	23.1	23.0	24.8	22.9	22.8	22.7
Death from intrapartum causes	7.5	9.2	8.8	9.1	11.1	9.2
Immaturity	49.0	46.6	47.3	49.7	48.7	49.2
Infection	9.2	9.7	8.3	6.9	6.9	7.4
Other specific causes	7.0	8.2	6.8	6.7	7.1	7.9
Accident or non intrapartum causes	0.4	0.4	0.1	0.2	0.1	0.1
Sudden infant death	2.8	2.2	2.8	2.8	2.5	2.4
Unclassifiable	1.0	0.8	1.2	1.8	0.9	0.9

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2000-2007

Table 4.6

SGA in neonatal deaths from intrapartum causes; England, Wales and Northern Ireland: 2006.

	Singleton		Multiple		Total	
	Number	%	Number	%	Number	%
Neonatal deaths from intrapartum causes	155	..	8	..	165	..
< 10th centile	21	13.7	1	12.5	22	13.7
< 3rd centile	7	4.6	-	-	7	4.3
Missing SGA data	2	..	-	..	4	..

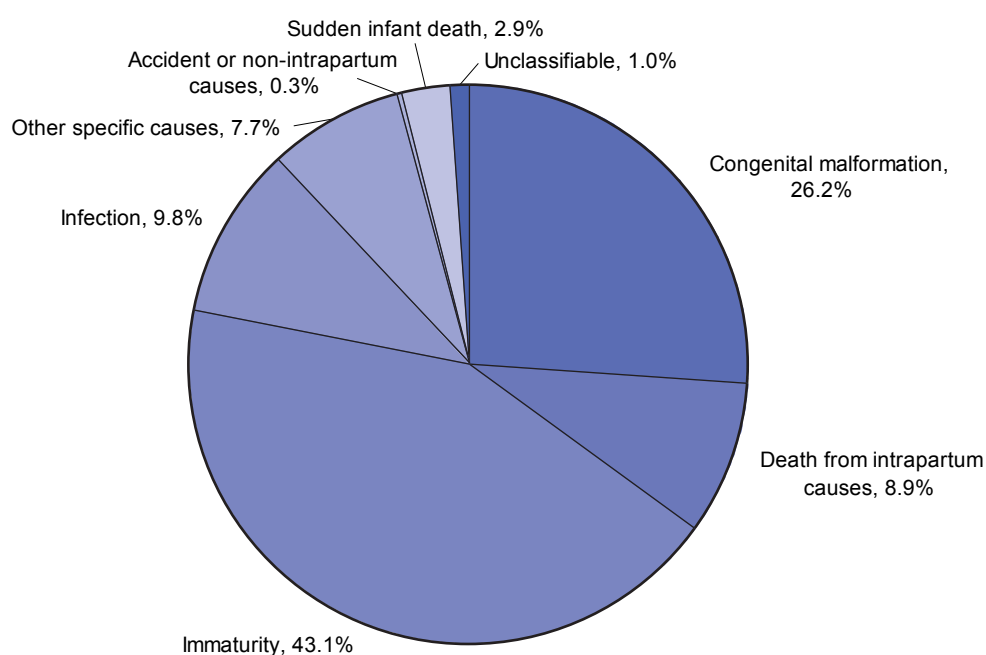
Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007
Child Growth Foundation

The causes of neonatal deaths are shown in Figure 4.5 (singleton births) and Figure 4.6 (multiple births). The two main differences between singleton and multiple births are: a) a marked increase in causes classified as immaturity from 43% in neonatal deaths following a singleton birth to 65% following a multiple pregnancy and b) fewer congenital anomalies in births following multiple compared with singleton pregnancies.

Figure 4.5

Percentage distribution of causes of neonatal deaths after a singleton pregnancy; England, Wales and Northern Ireland: 2006.



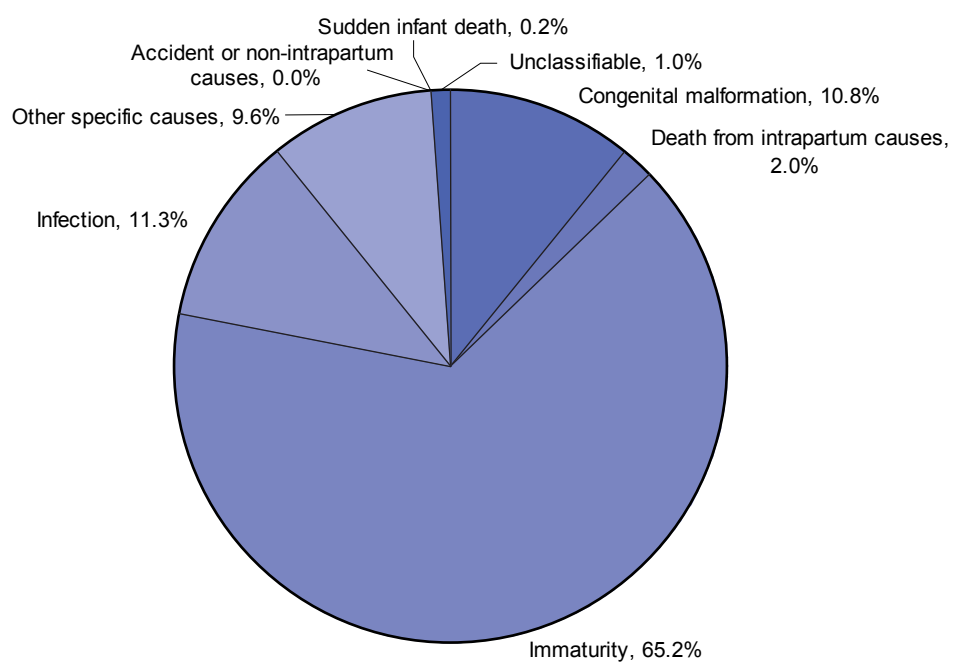
Total singleton neonatal deaths: 1,760.

Missing data: 22.

Sources: CEMACH 2006 & 2007

Figure 4.6

Percentage distribution of causes of neonatal deaths after a multiple pregnancy; England, Wales and Northern Ireland: 2006.



Total multiple neonatal deaths: 416.

Missing data: 8.

Sources: CEMACH 2006 & 2007

4.3 Post mortem examinations

4.3.1 Post mortem examination uptake

CEMACH collected information about whether a post mortem was held or was being arranged for each perinatal death notification. Post mortem reports were then obtained by the CEMACH regional offices to confirm the cause of death. Overall proportions of post mortems performed for all deaths in England, Wales, Northern Ireland and SHAs in England are shown in Table 4.7.

Table 4.7

Percentage distribution of post mortem examinations performed by maternal area of residence; England, Wales and Northern Ireland and by SHA in England: 2004-2006.

	2004		2005		2006	
	Number	%	Number	%	Number	%
E, W & NI ^a	3,018	42.2	2,680	38.8	2,470	38.4
England	2,757	42.2	2,437	38.4	2,248	37.9
Wales	148	43.1	139	45.3	125	43.1
Northern Ireland	86	39.3	93	44.7	87	47.8
East Midlands	243	40.0	193	35.7	218	42.7
East of England	219	43.1	183	37.3	228	39.9
London	704	49.2	561	44.5	559	46.6
North East	124	45.1	143	49.1	149	48.5
North West	231	27.2	252	27.4	217	27.5
South Central	447	49.6	231	50.9	172	44.4
South East Coast			199	45.7	152	40.4
South West	248	49.9	170	37.5	163	38.5
West Midlands	291	36.6	289	35.7	241	30.0
Yorkshire and Humberside	250	37.1	216	31.3	149	26.0
Not known, missing or elsewhere	27	..	11	..	10	..

a Includes not known, missing or elsewhere.

Sources: CEMACH 2004-2007

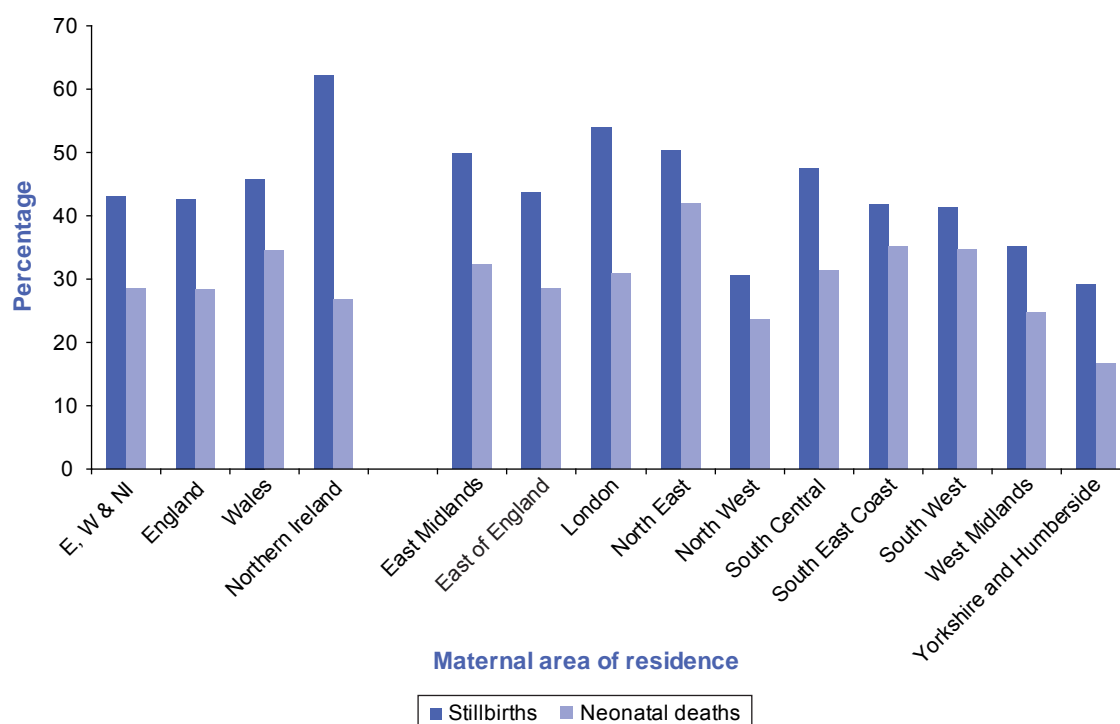
Note 1: Percentages are calculated removing post mortems that are missing and not known.

Note 2: The cases included are all late fetal losses, stillbirths and neonatal deaths.

Data for post mortem examinations performed according to the type of death (stillbirths or neonatal deaths) in England, Wales, Northern Ireland and SHAs in England are displayed in Figure 4.7, which shows, as in last year's report⁸, that: a) autopsy uptake for neonatal deaths is consistently lower than for stillbirths and b) there are marked variations in post mortem uptake between regions.

Figure 4.7

Percentage distribution of post mortem examinations performed for all types of deaths by maternal area of residence; England, Wales and Northern Ireland and by SHA in England: 2006.



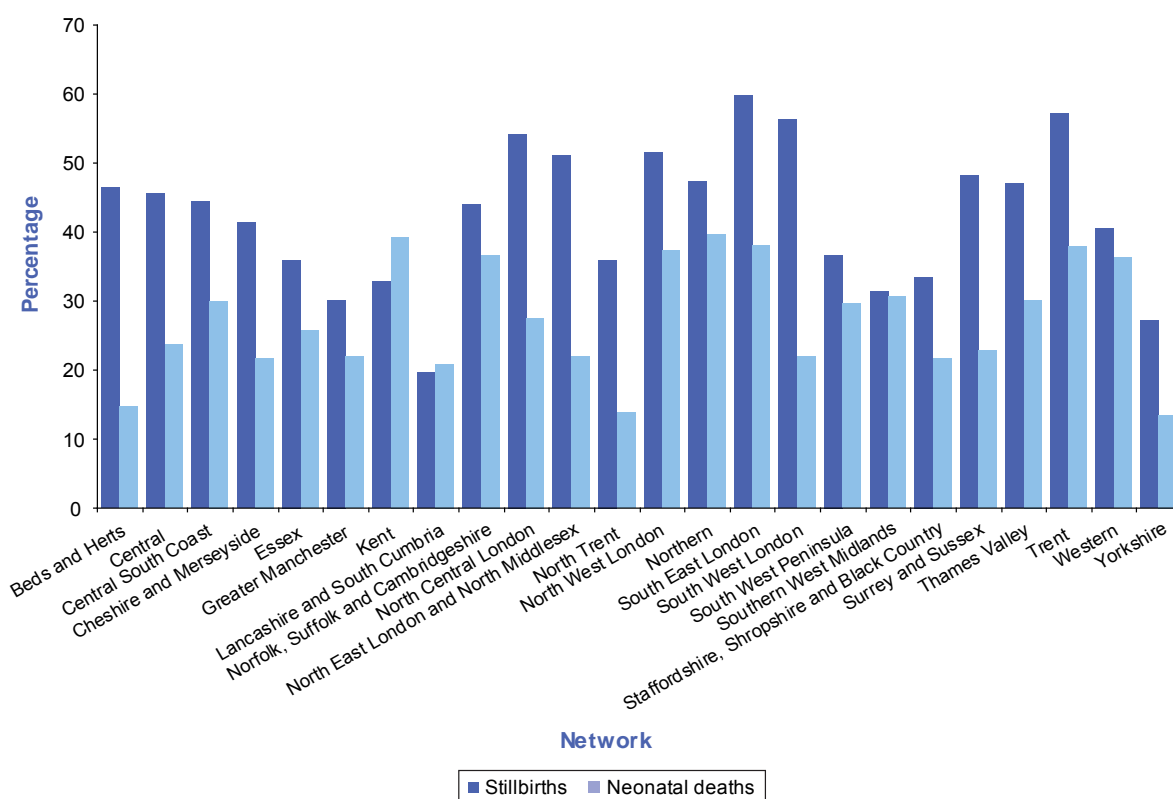
Sources: CEMACH 2006 & 2007

Note: The North West region includes cases from the Isle of Man and the South East Coast includes cases from the Channel Islands.

Post mortem uptake between Neonatal Networks in England is also displayed in Figure 4.8. It also shows marked variations between Networks especially post mortem for neonatal deaths. This information will be provided to each Neonatal Network chair from this year onwards.

Figure 4.8

Percentage distribution of post mortem examinations performed for all type of deaths by Network; England: 2006.



Sources: CEMACH 2006 & 2007

The proportion of post mortem examinations performed for stillbirths and neonatal deaths, in England, Wales, Northern Ireland and SHAs in England is shown in Table 4.8. Overall, a post mortem examination was performed in 38% of all deaths (43% of stillbirths, and 29% of neonatal deaths). This uptake is lower than described in the 2006 report for Scotland² (47% overall) but similar to the 2005 CEMACH report⁸ (39%). The data nevertheless confirm that post mortem examination uptake has declined from 48% of all deaths in 2000 to 38% in 2006. This confirms the overall decline in national perinatal post mortem uptake reported over the years by CEMACH³¹⁻³² and other recent publications³³. This trend over recent years is further illustrated in Figure 4.9.

Table 4.8
Percentage distribution of post mortem examinations performed by maternal area of residence for stillbirths, perinatal and neonatal deaths; England, Wales and Northern Ireland: 2006.

	Stillbirths			Perinatal deaths			Neonatal deaths		
	Total	PM performed	% ^a	Total	PM performed	% ^a	Total	PM performed	% ^a
E, W & NI ^b	3,692	1,461	43.1	5,531	1,900	38.5	2,380	570	28.5
England	3,417	1,329	42.5	5,115	1,734	38.1	2,190	520	28.4
Wales	173	76	45.8	232	95	43.0	88	29	34.5
Northern Ireland	88	51	62.2	159	65	45.1	86	20	26.7
East Midlands	282	131	49.8	420	172	44.9	195	54	32.3
East of England	297	125	43.7	448	163	38.8	192	49	28.5
London	774	366	54.0	1,089	435	47.4	407	96	31.0
North East	160	79	50.3	242	112	47.9	105	42	42.0
North West	449	132	30.5	704	188	28.4	317	65	23.6
South Central	246	102	47.4	362	129	42.3	140	33	31.4
South East Coast	233	77	41.8	325	99	39.1	126	32	35.2
South West	245	95	41.3	369	128	39.0	165	48	34.8
West Midlands	385	133	35.1	620	192	31.9	300	70	24.7
Yorkshire and Humberside	346	89	29.2	536	116	25.5	243	31	16.7
Not known, missing or elsewhere	14	5	..	25	6	..	16	1	..

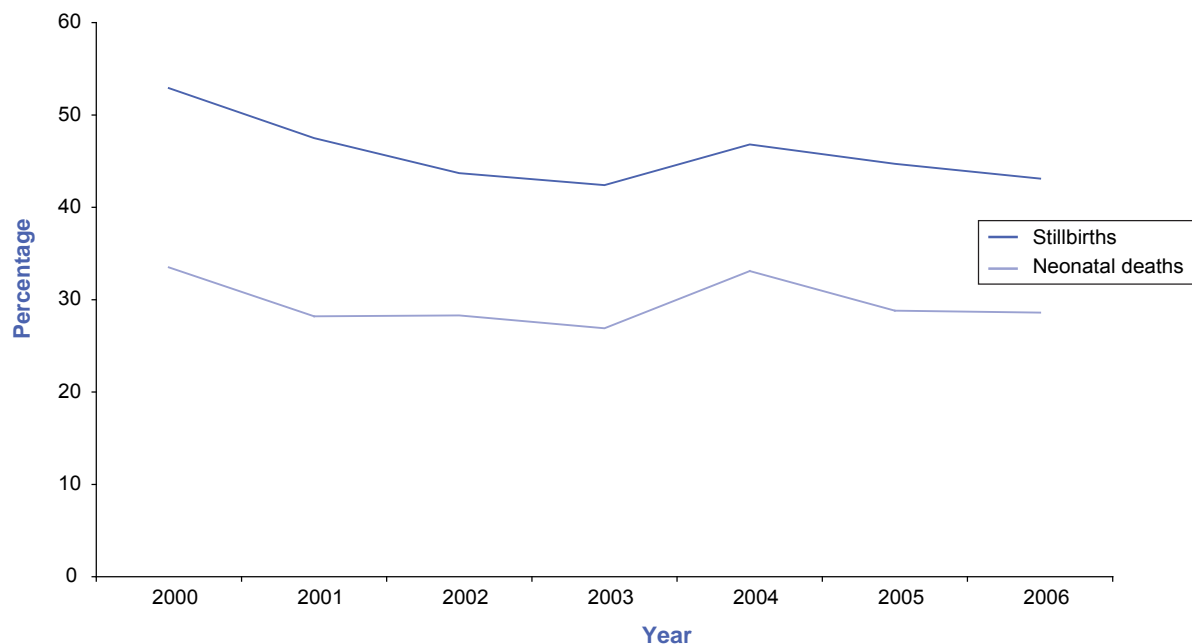
^a Percentages are calculated removing post mortems that are missing and not known.

^b Includes not known, missing or elsewhere.

Sources: CEMACH 2006 & 2007

Figure 4.9

Trends in post mortem examinations; England, Wales and Northern Ireland: 2000-2006.



Sources: CEMACH 2000-2007

4.3.2 Staff and parents' attitudes to post mortem examination

CEMACH also collected information on whether: a) a post mortem was not offered, b) was requested but parental consent was not given, or c) parental consent was given but the post mortem was not performed. Parents or guardians declined permission in 50% (2694/5384) of cases. A further 11% (612/5384) were not offered by medical staff with the remaining 0.9% (47/5384) not being performed even though consent was obtained. Recent research suggests that the lack of a perinatal pathologist remains the main reason for clinicians not requesting a post mortem³³.

Although requesting a post mortem examination may be perceived as difficult when parents have just lost a baby, it is useful for ascertaining the cause of death more precisely and helps parents to plan future pregnancies. A previous UK study found that clinico-pathological classification was altered after post mortem in 13% of cases, new information was obtained in 26% and cause of death was disclosed in 19%³⁴.

Perinatal pathology has been described in the UK as a service "in crisis with problems related to pathologist recruitment and lack of public confidence following recent publicity over organ retention"³⁵. While these issues are being addressed, the post mortem uptake has declined. The fact that in a quarter of deaths post mortem examination was not requested by medical staff should be explored further. Those few cases where consent was given but post mortem was not performed are of special concern. In half of deaths reported to CEMACH in 2006, parent withheld their consent to a post mortem examination. Post mortem examination will always remain a distressing choice for parents³⁶, nevertheless, it is important for a clinician to explain to the parents, the potential advantages of this investigation.

Chapter 5 Focus issues in perinatal mortality surveillance

One of the purposes of CEMACH's perinatal mortality surveillance is to identify clinically relevant topics, where it may be beneficial to carry out further more detailed studies. This year this chapter of the report focuses on:

- Intrapartum-related stillbirths and neonatal deaths
- Perinatal deaths during deliveries at home and in birth centres
- Pilot study on the new CEMACH perinatal deaths classification system.

5.1 All deaths of intrapartum origin

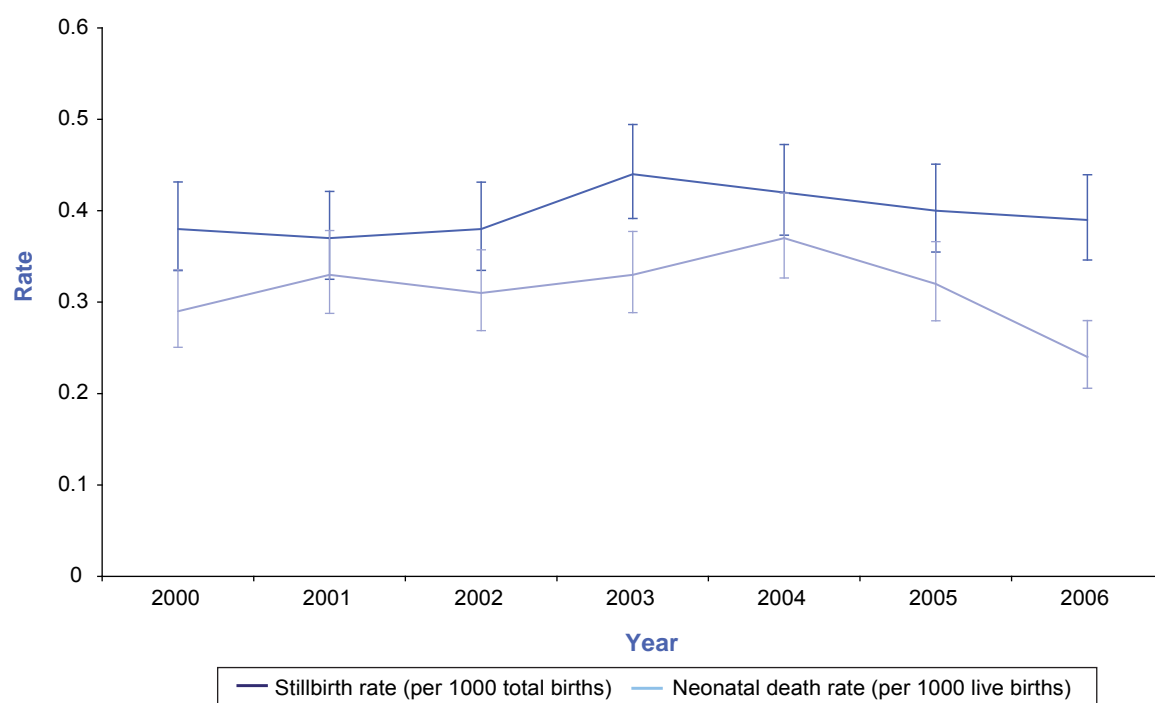
5.1.1 Background

Intrapartum-related deaths were reported as a significant perinatal public health issue in the 2005 CEMACH perinatal mortality report for England, Wales and Northern Ireland⁸. There were 270 stillbirths and 211 neonatal deaths ascribed to intrapartum causes. A high proportion of these intrapartum deaths occurred at term: 135 (50%) stillbirths and 142 (67%) neonatal deaths. CEMACH's analysis of the stillbirths and neonatal deaths due to intrapartum causes shows no change over the last six years (Figure 5.1).

The Chief Medical Officer (CMO) highlighted these CEMACH findings³⁰ and strongly recommended a review of these deaths to reduce the gaps in knowledge about their causes. This chapter presents a descriptive analysis of all intrapartum deaths in 2006. CEMACH are currently developing a project proposal for a future enquiry to detect avoidable factors in such deaths.

Figure 5.1

Trends of stillbirths and neonatal deaths due to intrapartum causes; England, Wales and Northern Ireland: 2000-2006.



Sources: CEMACH 2000-2007, ONS 2000-2006, NISRA-GRO 2000-2006

Note: Both trends are not statistically significant (Cochran-Armitage test for linear trends: $p=0.38$ for stillbirths and $p=0.22$ for neonatal deaths).

5.1.2 Results

The proportion of all stillbirths and neonatal deaths ascribed to intrapartum causes was identified using category 3 of the Extended Wigglesworth classification (deaths from intrapartum “asphyxia”, “anoxia” or “trauma”)³⁷. As described earlier in this 2006 report, this was 7.6% (269/3531) for stillbirths and 7.7% (165/2154) for neonatal deaths. To explore further the contribution of intrapartum events to these stillbirths and neonatal deaths from an obstetric perspective, a descriptive analysis and a classification of these deaths were performed (Table 5.1) using the Aberdeen Obstetric classification system³⁸. An unexplained cause was by far the most common category (48% for stillbirths and 53% for neonatal deaths). A catastrophic event at delivery was the second most common condition: placental abruption (20% for stillbirths and 15% for neonatal deaths), cord prolapse and cord compression (8% for stillbirths and 4% for neonatal deaths). Breech presentation complicated 5% stillbirths and 2% of these neonatal deaths; there was a malpresentation or a ruptured uterus in 3% stillbirths and 12% neonatal deaths, and a pre-existing maternal disorder complicated 10% stillbirths (a maternal infection in the vast majority of cases) and 7% neonatal deaths.

Table 5.1

Causes of intrapartum-related stillbirths and neonatal deaths; England, Wales and Northern Ireland: 2006.

Aberdeen obstetric classification	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Total	269	100.0	165	100.0
Congenital anomaly				
<i>Neural tube defects</i>	-	-	-	-
<i>Other anomalies</i>	-	-	-	-
Isoimmunisation				
<i>Due to Rhesus antigen</i>	1	0.4	-	-
<i>Due to other antigens</i>	-	-	-	-
Pre-eclampsia				
<i>Without APH</i>	8	3.0	-	-
<i>Complicated by APH</i>	-	-	1	0.6
Antepartum haemorrhage				
<i>With placenta praevia</i>	1	0.4	3	1.8
<i>With placental abruption</i>	55	20.4	25	15.2
<i>APH of uncertain origin</i>	7	2.6	8	4.8
Mechanical				
<i>Cord prolapse or compression with vertex or face presentation</i>	21	7.8	7	4.2
<i>Other vertex or face presentation</i>	3	1.1	8	4.8
<i>Breech presentation</i>	12	4.5	3	1.8
<i>Oblique or compound presentation, uterine rupture</i>	6	2.2	11	6.7
Maternal disorder				
<i>Maternal hypertensive disease</i>	1	0.4	-	-
<i>Other maternal disease</i>	4	1.5	8	4.8
<i>Maternal infection</i>	21	7.8	3	1.8
Miscellaneous				
<i>Neonatal infection</i>	-	-	-	-
<i>Other neonatal disease</i>	-	-	-	-
<i>Specific fetal conditions</i>	1	0.4	1	0.6
Unexplained				
<i>Equal or greater than 2.5kg</i>	68	25.3	64	38.8
<i>Less than 2.5kg</i>	58	21.6	22	13.3
<i>Unclassifiable</i>	2	0.7	1	0.6

Note: Percentages are calculated removing missing and not known.

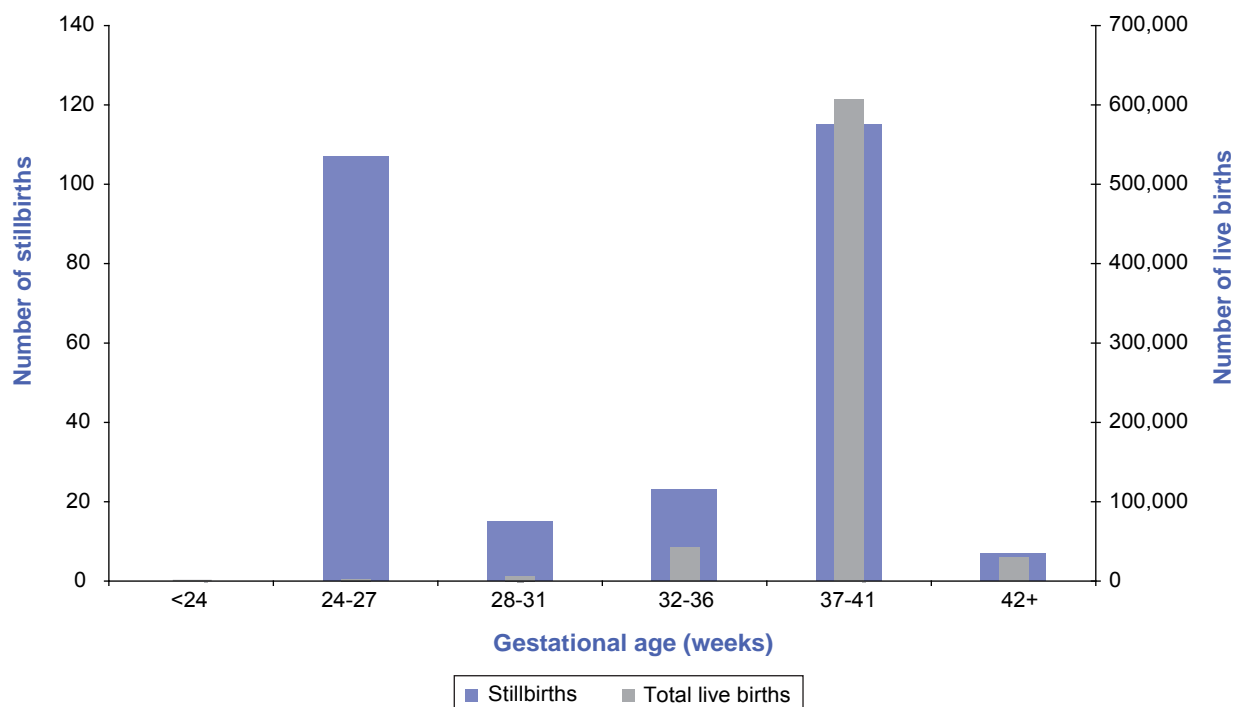
Sources: CEMACH 2006 & 2007

5.1.3 Intrapartum deaths according to gestational age and birth weight

Figures 5.2 to 5.5 describe these deaths in relation to gestational age and birth weight at the time of death. This clearly shows that the highest number of intrapartum related stillbirths is mainly at around 24 to 27 weeks' gestation or at term and for babies with a birth weight ≤ 1 kg or between 3 and 3.5kg. The highest number of intrapartum-related neonatal deaths is around term or for babies with a birth weight between 2.5 to 4kg.

Figure 5.2

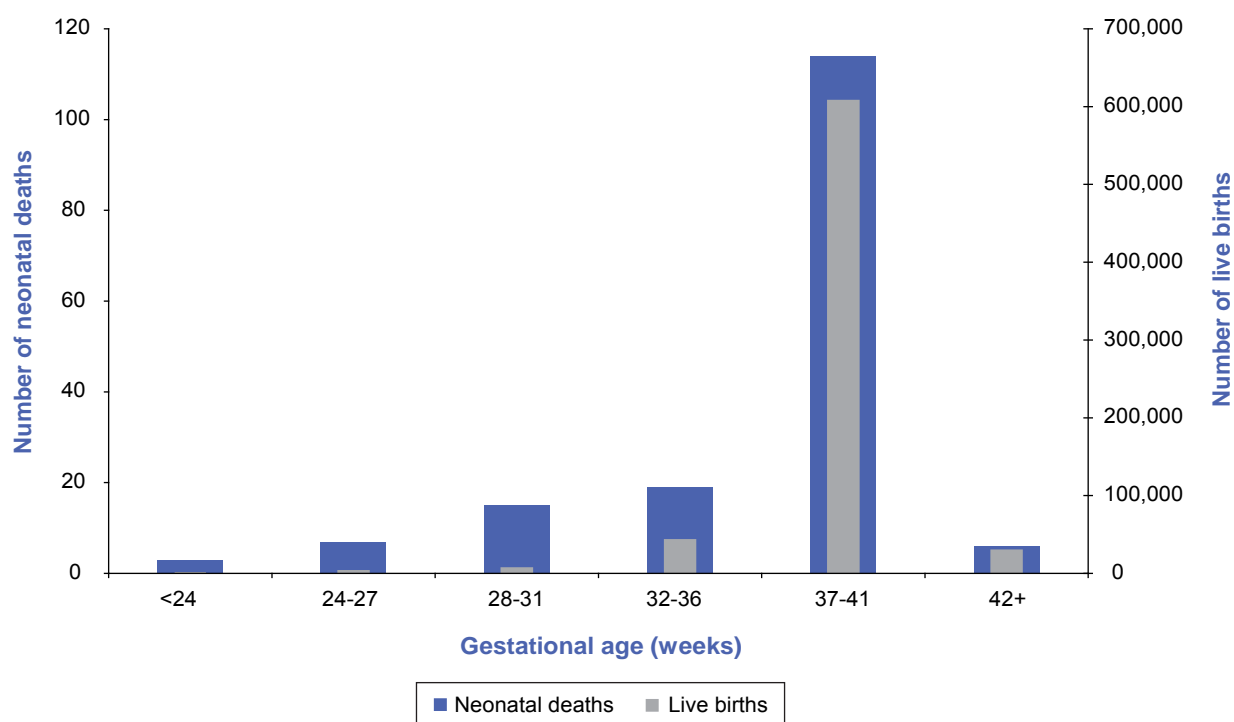
Stillbirths due to intrapartum causes by week of gestation; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

Figure 5.3

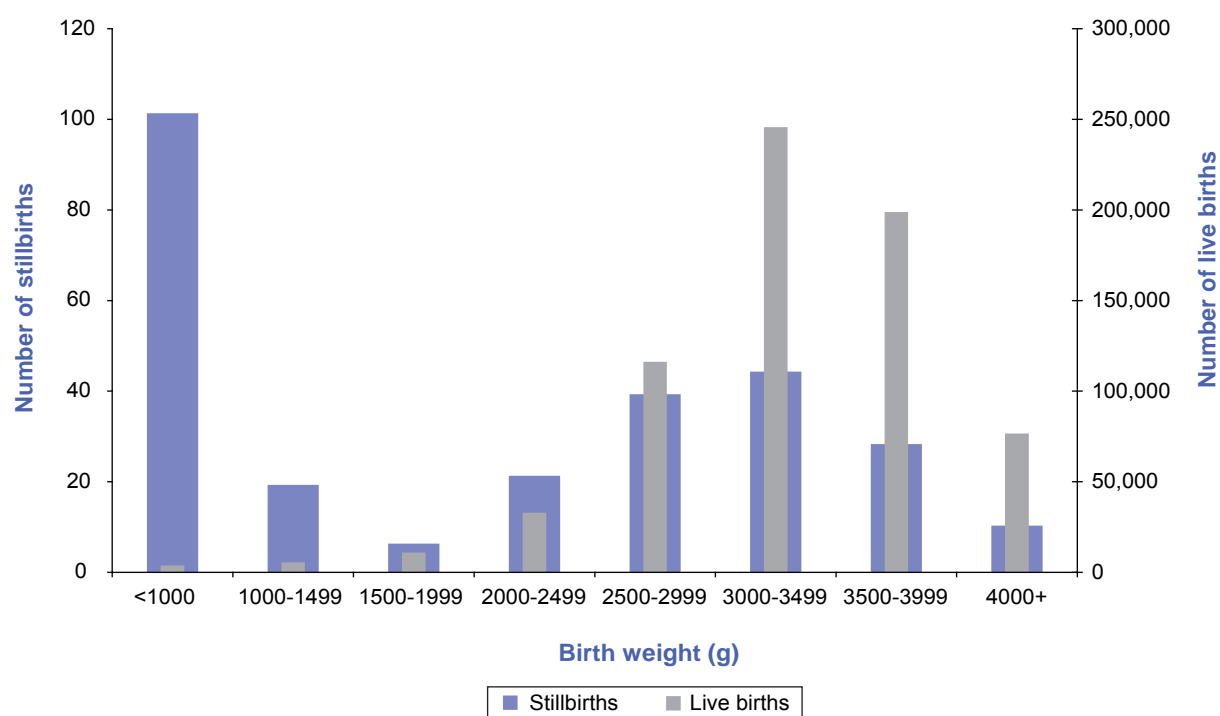
Neonatal deaths due to intrapartum causes by week of gestation; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

Figure 5.4

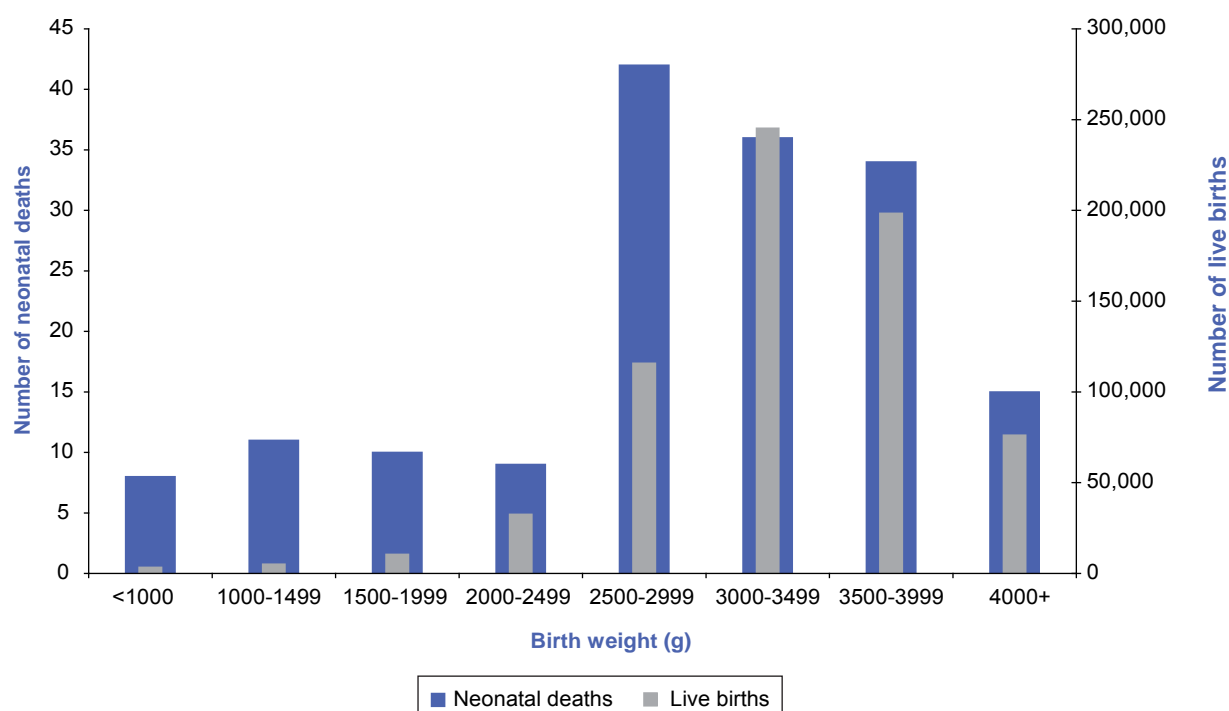
Stillbirths due to intrapartum causes by birth weight; England; Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

Figure 5.5

Neonatal deaths due to intrapartum causes by birth weight; England, Wales and Northern Ireland: 2006.



Sources: CEMACH 2006 & 2007, ONS 2006, NI CHS 2006

5.1.4 Intrapartum deaths and ethnicity

Table 5.2 shows a two-fold increase in intrapartum-related stillbirths in the Black population when compared to the White population. The stillbirth rate in the Indian population was also increased although this was not statistically significant.

Table 5.2

Stillbirths and neonatal deaths due to intrapartum causes by ethnicity; England: 2006.

Ethnicity	Maternities	Stillbirths			Neonatal deaths		
		Number	Rate ^a	Rate ratio [95% CI]	Number	Rate ^a	Rate ratio [95% CI]
Total	629,339	255	0.41	..	146	0.23	..
White	506,844	193	0.38	..	113	0.22	..
Black	34,518	30	0.87	2.3 [1.6, 3.4]	7	0.20	0.9 [0.4, 2.0]*
<i>Black African</i>	20,761	21	1.01	2.7 [1.7, 4.2]	5	0.24	1.1 [0.4, 2.6]*
<i>Black Caribbean</i>	7,179	8	1.11	2.9 [1.4, 5.9]	1	0.14	0.6 [0.1, 4.5]*
<i>Black Other</i>	6,578	1	0.15	0.4 [0.1, 2.8]*	1	0.15	0.7 [0.1, 4.9]*
Asian	50,473	16	0.32	0.8 [0.5, 1.4]*	16	0.32	1.4 [0.8, 2.4]*
<i>Indian</i>	16,940	10	0.59	1.6 [0.8, 2.9]*	6	0.35	1.6 [0.7, 3.6]*
<i>Pakistani</i>	24,331	5	0.21	0.5 [0.2, 1.3]*	8	0.33	1.5 [0.7, 3.0]*
<i>Bangladeshi</i>	9,202	1	0.11	0.3 [0.0, 2.0]*	2	0.22	1.0 [0.2, 3.9]*
Chinese	3,190	1	0.31	0.8 [0.1, 5.9]*	1	0.31	1.4 [0.2, 10.1]*
Mixed	8,657	2	0.23	0.6 [0.2, 2.4]*	2	0.23	1.0 [0.3, 4.2]*
Other	25,657	9	0.35	0.9 [0.5, 1.8]*	6	0.23	1.0 [0.5, 2.4]*
Not known	..	4	..	..	1	..	..

^a Rate per 1000 maternities.

* Rate not significantly different from baseline (white) at the 5% level.

Sources: CEMACH 2006 & 2007
ONS 2006
HES 2006 & 2007

5.1.5 Intrapartum deaths and previous obstetric history

Table 5.3 shows that around half of the stillbirths and neonatal deaths occur in primipara (women who had no previous live births) and in 3.5% of women who had had a previous stillbirth, making prevention based on obstetric history poorly predictive.

Table 5.3

Stillbirths and neonatal deaths due to intrapartum causes by past obstetric history; England, Wales and Northern Ireland: 2006.

Past obstetric history	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Total	269	..	165	..
Previous live births				
0	123	48.2	85	56.7
1	61	23.9	38	25.3
2+	71	27.8	27	18.0
Not known	14	..	15	..
Previous stillbirths				
0	241	96.8	140	96.6
1	8	3.2	5	3.4
Not known	20	..	20	..

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007

5.1.6 Intrapartum deaths and multiplicity

Multiple births are at greater risk of an adverse perinatal outcome compared to singleton births⁵. As shown in section 1.4, the stillbirth rate for multiples was 2.5 times that for singletons and the neonatal mortality rate for multiples was nearly eight times that for singletons. Looking specifically at the intrapartum-related deaths notified in 2006, numbers were small and there were no significant differences (Table 5.4). Table 5.5 shows that mortality rates are higher in singleton preterm babies.

Table 5.4

Stillbirths and neonatal deaths due to intrapartum causes by multiplicity; England, Wales and Northern Ireland: 2006.

Multiplicity	Live births	Stillbirths		Neonatal deaths	
		Number	Rate [95% CI] ^a	Number	Rate [95% CI] ^b
Total	693,503	269	0.39 [0.34, 0.44]	165	0.24 [0.20, 0.28]
Singleton	672,672	255	0.38 [0.34, 0.43]	155	0.23 [0.20, 0.27]
Multiple	20,831	14	0.67 [0.40, 1.13]	8	0.38 [0.19, 0.77]
Not known	-	-	..	2	..

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NI CHS 2006

Table 5.5
Stillbirths and neonatal deaths due to intrapartum causes by multiplicity of term and pre term babies; England, Wales and Northern Ireland: 2006.

Gestation (weeks)	Live births			Stillbirths						Neonatal deaths					
	s		m	Number		Rate [95% CI] ^a		Number		Rate [95% CI] ^b		s		m	
	s	m		s	m	s	m	s	m	s	m	s	m	s	m
Total	673,185	20,317		256	14	0.38 [0.34, 0.43]		155	8	0.23 [0.20, 0.27]				0.39 [0.20, 0.79]	
<37 weeks	41,120	10,757		132	13	3.20 [2.70, 3.80]		37	5	0.90 [0.65, 1.24]				0.46 [0.19, 1.12]	
37+ weeks	626,730	9,390		122	1	0.19 [0.16, 0.23]		117	3	0.19 [0.16, 0.22]				0.32 [0.10, 0.99]	
Not known	5,335	170		2	-	..		1	-	..				..

^a Rate per 1000 total births.

^b Rate per 1000 live births.

s = singleton and m = multiple.

Sources: CEMACH 2006 & 2007
ONS 2005 & 2006
NI CHS 2006

5.1.7 Intrapartum deaths and small for gestational age

The proportion of SGA (birth weight < 10th centile for its gestation) among intrapartum-related deaths was somewhat higher than expected in a normal population distribution. Sixteen percent of stillbirths and 14% of neonatal deaths of intrapartum origin had a birth weight below the 10th centile (Table 5.6).

Table 5.6

Stillbirths and neonatal deaths due to intrapartum causes by SGA; England, Wales and Northern Ireland: 2006.*

SGA	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Total	269	..	165	..
Above 10th centile	223	83.8	139	86.3
Below 10th centile	43	16.2	22	13.7
Not known	3	..	4	..

Note: Percentages are calculated removing missing and not known.

* Rates could not be calculated in the absence of live birth data for SGA.

Sources: CEMACH 2006 & 2007

Child Growth Foundation

5.1.8 Intrapartum deaths and post mortem examination

Although we have seen that requesting a post mortem examination may be perceived as difficult when parents have just lost a baby, autopsies are useful for ascertaining the cause of death more precisely and it helps parents to plan future pregnancies. Thirty-two percent of intrapartum stillbirths and 40% of neonatal deaths of intrapartum origin, had a post mortem performed (Table 5.7). This post mortem uptake for intrapartum stillbirths is lower than, and the uptake for intrapartum-related neonatal deaths is higher than, the national average for England, Wales and Northern Ireland in 2006 (43% and 29% respectively). This is reported in section 4.3.1.

Table 5.7

Stillbirths and neonatal deaths due to intrapartum causes by post mortem examinations; England, Wales and Northern Ireland: 2006.

Post mortem examinations	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Total	269	..	165	..
Held/being arranged	78	31.3	40	26.1
Not offered	26	10.4	17	11.1
Parent or guardian refused permission	143	57.4	72	47.1
Coroner's post mortem	1	0.4	21	13.7
Consent given but post mortem not performed	1	0.4	3	2.0
Not known	20	..	12	..

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007

5.1.9 Intrapartum deaths at term and hypoxia-ischaemia

The 2005 CEMACH perinatal mortality report⁸ showed that nearly two-thirds of all neonatal deaths from intrapartum causes were classified as “intrapartum asphyxia” in term infants. The incidence of intrapartum stillbirths and of severe neonatal encephalopathy of hypoxic origin leading to a neonatal death had also not changed over the period 1993-2001 in two English regions (Trent and Northern region)³⁹. Intrapartum-related neonatal deaths remain one of the most important identifiable causes of neonatal deaths^{31,40}. Previous national and regional confidential enquiries have reported substandard care in as many as 75% of these cases^{41,42} although their reliability was limited by the absence of controls. The contribution and therefore the possible prevention of intrapartum events leading to a hypoxic insult are controversial^{43, 44}. Intrapartum deaths were further sub-classified into “intrapartum asphyxia”. To explore the contribution of intrapartum events to these deaths from an obstetric perspective, a descriptive analysis and a classification of these deaths were performed using the Aberdeen Obstetric classification system³⁸.

The proportion of all stillbirths and neonatal deaths dying because of intrapartum causes was identified using category 3 of the Extended Wigglesworth classification (deaths from intrapartum “asphyxia”, “anoxia” or “trauma”)³⁷. There were 269 stillbirths and 165 neonatal deaths in 2006. Deaths at term attributable to an intrapartum cause³⁷ were identified using the Fetal and Neonatal classification system³⁸. One hundred and seventeen out of these 269 stillbirths and 106 out of these 165 neonatal deaths were born at term within this sub-classification. The stillbirth rate for all term infants who died from intrapartum asphyxia was 0.17 per 1000 total births and the neonatal death rate for all term infants who died because of intrapartum asphyxia was 0.15 per 1000 live births. These rates were similar to the rate for stillbirths of hypoxic-ischaemic origin and for babies dying because of moderate and severe hypoxic-ischaemic encephalopathy (0.2 per 1000 (140/704130 births)) reported for the Trent 12 years cohort³⁹. The 106 term infants’ deaths represented 64% (106/165) of the total of all neonatal deaths attributable to intrapartum causes and the 117 term stillbirths represented 43% (117/269) of the total of all stillbirths due to an intrapartum cause.

These 117 stillbirths and 106 neonatal deaths were further categorised according to the Aberdeen Obstetric classification system³⁸ to describe the causes of death in more detail from an obstetric perspective (Table 5.8). An unexplained cause was by far the most common category (57% for stillbirths and 58% for neonatal deaths). When the cause was identifiable, a catastrophic event at delivery was the most common condition: placental abruption (17% and 15%), cord prolapse and cord compression (9% and 5%). A breech presentation occurred in 3% of stillbirths and there was a malpresentation or a ruptured uterus in 4% of stillbirths and 9% of neonatal deaths. A pre-existing maternal disorder was present in 8% of stillbirths and 6% of neonatal deaths.

Table 5.8

Stillbirths and neonatal deaths due to intrapartum causes at term with "intrapartum asphyxia"; England, Wales and Northern Ireland: 2006.

Aberdeen Obstetric classification	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Total	117	100.0	106	100.0
Congenital anomaly				
<i>Neural tube defects</i>	-	-	-	-
<i>Other anomalies</i>	-	-	-	-
Isoimmunisation				
<i>Due to Rhesus antigen</i>	-	-	-	-
<i>Due to other antigens</i>	-	-	-	-
Pre-eclampsia				
<i>Without APH</i>	1	0.9	-	-
<i>Complicated by APH</i>	-	-	1	0.9
Antepartum haemorrhage				
<i>With placenta praevia</i>	-	-	3	2.8
<i>With placental abruption</i>	20	17.1	16	15.1
<i>APH of uncertain origin</i>	1	0.9	5	4.7
Mechanical				
<i>Cord prolapse or compression with vertex or face presentation</i>	11	9.4	5	4.7
<i>Other vertex or face presentation</i>	2	1.7	4	3.8
<i>Breech presentation</i>	3	2.6	-	-
<i>Oblique or compound presentation, uterine rupture</i>	3	2.6	5	4.7
Maternal disorder				
<i>Maternal hypertensive disease</i>	-	-	-	-
<i>Other maternal disease</i>	3	2.6	4	3.8
<i>Maternal infection</i>	6	5.1	2	1.9
Miscellaneous				
<i>Neonatal infection</i>	-	-	-	-
<i>Other neonatal disease</i>	-	-	-	-
<i>Specific fetal conditions</i>	-	-	-	-
Unexplained				
<i>Equal or greater than 2.5kg</i>	63	53.8	56	52.8
<i>Less than 2.5kg</i>	3	2.6	4	3.8
<i>Unclassifiable</i>	1	0.9	1	0.9

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007

The proportion of SGA (birth weight < 10th centile for its gestation) among intrapartum deaths at term with hypoxic ischaemia was higher than expected in a normal population distribution. Seventeen percent of stillbirths and 19% of neonatal deaths of intrapartum origin had a birth weight below the 10th centile (Table 5.9).

Table 5.9

SGA in stillbirths and neonatal deaths due to intrapartum causes at term with “intrapartum asphyxia”; England, Wales and Northern Ireland: 2006.

	Stillbirths		Neonatal deaths	
	Number	%	Number	%
Intrapartum asphyxia	117	..	106	..
< 10th centile	19	16.2	18	17.0
< 3rd centile	6	5.1	5	4.7
Missing SGA data	5	..	10	..

Note: Percentages are calculated removing missing and not known.

Sources: CEMACH 2006 & 2007
Child Growth Foundation

5.1.10 Conclusions

The incidence of deaths due to intrapartum adversity has not changed over the last six years. Half of these stillbirths and neonatal deaths remain unexplained by CEMACH's current classification system. Despite this, the post mortem uptake in stillbirths is lower and uptake in neonatal deaths is higher than the national average. Among identifiable causes, top of the list are catastrophic events such as placenta abruption, cord prolapse, cord compression and malpresentation. A review of these cases will be required to ascertain if some of these deaths are preventable. Maternal infection is a significant factor in stillbirths.

The burden of these cases is in fetuses and babies born at term with birth weights between 2.5 and 4kg. An associated risk factor for stillbirths is Black ethnicity. The proportion of SGA is higher in both stillbirths and neonatal deaths.

Intrapartum-related deaths are planned to be the subject of the next CEMACH perinatal enquiry to gain more knowledge about these cases including avoidable factors and the quality of care they received, a priority as suggested by the CMO's 2006 report³⁰.

5.2 Deliveries at home: stillbirths and neonatal deaths

5.2.1 Background

Definition:

The Maternity Standard of the National Service Framework for Children, Young People and Maternity Services published by the Department of Health in 2004⁴⁵ recommends that “women should have easy access to supportive, high quality maternity services, designed around their individual needs and those of their babies”. Women are currently able to choose a place to give birth from a number of different settings including hospital, a birth centre or at home. The Maternity Standard (p 28) advocates that “home births should be offered within a risk management framework and with adequate local infrastructure and support”⁴⁵. The relative safety of home birth has been examined in many large studies but remains an area of debate⁴⁶⁻⁴⁸. Home birth is defined in this analysis as a birth taking place at the mother’s residence.

Whilst this analysis does not provide a definitive answer to questions raised about the safety of home births, it does provide information about the total number and characteristics of pregnancies delivered at home and which ended in a stillbirth or a neonatal death. These are discussed further below. The CEMACH data also allow for differentiation between deliveries planned at home at the time of booking, at onset of labour, and unplanned home deliveries.

5.2.2 Results

In 2006, there were 18,132 live births at home in England, Wales and Northern Ireland. Of the 7237 deaths that were notified to CEMACH in 2006 as late fetal losses, stillbirths or neonatal deaths, 95 (1.3%) were delivered at home. Table 5.10 shows the type of deaths according to whether delivery at home was planned or not. The vast majority of these 95 deaths during a delivery at home were not planned as home births. Sixty-one percent were booked to deliver in hospital and 29% were unbooked. Only 9 out of 87 (10%), for whom intended place of delivery information was available, were planned home deliveries: these include three stillbirths and six neonatal deaths. The gestational ages of these three stillbirths at the time of death were 33, 38 and 40 weeks. Only one of these three stillbirths occurred intrapartum. The gestational ages of the neonatal deaths were one at 38 weeks, one at 39 weeks, two at 40 weeks and two at 41 weeks.

Table 5.10

Late fetal losses, stillbirths and neonatal deaths according to unplanned/planned home births; England, Wales and Northern Ireland: 2006.

Case type	2005		2006	
	Unplanned	Planned	Unplanned	Planned
Total	105	14	78	9
Late fetal losses	16	1	9	-
Stillbirths	52	4	41	3
Early neonatal deaths	31	7	20	3
Late neonatal deaths	6	2	6	3
Not known	-	-	1	-

Sources: CEMACH 2005-2007

The stillbirth rate for babies born at home regardless of whether they were unplanned or planned is 2.4 [1.8, 3.3] which is significantly lower than for all stillbirths (5.3 [5.1, 5.5]). The home births perinatal death rate is 3.7 [2.9, 4.7], this is also significantly lower than for all perinatal deaths (7.9 [7.7, 8.1]). The home births neonatal death rate (1.8 [1.2, 2.5]) was also significantly lower than that for all neonatal deaths (3.4 [3.3, 3.6]).

Table 5.11 shows the causes of deaths of these home births. The main cause of neonatal deaths in unplanned births at home was immaturity and most stillbirths were recorded as “ante partum”. Overall, for stillbirths and neonatal deaths an intrapartum-related cause of death (15/79) was more frequently represented than in the maternity population (19% versus 7%). Out of nine planned home births that resulted in death: of the three stillbirths, one was attributable to an intrapartum cause and two were unexplained ante partum deaths; of the six neonatal deaths, two related to infection; one was classified as an accident or non-intrapartum trauma and three were attributed to sudden infant death syndrome (occurring at 2, 15 and 23 days after birth).

Table 5.11
Cause of stillbirths and neonatal deaths according to unplanned/planned home births; England, Wales and Northern Ireland: 2006.

Cause of death	Unplanned			Planned			Rate [95% CI] ^a	
	Stillbirths	Neonatal deaths	26	Stillbirths	Neonatal deaths	6	Stillbirth ^b	Neonatal death ^c
Total	41		26	3		6	2.4 [1.8, 3.3]	1.8 [1.3, 2.5]
Congenital malformations	3		2	-		-	0.2 [0.1, 0.5]	0.1 [0.0, 0.4]
Antepartum haemorrhage	2		-	-		-	0.1 [0.0, 0.4]	-
Maternal disorder	-		-	-		-	-	-
Pre-eclampsia	1		-	-		-	0.1 [0.0, 0.4]	-
Death from intrapartum causes	8		6	1		-	0.5 [0.2, 1.0]	0.3 [0.1, 0.7]
Immaturity	-		10	-		-	-	0.6 [0.3, 1.0]
Infection	1		4	-		2	0.1 [0.0, 0.4]	0.3 [0.1, 0.7]
Other specific causes	2		-	-		-	0.1 [0.0, 0.4]	-
Sudden infant death	-		2	-		3	-	0.3 [0.1, 0.7]
Accident or non-intrapartum causes	-		-	-		1	-	0.1 [0.0, 0.4]
Unexplained antepartum fetal death <2500g	16		-	1		-	0.9 [0.6, 1.5]	-
Unexplained antepartum fetal death 2500g+	4		-	1		-	0.3 [0.1, 0.7]	-
Unclassifiable	4		1	-		-	0.2 [0.1, 0.6]	0.1 [0.0, 0.4]
Not known	-		1	-		-	..	..

^a Included both unplanned and planned home births.

^b Rate per 1000 total births.

^c Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

5.2.3 Delivery intended at home at onset of labour

We acknowledge that “planned home deliveries” at booking are not the same as those “planned at the onset of labour” and that women may change their plans during a pregnancy. This year’s CEMACH data allow for differentiation between deliveries at home that were planned and unplanned at the onset of labour. Table 5.12 shows that in half of the cases that ended in a stillbirth or neonatal death, delivery was planned at onset of labour to be at home but transferred to hospital for delivery to occur. Most stillbirths occurred in hospital while most deliveries ending in neonatal deaths happened at home.

Table 5.12

Place of delivery when intended to deliver at home at onset of labour; England, Wales and Northern Ireland: 2006.

Case type	Actual place of delivery	
	Home	Hospital
Total	10	11
Stillbirths	2	10
Early neonatal deaths	5	0
Late neonatal deaths	3	1

Sources: CEMACH 2006 & 2007

The two stillbirths that were planned at home at the onset of labour and that were born at home delivered at 33 and 40 weeks’ gestation. Of these two stillbirths, one died of intrapartum causes and the other was an unexplained antepartum death. The 10 stillbirths planned at home but who were born at a hospital were delivered at 36 to 41 weeks, 40% of these stillbirths died of intrapartum causes.

The gestation of neonatal deaths planned at onset of labour and delivering at home ranged from 27 to 41 and survived for between 0 to 23 days after birth. One of these eight babies died from immaturity, two died from infections, one died from an accident or non-intrapartum cause, and four died from sudden infant death. The neonatal death planned at home but who delivered in hospital was born at 40 weeks’ gestation, lived for two days, and died of intrapartum causes.

5.2.4 Conclusions

Stillbirth and neonatal mortality remain commonly used indicators for examining the relative safety of different birth settings. When considering the intended place of delivery (as determined at booking for antenatal care), it is clear that the vast majority of cases were not originally planned as home births. Thus their outcome should not give rise to concern about risk management standards in respect of planned home deliveries: just under two-thirds of these cases originally intended to deliver at a hospital and over one quarter were unbooked pregnancies. It is possible that in many of these cases, women went into labour unexpectedly: 39% (12/31) of all neonatal deaths in this group were related to immaturity.. The high number of home births that were unexpected home deliveries or unbooked pregnancies may also explain the high proportion of deaths classified as ‘intrapartum-related’ deaths. A strategy to reduce perinatal mortality in these cases is likely to be difficult.

A minority of perinatal deaths (three stillbirths and six neonatal deaths) were planned home births at the time of booking; an intrapartum cause was identified for one of these. This is a smaller number than in 2005 when there were four stillbirths and nine neonatal deaths. There were three deaths during the neonatal period that were classified as sudden infant deaths (SIDS). The home birth (unplanned and planned) neonatal rate for SIDS is 0.3 [0.12, 0.66] is statistically significantly higher than when compared to all neonatal deaths from

SIDS (0.1 [0.06, 0.10]). These numbers are small and may have been subjected to random variation. While these cases could be compared to UK CESDI data published ten years ago⁴⁹, it would be very useful to gather information on denominator data for planned home births in the future to compare with the rate in the general population.

The CEMACH data collection system cannot estimate the perinatal mortality rates in deliveries occurring at home or planned home births because information on the number of live births at home is not currently available for the whole of England, Wales and Northern Ireland and data about intended place of delivery are incomplete in maternity HES²⁵. In order to provide further information relevant to evaluation of the safety of planned home deliveries, CEMACH has during 2006 collected information on deaths in hospital where delivery was planned to be at home at the onset of labour. This shows that nearly half of the births where the baby died and the delivery was planned at home at the onset of labour, actually occurred in hospital.

The additional information collected by CEMACH in 2006 on cases where the birth was planned to be at home at onset of labour, identified that 10 cases resulted in a stillbirth or neonatal death at home and 11 cases resulted in a stillbirth or neonatal death in hospital. Without denominator data on intention to deliver at home at onset of labour, it is impossible to determine the mortality rate in deliveries in such circumstances. However, the relatively low number of stillbirths and neonatal deaths occurring in these circumstances would not appear to substantiate major concerns about risk management standards in relation to births planned to be at home at onset of labour. Government policy on improving choice for women in respect of place of birth requires the maintenance of high standards of risk management, should the number of planned home births increase. CEMACH will continue to monitor in this area to ensure that if there is any need for concern, this is identified at an early stage.

5.3 Deliveries at freestanding midwifery units: stillbirths and neonatal deaths

5.3.1 Background

Definition:

Our definition of a Freestanding Midwifery Unit (FMU), which was used by the Healthcare Commission in their Maternity Services Review⁶⁰, is as follows:

An NHS clinical location offering care to women with straightforward pregnancies during labour and birth in which midwives take primary professional responsibility for care. General Practitioners may also be involved in care. During labour and birth diagnostic and treatment medical services including obstetric, neonatal and anaesthetic care, are not immediately available but are located on a separate site should they be needed. Transfer will normally involve car or ambulance.

As mentioned above for home births, the Maternity Standard of the National Service Framework for Children, Young People and Maternity Services published by the Department of Health in 2004⁴⁵ recommends that “women should have easy access to supportive, high quality maternity services, designed around their individual needs and those of their babies”. Women are currently able to choose to give birth in an FMU instead of the maternity hospital. The relative safety of FMUs needs further quality studies⁵¹⁻⁵⁴. This remains an area of significant debate. On one side of the argument, the development of FMUs provides further choice for women in a setting where a conventional midwifery approach can be fully implemented including “need for respect, recognition and support of the physiological processes of birth while recognising deviation from the norm”⁵⁵. On the other side of the argument, there is a concern that these FMUs “are being promoted before their safety has been established”⁵⁶.

Whilst this analysis cannot provide a definitive answer to questions raised in the debate about the safety of FMUs, it does provide information about the number and characteristics of pregnancies delivered in these centres and which ended in a stillbirth or a neonatal death. These are set out below.

5.3.2 Results

There are 59 FMUs in England, of which nine reported late fetal losses, stillbirths or neonatal deaths. The number of deliveries with these outcomes ranged from one to two per FMU. Table 5.13 shows that there were 11 deaths recorded: one late fetal loss, two stillbirths, four early neonatal deaths and four late neonatal deaths. Of the nine FMUs that were the place of delivery of the reported deaths, four also provided CEMACH with their number of live births for 2006. The other five had their live births figures provided in combination with other larger units. Because of this we are unable to distinguish which babies were born at the larger unit and which babies were born in the FMU and so rates cannot be calculated.

Of the 11 babies who were delivered in an FMU and died, three (27%) died within the FMU (one late fetal loss and two stillbirths), two (18%) died at home (two late neonatal deaths), one (9%) died in a children’s hospital (late neonatal death) and the remaining five (45%) died in the closest consultant-led unit to the FMU (four early neonatal deaths and one late neonatal death).

Table 5.13

Late fetal losses, stillbirths and neonatal deaths that were delivered in freestanding midwifery units; England: 2006.

Case type	Total
Total	11
Late fetal losses	1
Stillbirths	2
Early neonatal deaths	4
Late neonatal deaths	4

Sources: CEMACH 2006 & 2007

Table 5.14 shows the recorded causes of deaths in FMUs. There was one intrapartum stillbirth and one intrapartum-related neonatal death both of which delivered at 39 weeks' gestation, one case of unexplained antepartum fetal death (35 weeks' gestation) and one sudden infant death at 37 weeks' gestation and postnatal age 24 days.

Table 5.14

Cause of stillbirths and neonatal deaths that were delivered in freestanding midwifery units; England: 2006.

Cause of death	Stillbirths	Neonatal deaths	Total
Total	2	8	10
Congenital malformations	-	2	2
Death from intrapartum causes	1	1	2
Infection	-	1	1
Other specific causes	-	1	1
Sudden infant death	-	1	1
Unexplained antepartum fetal death <2500g	1	-	1
Unclassifiable	-	1	1
Not known	-	1	1

Sources: CEMACH 2006 & 2007

5.3.3 Conclusions

As for home births, a small number of cases, two stillbirths and eight neonatal deaths, occurred in FMUs. There were two intrapartum-related deaths and one neonatal death that was classified as a sudden infant death. In the future, it would, however, be useful to have precise denominator data from FMUs. At present, the data of some FMUs are merged with those of other larger units and this does not allow for the calculation of mortality rates as a measure of outcome.

The Birthplace in England Research Programme (Birthplace, www.npeu.ox.ac.uk/birthplace), funded by the National Institute for Health Research Service delivery and Organisation Programme and the Department of Health and led by the National Perinatal Epidemiology Unit at the University of Oxford, has been designed to provide more information about the safety and quality of care of births occurring at home or in FMUs raised by these CEMACH findings.

5.4 New CEMACH perinatal deaths classification system: a preliminary report

5.4.1 Background

The current CEMACH classification systems are based on the Aberdeen Obstetric classification system published in 1986³⁷, a Fetal and Neonatal classification system published at the same time³⁸ and the Extended Wigglesworth system published by CESDI in its first annual report in 1993⁵⁷. However, these systems lead to over 50% of stillbirths being classified as 'unexplained' and 48% of neonatal deaths as due to 'immaturity'. Other systems may result in a lower proportion of 'unexplained' stillbirths^{39,40}. For example, the Australia and New Zealand Antecedent Classification of Perinatal Mortality classifies 32% of stillbirths as 'unexplained' using obstetric antecedents and uses supplementary codes for important factors contributing to neonatal deaths⁵⁸. The lack of consistency between many classification systems also leads to difficulties in allowing valid comparison of data¹¹.

More precision about the causes of deaths from an improved perinatal mortality classification system would increase the value of CEMACH perinatal mortality surveillance reports to clinicians, epidemiologists and those responsible for planning services. Additional knowledge about factors associated with perinatal mortality, even though not directly causal, could lead to the identification of potentially promising areas for targeted clinical research into the causes of stillbirths and neonatal deaths. The ultimate aim is for better information to inform interventions that might reduce perinatal mortality. A Perinatal Mortality Classification Review Advisory Group (PMCRAAG) (Chair: Dr Steve Gould) was established to review the CEMACH classification of perinatal deaths. PMCRAAG involved key professional disciplines, such as midwifery, neonatology, obstetrics, pathology, public health and ONS. The Stillbirths and Neonatal Deaths Society (SANDS), a leading UK charity supporting bereaved parents, provided a lay perspective. This is a brief description of progress to date in this process of classification revision.

5.4.2 Methodology

A review of the literature and existing classification systems was undertaken to see if another established classification systems could be used, adapted or modified. Whilst many systems reduced the proportion of deaths that were classified as unexplained, they often relied on resources unavailable to CEMACH or would have precluded continuity with previous data.

Obstetric classification

It was decided therefore to modify the current obstetric classification to maintain the underlying basis of the current system i.e. to have a hierarchical system based on the initiating factor or event that adequately described the death. Changes involved modifications to the process of classification (linked closely to a new PDN form), and to the categories and subcategories within the classification system. Modifications included the recording of more than one factor implicated in the death: one main factor and up to two additional factors. The main changes to the obstetric classification system included: simplifying the major categories; introducing infection, placental pathology and growth restriction as specific categories; and introducing a category to identify significant associated factors and the recording of intrapartum asphyxia.

Neonatal classification

The Fetal and Neonatal classification (F&N) has been used to classify stillbirths and neonatal deaths, according to their pathophysiological cause of death. When applied to stillbirths, 93% of stillbirths fell into one of three main categories: Congenital malformation (16%); Antepartum asphyxia (70.3%) and Intrapartum asphyxia (7.3%). The proposed modifications to the obstetric classification meant that as none of this information would be lost, there would be no value in maintaining an F&N classification system for stillbirths.

A classification system for neonates only was developed (CEMACH collects data on deaths up to 28 days of age) although it could be applied to other infant deaths if required. The classification is similar in principle to that published by the Perinatal Society of Australia and New Zealand (PSANZ) neonatal classification⁵⁸ with some differences in the major categories and hierarchy. There is also some simplification with fewer subcategories.

5.4.3 Redeveloping the data collection tool

The data collection tool was revised to support the changes to the classification system and to improve the quality and completeness of some existing data items. The form was streamlined to reflect better the order of patient notes, to collect new data items, and to reduce local reporter workload by removing the need for death classification.

New data items included risk factors of previous pregnancies, final mode of delivery, type of caesarean section and post mortem status. Items on cause of death were reconfigured to reflect the new classification system (Appendix E). In reconfiguring the perinatal death classification system, regional managers will code the cause of death using the new classification system, information provided from the PDN and any additional information such as post mortem results.

5.4.4 Pilot

A small pilot study was carried out on the new form and classification system in July and August 2007. The pilot consisted of a sample of 50% of stillborn and neonatal deaths reported to two CEMACH regional offices (including East Midlands, Yorkshire and Humberside and East of England) over a three month period (1st January to 31st March 2007). Of this sample, 73% (118 cases) had a pilot case form completed, and thus, were included in the comparison of the classification systems.

The modified obstetric classification seeks to add more detail to the known underlying causes of death and associated factors to reduce the proportion of cases that appeared to be unremarkable until such time as the baby died. A comparison of classification under the two systems is given in Table 5.15. Because the second classification process was undertaken three months after the first, and more information was available mainly from autopsy data, the relatively minor discrepancies between categories where case numbers might be expected to be unchanged is not surprising.

Probably the most significant condition now more formally factored into the classification system is growth restriction. As noted above (Table 4.3), 38% of unexplained (old system) singleton stillbirths are less than the 10th centile, a not too dissimilar figure to that identified in other studies⁵⁷. In the pilot, a much smaller proportion of cases was identified as growth restricted under the new system, even when IUGR was recorded as a secondary cause. This might be partly due to the small numbers involved but inexperience in recognising and recording growth restriction using the new system may have contributed.

Table 5.15

Comparison of old and new obstetric classification system; East Midlands, East of England and Yorkshire and Humberside: 2007.

Old			New		
Cause of stillbirths	Number	%	Cause of stillbirth	Number	%
Total	85	..	Total	85	..
Congenital malformation	12	14.5	Congenital malformation	15	17.6
Pre-eclampsia	5	6.0	Isoimmunisation	-	-
Antepartum haemorrhage	8	9.6	Pre-eclampsia Toxaemia	6	7.1
Death from intrapartum causes	3	3.6	Antepartum or intrapartum haemorrhage	9	10.6
Mechanical	-	-	Mechanical	2	2.4
Maternal disorder	5	6.0	Maternal disorder	3	3.5
Infection	1	1.2	Infection	4	4.7
Other specific causes	3	3.6	Specific fetal conditions	-	-
			Specific placental conditions	4	4.7
			Intra-uterine growth restriction	7	8.2
			Associated obstetric factors	3	3.5
Accident or non-intrapartum causes	-	-			
Unexplained antepartum fetal death	46	55.4	No antecedent or associated factors	32	37.6
Unclassifiable	-	-	Unclassified	-	-
Not known	2	..			

Note: Percentages are calculated removing missing and not known.

Source: CEMACH 2007

5.4.5 Conclusions

The pilot study was small and focussed primarily on obstetric classification and so conclusions are limited. Further it tested a new process and form as well as a new classification. There is no indication that there is a problem with the underlying principles of the classification but there are certain areas that need to be defined more clearly. Growth restriction is the most obvious. Further clarity is also needed in the use of the hierarchy when classifying by primary or main causes and secondary or other contributing factor. Training of those involved in the classification process will be critical.

This represents work in progress. It is intended that changes should, as far as possible be introduced progressively and it may be a number of years before full implementation. Both ICD-10 coding and customised birth weight centiles are intended future steps when this is better established.

Chapter 6 Feedback on 2005 report

6.1 Introduction

As part of its ongoing perinatal mortality surveillance work, CEMACH produces individual perinatal mortality reports for NHS Trusts, Neonatal Networks and Strategic Health Authorities (SHA) as well as the national overview report. These reports are produced on an annual basis and distributed to all NHS Trusts in Englandⁱ, Wales and Northern Ireland and to all Neonatal Networks and SHAs in England.

As part of the distribution for the 'Perinatal Mortality 2005' report, in 2007 a short questionnaire was sent with each report asking for feedback on the individualised reports. There are 172 NHS Trusts in England, Wales and Northern Ireland, 24 Neonatal Networks and 10 SHAs.

Each Trust report was sent to approximately nine key contacts in each NHS Trust:

- Head of midwifery services
- Clinical director of obstetrics/maternity/women's health directorates
- Clinical director of paediatrics/neonatology
- Local unit co-ordinators
- Consultant obstetricians
- Consultant neonatologists
- Pathologists
- Directors of nursing
- Risk manager/Clinical governance lead (Maternity Care).

Each Neonatal Network report was sent to the Network chairs, and each SHA report was sent to the Chief Executive, Director of Public Health, and to the local supervisory authority midwife.

This section reports the feedback received in these questionnaires.

6.2 Response rate and general findings

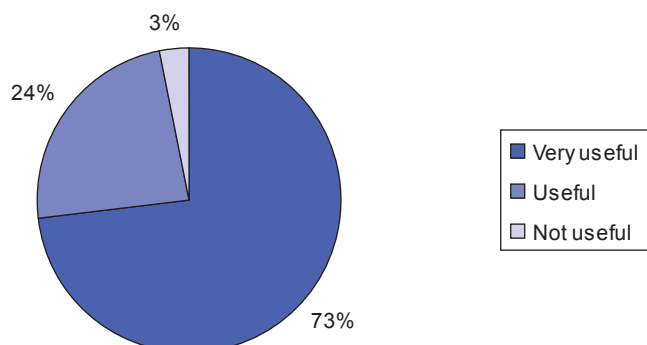
In total we received 215 completed questionnaires. We received 211 from NHS Trusts and four from Neonatal Network chairs.

Figure 6.1 outlines respondents' perception on the usefulness of their individual reports. Collectively, 73% of the 215 responders found their individual report 'very useful', and 24% found it 'useful'. Three percent (n=6) found the individual report 'not useful'.

ⁱ with the exception of Trusts in the North East of England who already receive this information via the Regional Maternity Survey Office.

Figure 6.1

Summary of respondents' perceptions on the usefulness of their individual reports.



We looked more closely at the six responders who did not find the report useful. These responses were due to data inaccuracy (n=2) and missing data (n=2). The remaining two responders did not provide a reason.

The data issues reported were investigated and resolved following the comments received.

6.3 How the individual Trust, Neonatal Network or SHA reports are used in organisations

The questionnaire asked the recipient if they planned to discuss the perinatal mortality findings contained in the individual CEMACH report within their organisation. Ninety-two percent stated that they would. When asked where in the organisation the report would be discussed, respondents noted the following as examples: perinatal meetings, local clinical governance meetings, divisional board meetings, joint paediatric meetings, Neonatal Network meetings and audit forums.

6.4 What aspects of the individual report are most useful

Every section of the 2005 individual reports was considered useful by at least 50% of all responders. Findings from this section of the questionnaire show that the presentation of rates of fetal losses, stillbirths and neonatal deaths were considered particularly useful aspects of the reports.

Table 6.1 gives the percentage of respondents who considered each section useful.

Table 6.1
Sections considered useful by participants.

Area of report	%
Rate of fetal losses, stillbirths and neonatal deaths	67
Number of late fetal losses, stillbirths and neonatal deaths	63
Birth weight and gestation data	61
Neonatal mortality funnel plots	60
Number of congenital anomalies	55
Stillbirth funnel plots	54

6.5 Areas for development and improvement

Over a third (38%) of those who returned the questionnaire suggested further developments to the reports. These comments are particularly useful to CEMACH to enable the development of the way we analyse and present data in these reports in future.

The most commonly cited suggestions are presented in this section.

- Analysis of Trusts to be carried out in comparison with NHS Trusts providing similar services, e.g. by tertiary services, teaching hospitals or levels 1, 2 or 3 neonatal services.
- To adjust mortality rates for deprivation, ethnicity and postcode.
- To adjust mortality rates by gestation/birth weight excluding congenital anomalies.
- To present and discuss possible trends, outcomes and reasons for the findings.
- To present charts showing comparisons between stillbirths, neonatal deaths and perinatal deaths over past years.
- To show three to five year rolling averages so as to provide more robust statistical information.

-
- To analyse mortality relating to obesity.
 - To include hypoxic ischaemic encephalopathy as a cause of death.
 - To provide funnel plots of intrapartum stillbirths.
 - Identify units/ and Trusts in reports (Neonatal Network specific).
 - To provide details on the stillbirths and neonatal deaths, rather than figures.
 - Denominator data for gestation, birth and post mortems.

Additional suggestions

- “Could CEMACH ask Trusts for additional information on congenital anomalies and subsequent terminations before 24 weeks?”
- “The perinatal mortality data presented is two years out of date – is it possible to work faster and issue results sooner?”
- “Should we not have weight/BMI etc added to a national proforma?”
- “It would be quite useful to define the nature of the units on the scatter graphs.”
- “Excellent plot and much better than before but if changes are to be made then data must become interpretable and useful and not hide behind graphs.”
- “More precise advice and recommendations on how to improve the situation.”

6.6 Additional comments

Almost half (44% (n=95)) of those who returned the questionnaire gave additional comments. Responses to this section were largely positive, and key themes arose on several occasions, in particular, with regards to the possible adjustments that could be made to the data. The development work that has been undertaken since these reports were distributed, and since this feedback was received, has incorporated where possible, these comments.

A sample of positive comments:

- “Very interesting and important for units to receive feedback and comparison with regional and national data”.
- “Much more useful than anonymous data.”
- “Excellent report, thank you for your hard work, keep them coming.”
- “Excellent, user friendly report and especially the individual Trust information...very useful and encouraging to staff...”
- “An excellent report, particularly for deciding on the management of specific antenatal clinics e.g. the ethnic minority clinics, radical clinics.”
- “Really pleased with the individual report in addition to national information - a well presented report.”
- “We include these results in our annual hospital mortality programme.”
- “Allows us to see where we stand and can act an incentive to react and learn.”
- “Helps to improve standards of record keeping.”

- “Very useful for benchmarking and understanding the breakdown in the statistics.”
- “Easy to read, good to be able to compare local with regional and national figures.”
- “Very useful to reinforce confidence in areas of good performance. Long overdue benchmarking opportunities.”

Negative comments:

- “The statistics are too crude to be a useful measure at how Trusts and Networks are performing.”
- “Data should have been made available to Trusts before producing the final analysis.”
- “Data had not been sent to the correct Consultant.”

6.7 Summary and next steps

Overall the feedback shows that the Trust specific perinatal mortality reports have been well received and are being used locally to discuss and review perinatal deaths. Many of the suggestions for development have been incorporated for the 2006 reports such as excluding congenital anomalies for comparative purposes and further improving the comparability of the data. We are also working on improving the timeliness of the data. To achieve this we are intending in future to provide Trust and Network specific reports within 12 months of the year end and the national analytical report within 15 months of the year end. We hope that the earlier quantitative data will be useful even though the national report will follow some time later. The feedback exercise will be repeated for the 2006 reports as we strive to continue to develop and improve the perinatal mortality surveillance system.

The CEMACH work programme

CEMACH perinatal mortality surveillance in context

CEMACH's work on perinatal mortality surveillance is part of an integrated enquiry programme. This section places this work in the context of the wider enquiry programme.

Maternal Death Enquiry

CEMACH undertakes ongoing enquiries into maternal deaths in the UK. There is a triennial report setting out the results of the case reviews into maternal deaths. The most recent report covering the years 2003-5 was issued on 4 December 2007. This can be downloaded from the CEMACH website or purchased in hard copy form from www.cemach.org.uk.

Child Death Review

CEMACH started work on a new national confidential enquiry into child health in 2004. We are now completing our first child health enquiry. This involves a review of all child deaths in 2006 in Wales, Northern Ireland, the West Midlands, South West and North East of England. This is a pilot study to inform CEMACH's future work on the child health enquiry. We also aim to identify the extent of avoidability in child deaths and to generate information about important issues in child health that require further research and/or enquiry work. The report of the Child Death Review is due in April 2008. Further information on the Child Death Review can be found at <http://www.cemach.org.uk/Programmes/Child.aspx>.

Obesity in Pregnancy

CEMACH has commenced work on a project on obesity in pregnancy. This topic was selected by our national advisory committee because of their concerns about the role of obesity in increasing pregnancy risks, an issue identified by our enquiry work on maternal deaths and perinatal mortality surveillance. The aim will be to carry out an organisational survey of services for obesity in pregnancy, develop consensus clinical care standards, improve knowledge of prevalence and carry out a confidential enquiry into care provided in the UK. There will be a number of reports over the project period of 2008-10. Further information on the obesity project can be found at <http://www.cemach.org.uk/Programmes/Maternal-and-Perinatal/Maternal-Obesity.aspx>.

Intrapartum mortality and neonatal encephalopathy

We are developing a project on intrapartum mortality and neonatal encephalopathy. The intention is to carry out an organisational survey, develop consensus standards, improve knowledge of prevalence and carry out a national clinical audit of care provided in England, Wales and Northern Ireland. Consideration will be given to whether to extend the project, with partners, to include a case control study, given the potential significance of this area in terms of costs of clinical negligence. Further information on this study can be found at <http://www.cemach.org.uk/Programmes/Maternal-and-Perinatal/Neonatal-Encephalopathy.aspx>.

Head Injury in Children

Our national advisory committee recommended we develop a project on accidental injury in children. Head injury is the leading cause of childhood mortality and in non-fatal cases may result in severe morbidity in children. CEMACH is carrying out a feasibility study into a project to evaluate early care provided in cases of head injury in children. This will require us to be able to match notes relating to care at the scene of the accident with intensive care records. We aim to develop the study ultimately for national roll-out. We are grateful to PICANET and London

Ambulance Service (LAS) for their input into the feasibility study for this project.



“BEADI” project

The national charity BLISS has funded CEMACH to carry out a study, the BLISS trial for the Effect of Active Dissemination of Information (BEADI). This will compare the impact of an active strategy for dissemination of confidential enquiry findings with more traditional approaches. This project concludes with a final report in 2009.

Diabetes in Pregnancy

CEMACH has now almost completed its diabetes in pregnancy project for England, Wales and Northern Ireland. Two reports were issued in 2007 to complete the series of reports and papers produced on this project. These reports cover the results of the enquiry into standards of care provided to women with diabetes in pregnancy and a report on the care of babies delivered to women with diabetes. A further short report on anaesthesia for women with diabetes having a caesarean section is planned to be issued in 2008. The completed reports can be downloaded from the CEMACH website at <http://www.cemach.org.uk/Programmes/Maternal-and-Perinatal/Diabetes-in-Pregnancy.aspx>.



CEMACH/UCL project on diabetes in pregnancy

Following the successful conclusion of the main CEMACH studies into diabetes in pregnancy project, Novo Nordisk have funded a collaborative project now being undertaken by UCL and CEMACH to further study issues which had not been fully explored by the main CEMACH diabetes in pregnancy project. These include preconception care and postnatal care offered to women who have developed gestational diabetes. Further information on this study can found at <http://www.cemach.org.uk/Programmes/Maternal-and-Perinatal/CEMACH-UCL-Diabetes-Project.aspx>.

Further information

Further information on CEMACH and these work programmes can be obtained from the website www.cemach.org.uk.

CEMACH Reports, published articles, editorials & abstracts (2006-2007)

Reports

2006

Confidential Enquiry into Maternal and Child Health. Perinatal Mortality Surveillance, 2004: England, Wales and Northern Ireland. London: CEMACH; 2006.

2007

Confidential Enquiry into Maternal and Child Health. Perinatal Mortality 2005: England, Wales and Northern Ireland. CEMACH: London; 2007.

Confidential Enquiry into Maternal and Child Health. Diabetes in Pregnancy: Are we providing the best care? Findings of a National Enquiry: England, Wales and Northern Ireland. CEMACH: London; 2007.

Confidential Enquiry into Maternal and Child Health (CEMACH). Diabetes in Pregnancy: caring for the baby after birth. Findings of a National Enquiry: England, Wales and Northern Ireland. CEMACH: London; 2007.

The Confidential Enquiry into Maternal and Child Health (CEMACH). Child Death Review: Report on Case Ascertainment and Data Acquisition. CEMACH: London; 2007.

Lewis G (ed) The Confidential Enquiry into Maternal and Child Health (CEMACH). Saving Mothers' Lives: reviewing maternal deaths to make motherhood safer – 2003-2005. The Seventh Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. CEMACH: London; 2007.

Published articles, editorials and abstracts

2006

Acolet D, Fleming KM, Bailey J, Macintosh M, Hawdon J. Standards of postnatal care in babies of mothers with pregestational diabetes in England, Wales and Northern Ireland in 2002/03. *Arch Dis Child* (Proceedings of the 10th Spring Meeting of Royal College of Paediatrics and Child Health) April 2006;1(1):A18.

Should obese women with polycystic ovary syndrome receive treatment for infertility? Given the risks such women will face in pregnancy, they should lose weight first. Balen AH, Dresner MT, Scott EM, **Drife, JO.** *Br. Med. J.* FEB 25 2006 332 (7539) p. 434 - 435

Fleming KM, Acolet D, Bailey J, Modder J, Macintosh MCM. Perinatal outcome of pregnancies in women with type 1 and type 2 diabetes in England, Wales and Northern Ireland, 2002-03. *Arch Dis Child* (Proceedings of the 10th Spring Meeting of Royal College of Paediatrics and Child Health) April 2006;1(1):A3-A4.

Lewis G, de Bernis L. Maternal health in developing countries. Elsevier. 2006.

Lewis G (ed). Reducing stillbirths and perinatal deaths to make childhood safer; the contribution of confidential enquiries. In: Beyond the Little Numbers, World Health Organisation (WHO), Geneva 2006 (on going)

Lewis G (ed). Obstetric fistula. Guiding principles for clinical management and programme development. World Health Organisation; Geneva. September 2006. ISBN 92 4 159367 8 www.who.int/entity/makingpregnancysafer/publications/obstetric_fistula.pdf

Thorne S, **Nelson-Piercy C**, MacGregor A, Gibbs S, Crowhurst J, Panay N, Rosenthal E, Walker F, Williams D, **de Swiet M**, Guillebaud J. Pregnancy and contraception in heart disease and pulmonary arterial hypertension. *J Fam Plan Reprod Health Care* APR 2006;32(2): p. 75 – 81.

Macintosh MCM, Fleming KM, Acolet D, Golightly S, Miller A, Modder J Preparation for pregnancy in women with pre-existing diabetes in England, Wales and Northern Ireland 2002-03. *J Obstet Gynaecol* (Programme and Abstracts of British Maternal and Fetal Medicine Society 11th Annual Conference) April 2006;26(1): S72.

Modder J, Fleming K. Antenatal prediction of fetal size in women with type 1 and type 2 diabetes. *J Obstet Gynaecol* (Programme and Abstracts of British Maternal and Fetal Medicine Society 11th Annual Conference) April 2006;26(1):S80-81.

2007

Acolet, D., et al., Neonatal care of term babies of mothers with pre-gestational diabetes in England, Wales and Northern Ireland. *Archive of Diseases in Children*, 2007.

Acolet, D., The quality of neonatal care and outcome. *Arch. Dis. Child. Fetal Neonatal Ed.*, 2007: p.adc.2006.094946.

Acolet, D., et al., The BLISS cluster randomised controlled trial of the effect of 'active dissemination of information' on standards of care for premature babies in England (BEADI) study protocol [ISRCTN89683698]. *Implementation Science* 2007. 2(33).

Hawdon, J., Diabetes in Pregnancy - management of the baby, in *Trouble Up North*. 2007.

Marlow, N., What's happening to neonatal services. *Infant: for neonatal and Paediatric healthcare professionals*, 2007.

Modder, J., Pregnancy with diabetes – what women and their partners need to know. *Diabetes Lifestyle*, 2007.

Miller, A., Diabetes in Pregnancy - standards of care. *Practicing Midwife*, 2007.

References

1. World Health Organization. *International statistical classification of diseases and related health problems. Tenth Revision*. Geneva, Switzerland: World Health Organization, 1993:129.
2. Scottish Programme for Clinical Effectiveness in Reproductive Health (SPCERH). *Scottish Perinatal and Infant Mortality and Morbidity Report 2006*. Edinburgh: NHS Quality Improvement Scotland (NHS QIS), 2007.
3. Royal College of Obstetrics and Gynaecologists. *Registration of stillbirths and certification of pregnancy losses before 24 weeks of gestation*. London: RCOG, 2005.
4. International Federation of Gynaecology and Obstetrics. *Report of a FIGO Committee on perinatal mortality and morbidity following a workshop on monitoring and reporting perinatal mortality and morbidity (F. Kubli Chairman), Heidelberg, Germany, March 19-21, 1982* London The Chameleon Press Ltd 1984.
5. Glinianai S, Pharoah P, Sturgiss S. *Comparative trends in cause-specific fetal and neonatal mortality in twin and singleton births in the North of England 1982-1994*. British Journal of Obstetrics and Gynaecology 2000;107(4):452-60.
6. Simmons R, Doyle P, Maconochie N. *Dramatic reduction in triplet and higher order births in England and Wales*. British Journal of Obstetrics and Gynaecology 2004;111(8):856-8.
7. Rankin J, Pattenden S, Abramsky L, Boyd P, Jordan H, Stone D, et al. *Prevalence of congenital anomalies in five British regions, 1991-99*. Archives of Disease in Childhood.- Fetal Neonatal Edition 2005;90(5):F374-379.
8. Confidential Enquiry into Maternal and Child Health (CEMACH). *Perinatal Mortality 2005: England, Wales and Northern Ireland*. London CEMACH, 2007.
9. Perinatal Institute. *West Midlands Perinatal Mortality Update, March 2006*
10. Macfarlane A, Mugford M, Henderson J, Furtado A, Stevens J, Dunn A. *Birth counts: statistics of pregnancy and child birth*. 2nd ed. London: The Stationary Office, 2000.
11. Acolet D. *The quality of neonatal care and outcome*. Archives of Disease in Childhood.- Fetal Neonatal Edition 2008; 93:F69-F73.
12. Yorkshire Neonatal Network. *The Neonatal Survey and Yorkshire Neonatal Network report 2005*.
13. Field D, Petersen S, Clarke M, Draper E. *Extreme prematurity in the UK and Denmark: population differences in viability*. Archives of Disease in Childhood - Fetal Neonatal Edition 2002;87(3):172-5.
14. Tucker J, Tarnow-Mordi W, Gould C, Parry G, Marlow N. *UK neonatal intensive care services in 1996. On behalf on the Neonatal Staffing Collaborative Group*. Archives of Disease in Childhood - Fetal Neonatal Edition 1999;80(3):233-4.
15. Horbar J. *The Vermont-Oxford Neonatal Network: integrating research and clinical practice to improve the quality of medical care* Seminars in Perinatology 1995;19(2):124-31.
16. Stillbirth Definition Act 1992 [16 March 1992]. *Current law statutes annotated GB*. 1992;2:29-1 - 29-3.
17. Confidential Enquiry into Stillbirths and Deaths in Infancy. (CESDI). *CESDI Project 27/28*. Maternal and Child Health Consortium. London, 2003.

18. Acolet D, Elbourne D, McIntosh N, Weindling M, Korkodilos M, Haviland J, et al. *Project 27/28: inquiry into quality of neonatal care and its effect on the survival of infants who were born at 27 and 28 weeks in England, Wales, and Northern Ireland*. Pediatrics 2005;116(6):1457-65.
19. Marlow N, Gill B. *Establishing neonatal networks: the reality*. Archive of Disease in Childhood - Fetal Neonatal Ed 2007;92(2):F137-42.
20. Maher J, Macfarlane A. *Inequalities in infant mortality: trends by social class, registration status, mother's age and birthweight, England and Wales, 1976-2000*. Health Statistics Quarterly 2004(24): 14-22.
21. Department of Health. *Health Survey for England 2003*. London, 2004. Available at <http://www.dh.gov.uk/PublicationsAndStatistics/PublishedSurvey/HealthSurveyForEngland/fs/en>. Last accessed January 2008
22. Heslehurst N, Ells L, Simpson H, Batterham A, Wilkinson J, Summerball C. *Trends in maternal obesity incidence rates, demographic predictors, and health inequalities in 36,821 women over a 15 year period*. British Journal of Gynaecology 2007;114:187-194.
23. Office of the Deputy Prime Minister. *Index of Multiple Deprivation 2004*, 2004.
24. Bambang S, Spencer N, Logan S, Gill L. *Cause-specific perinatal death rates, birth weight and deprivation in the West Midlands, 1991-93*. Child Care Health Development 2000;26(1):73-82.
25. Department of Health. *NHS Maternity Statistics, England 2004 - 05* Statistical Bulletin 2006, 2006.
26. Department of Health. *NHS Maternity Statistics, England, 2005-2006*. London: The Information Centre, 2007.
27. Health Statistics Quarterly. *Introducing new data on gestational specific infant mortality among babies born in 2005 in England and Wales*. 2007(35):13-27.
28. Frøen JF, Gardosi JO, Thurmann A, Francis A, Stray-Pedersen B. *Restricted fetal growth in sudden intrauterine unexplained death*. Acta Obstetrica et Gynecologica Scandinavica. 2004 Sep;83(9):801-7.
29. Child Growth Foundation. *British 1990 Growth Reference for Height, Weight, BMI and Head Circumference analysis disk, 2001*.
30. Department of Health. *Intrapartum-related deaths: 500 missed opportunities*. In 'On the state of public health: Annual report of the Chief Medical Officer 2006'. London: Department of Health 2007.
31. Confidential Enquiry into Maternal and Child Health (CEMACH). *Stillbirth, Neonatal and Post-neonatal Mortality 2000-2003 - England, Wales and Northern Ireland*. London, 2005.
32. Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). *8th Annual Report Focusing on Stillbirths, European Comparisons of Perinatal Care, Paediatric Post Mortem Issues, Survival Rates of Premature Babies: Project 27/28*. London, 2001.
33. Rose C, Evans M, Tooley J. *Falling rates of perinatal postmortem examination: are we to blame?* Archives of Disease in Childhood - Fetal Neonatal Edition 2006;91(6):465.

-
34. Cartlidge PHT, Dawson AJ, Stewart JH, Vujanic GM. *The value and quality of perinatal and infant postmortem examinations*. British Medical Journal 1995;310:156-8.
 35. Royal College of Paediatrics and Child Health. *The future of paediatric pathology services*. London, 2002.
 36. McHaffie H, Fowlie P, Hume R, Laing I, Lloyd D, Lyon A. *Consent to autopsy for neonates*. Archives of Disease in Childhood - Fetal Neonatal Edition 2001;85(1):4-7.
 37. Wigglesworth J. *Monitoring perinatal mortality. A pathophysiological approach*. The Lancet 1980 2(8196):684-6.
 38. Cole S, Hey E, Thomson A. *Classification perinatal death: an obstetric approach*. British Journal of Obstetrics and Gynaecologists 1986;93(12):1204-12.
 39. Kurinczuk J, Barralet J, Redshaw M, Brocklehurst P. *Report to the Patient Safety Agency Research Programme (Policy Research Programme of the Department of Health). Monitoring the incidence of neonatal encephalopathy - what next?* Oxford, 2005.
 40. Confidential Enquiry into Maternal and Child Health (CEMACH). *Perinatal Mortality Surveillance Report 2004, England, Wales and Northern Ireland*. London, 2006.
 41. Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). *7th Annual Report Focusing on Stillbirths, European Comparisons of Perinatal Care, Paediatric Post Mortem Issues, Survival Rates of Premature Babies: Project 27/28*. London, 2001.
 42. Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). *Annual Report for 1 January - 31 December 1993. Part 1: summary of methods and main results*. London, 1995.
 43. Draper E, Kurinczuk J, Lamming C, Clarke M, James D, Field D. *A confidential enquiry into cases of neonatal encephalopathy*. Archives of Disease in Childhood - Fetal Neonatal Edition 2002;87(3): 176-80.
 44. Badawi N, Kurinczuk J, Keogh J, Alessandri L, O'Sullivan F, Burton P, et al. *Intrapartum risk factors for newborn encephalopathy: the western Australian case-control study*. British Medical Journal 1998;5 (317) (7172):1554-8.44.
 45. Department of Health. *National service framework for children, young people and maternity services, September 2004* The Stationery Office, 2004.
 46. *Choosing between home and hospital delivery*. Comment on: BMJ. 1999 Oct 9; 319 (7215):1008. British Medical Journal 2000 Mar 18: 320 (7237):798; author reply 799. 2000.
 47. Chamberlain G, Wraight A, Crowley P. Home births. *Report of the 1994 confidential enquiry by the National Birthday Trust Fund*. Carnforth, 1997.
 48. National Institute for Health and Clinical Excellence (NICE). *NICE Clinical Guideline 55 - Intrapartum care: care of healthy women and their babies during childbirth*. London, 2007.
 49. Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). *5th Annual Report*. London, 1998.
 50. Healthcare Commission. *2007 Maternity Services Review*. London: Healthcare Commission, 2008.

51. Stewart M, McCandlish R, Henderson J, Brocklehurst P. *Report of a structured review of birth centre outcomes*. Oxford 2007.
52. Walsh D, Downe SM. Outcomes of free-standing, midwife-led birth centers: a structured review. *Birth* 2004;31(3):222-9.
53. Hodnett ED, Downe S, Edwards N, Walsh D. *Home-like versus conventional institutional settings for birth*. Cochrane Database Sysematict Reviews 2005(1):CD000012.
54. Rowe R. *Evaluation of maternity units in England (EMU) research programme*: National Perinatal Epidemiology Unit (NPEU), 2006.
55. Page L. *Is there enough evidence to judge midwife led units safe? Yes*. *British Medical Journal* 2007;335(7621):642.
56. Drife J. *Do we have enough evidence to judge midwife led maternity units safe? No*. *British Medical Journal* 2007;335(7621):643.
57. Hey E, Lloyd D, Wigglesworth J. *Classification perinatal death: an obstetric approach*. *British Journal of Anaesthesia* 1986;93(12):1213-23.
58. Chan A, King J, Flenady V, Haslam R, Tudehope D. *Classification of perinatal deaths: development of the Australian and New Zealand classifications*. *Journal Paediatric Child Health* 2004;40(7):340-7.
59. EPICure2. <http://www.nottingham.ac.uk/human-development/Epicure/epicureprofessional/EPICure%202%20Protocol.doc>
60. General Register Office (Northern Ireland) *Annual report of the Registrar General* [www.groni.gov.uk/index.html]

Index of tables

Table number	Title	Page number
Table 1.1	Summary mortality rates; England, Wales and Northern Ireland: 2006.	2
Table 1.2	Stillbirth, perinatal and neonatal death trends; England, Wales and Northern Ireland: 2000-2006.	3
Table 1.3	Stillbirth, perinatal and neonatal death rates using FIGO classification; England, Wales and Northern Ireland: 2006.	6
Table 1.4	Stillbirth, perinatal and neonatal death rates by multiplicity; England, Wales and Northern Ireland: 2000-2006.	8
Table 3.1	Percentage distribution of stillbirths, perinatal and neonatal deaths and rates by mother's BMI; England, Wales and Northern Ireland: 2006.	28
Table 3.2	Stillbirth, perinatal and neonatal deaths and rates by quintiles of deprivation; England: 2006.	29
Table 3.3	Stillbirth, perinatal and neonatal death rates by ethnicity; England: 2006.	30
Table 3.4	Stillbirth, perinatal and neonatal deaths and rates by gestational age; England, Wales and Northern Ireland: 2006.	31
Table 3.5	Birth weight specific stillbirth, perinatal and neonatal deaths and rates; England, Wales and Northern Ireland: 2006.	32
Table 3.6	Birth weight specific deaths and rates for singleton births; England, Wales and Northern Ireland: 2006.	33
Table 3.7	Birth weight specific deaths and rates for multiple births; England, Wales and Northern Ireland: 2006.	33
Table 4.1	Cause specific stillbirth rates; England, Wales and Northern Ireland: 2006.	35
Table 4.2	Trend of causes of stillbirths; England, Wales and Northern Ireland: 2000-2006.	36
Table 4.3	SGA in unexplained stillbirths; England, Wales and Northern Ireland: 2006.	37
Table 4.4	Cause-specific neonatal deaths and rates; England, Wales and Northern Ireland: 2006.	40
Table 4.5	Trend of causes of neonatal deaths; England, Wales and Northern Ireland: 2000-2006.	41
Table 4.6	SGA in neonatal deaths from intrapartum causes; England, Wales and Northern Ireland: 2006.	42
Table 4.7	Percentage distribution of post mortem examinations performed by maternal area of residence; England, Wales and Northern Ireland and by SHA in England: 2004-2006.	44
Table 4.8	Percentage distribution of post mortem examinations performed by maternal area of residence for stillbirths, perinatal and neonatal deaths; England, Wales and Northern Ireland: 2006.	47
Table 5.1	Causes of intrapartum-related stillbirths and neonatal deaths; England, Wales and Northern Ireland: 2006.	51
Table 5.2	Stillbirths and neonatal deaths of intrapartum causes by ethnicity; England: 2006.	55
Table 5.3	Stillbirths and neonatal deaths of intrapartum causes by past obstetric history; England, Wales and Northern Ireland: 2006.	56
Table 5.4	Stillbirths and neonatal deaths of intrapartum causes by multiplicity; England, Wales and Northern Ireland: 2006.	56
Table 5.5	Stillbirths and neonatal deaths of intrapartum causes by multiplicity of term and pre term babies; England, Wales and Northern Ireland: 2006.	57

Table number	Title	Page number
<i>Table 5.6</i>	Stillbirths and neonatal deaths of intrapartum causes by SGA; England, Wales and Northern Ireland: 2006.	58
<i>Table 5.7</i>	Stillbirths and neonatal deaths of intrapartum causes by post mortem examinations; England, Wales and Northern Ireland: 2006.	58
<i>Table 5.8</i>	Stillbirths and neonatal deaths of intrapartum causes at term with “intrapartum asphyxia”; England, Wales and Northern Ireland: 2006.	60
<i>Table 5.9</i>	SGA in stillbirths and neonatal deaths of intrapartum causes at term with “intrapartum asphyxia”; England, Wales and Northern Ireland: 2006.	61
<i>Table 5.10</i>	Late fetal losses, stillbirths and neonatal deaths according to unplanned/planned home births; England, Wales and Northern Ireland: 2006.	62
<i>Table 5.11</i>	Cause of stillbirths and neonatal deaths according to unplanned/planned home births; England, Wales and Northern Ireland: 2006.	64
<i>Table 5.12</i>	Place of delivery when intended to deliver at home at onset of labour; England, Wales and Northern Ireland: 2006.	65
<i>Table 5.13</i>	Late fetal losses, stillbirths and neonatal deaths that were delivered in freestanding midwifery units; England: 2006.	66
<i>Table 5.14</i>	Cause of stillbirths and neonatal deaths that were delivered in freestanding midwifery units; England: 2006.	68
<i>Table 5.15</i>	Comparison of old and new obstetric classification system; East Midlands, East of England and Yorkshire and Humberside: 2007.	71
<i>Table 6.1</i>	Sections considered useful by participants.	73

Index of figures

Figure number	Title	Page number
Figure i	Trend in neonatal deaths; England and Wales: 2000-2006.	x
Figures ii and iii	Adjusted stillbirth and neonatal death rates by Trust against average Trust stillbirth and neonatal death rates and associated 95% confidence intervals for all cases that booked and died at the Trust; England, Wales and Northern Ireland: 2006.	xii
Figure 1.1	Stillbirths and neonatal deaths; England and Wales: 1954-2006.	4
Figure 1.2	Stillbirths, perinatal and neonatal deaths; England and Wales: 2000-2006.	4
Figure 2.1	Distribution of early neonatal deaths delivered at less than 22 weeks' gestation; England, Wales and Northern Ireland: 2006.	9
Figure 2.2	Distribution of early neonatal deaths delivered at less than 22 weeks' gestation by SHA; England, Wales and Northern Ireland: 2006.	10
Figure 2.3	Adjusted stillbirth rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.	11
Figure 2.4	Adjusted perinatal death rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.	12
Figure 2.5	Adjusted early and late neonatal death rates and 95% confidence intervals; England, Wales and Northern Ireland and by SHA in England: 2006.	13
Figure 2.6	<u>Crude perinatal death</u> rates by Trust against average Trust perinatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.	15
Figures 2.7 and 2.8	<u>Adjusted stillbirth</u> rates by Trust against average Trust stillbirth rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.	17
Figures 2.9 and 2.10	<u>Adjusted perinatal death</u> rates by Trust against average Trust perinatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.	18
Figures 2.11 and 2.12	<u>Adjusted neonatal death</u> rates by Trust against average Trust neonatal death rate and associated 95% confidence intervals; England, Wales and Northern Ireland: 2006.	19
Figure 2.13	Distribution of early neonatal deaths delivered at less than 22 weeks' gestation by Network; England: 2006.	20
Figure 2.14	<u>Crude perinatal death</u> rates by Network against average Network perinatal death rate and associated 95% confidence intervals; England: 2006.	21
Figures 2.15 and 2.16	<u>Adjusted stillbirth</u> rates by Network against average Network stillbirth rate and associated 95% confidence intervals; England: 2006.	23
Figures 2.17 and 2.18	<u>Adjusted perinatal death</u> rates by Network against average Network perinatal death rate and associated 95% confidence intervals; England: 2006.	24
Figures 2.19 and 2.20	<u>Adjusted neonatal death</u> rates by Network against average Network neonatal death rate and associated 95% confidence intervals; England: 2006.	25
Figure 3.1	Age specific stillbirth rates; England, Wales and Northern Ireland: 2006.	26
Figure 3.2	Age specific perinatal death rates; England, Wales and Northern Ireland: 2006.	27
Figure 3.3	Age specific neonatal death rates; England, Wales and Northern Ireland: 2006.	28

Figure number	Title	Page number
<i>Figure 4.1</i>	Percentage distribution of causes of stillbirths; England, Wales and Northern Ireland: 2006.	34
<i>Figure 4.2</i>	Percentage distribution of causes of singleton stillbirths; England, Wales and Northern Ireland: 2006.	38
<i>Figure 4.3</i>	Percentage distribution of causes of multiple stillbirths; England, Wales and Northern Ireland: 2006.	38
<i>Figure 4.4</i>	Percentage distribution of causes of neonatal deaths; England, Wales and Northern Ireland: 2006.	39
<i>Figure 4.5</i>	Percentage distribution of causes of neonatal deaths after a singleton pregnancy; England, Wales and Northern Ireland: 2006.	42
<i>Figure 4.6</i>	Percentage distribution of causes of neonatal deaths after a multiple pregnancy; England, Wales and Northern Ireland: 2006.	43
<i>Figure 4.7</i>	Percentage distribution of post mortem examinations performed for all types of deaths by maternal area of residence; England, Wales and Northern Ireland and by SHA in England: 2006.	45
<i>Figure 4.8</i>	Percentage distribution of post mortem examinations performed for all type of deaths by Network; England: 2006.	46
<i>Figure 4.9</i>	Trends in post mortem examinations; England, Wales and Northern Ireland: 2000-2006.	48
<i>Figure 5.1</i>	Trends of stillbirths and neonatal deaths of intrapartum causes; England, Wales and Northern Ireland: 2000-2006.	49
<i>Figure 5.2</i>	Stillbirths of intrapartum causes by week of gestation; England, Wales and Northern Ireland: 2006.	52
<i>Figure 5.3</i>	Neonatal deaths of intrapartum causes by week of gestation; England, Wales and Northern Ireland: 2006.	53
<i>Figure 5.4</i>	Stillbirths of intrapartum causes by birth weight; England; Wales and Northern Ireland: 2006.	53
<i>Figure 5.5</i>	Neonatal deaths of intrapartum causes by birth weight; England, Wales and Northern Ireland: 2006.	54
<i>Figure 6.1</i>	Summary of respondents' perceptions on the usefulness of their individual reports.	72

Appendix A

Stillbirth, perinatal and neonatal deaths using FIGO classification, England, Wales and Northern Ireland, 2006

	Numbers
Registered births	697,195
Less than 500g	
<i>Total births</i>	716
<i>Stillbirths</i>	295
<i>Early neonatal deaths</i>	341
<i>Late neonatal deaths</i>	7
500g or over	
<i>Total births</i>	696,838
<i>Stillbirths</i>	3,335
<i>Early neonatal deaths</i>	1,309
<i>Late neonatal deaths</i>	477
Of which lethal malformations	
<i>Total</i>	1,179
<i>Stillbirths</i>	496
<i>Early neonatal deaths</i>	341
<i>Late neonatal deaths</i>	112
1000g or over	
<i>Total births</i>	692,605
<i>Stillbirths</i>	2,476
<i>Early neonatal deaths</i>	708
<i>Late neonatal deaths</i>	247
Of which lethal malformations	
<i>Total</i>	722
<i>Stillbirths</i>	298
<i>Early neonatal deaths</i>	303
<i>Late neonatal deaths</i>	104

Sources: CEMACH 2006 & 2007

Appendix B

Stillbirth, perinatal and neonatal rates by maternal region of residence, England, Wales and Northern Ireland, 2006

Maternal area of residence	Stillbirth rate [95% CI] ^a	Perinatal death rate [95% CI] ^a	Neonatal death rate [95% CI] ^b
England, Wales and Northern Ireland	4.1 [3.9, 4.2]	5.7 [5.5, 5.9]	2.2 [2.1, 2.3]
England	4.1 [3.9, 4.3]	5.8 [5.6, 5.9]	2.3 [2.2, 2.4]
Wales	4.2 [3.5, 4.9]	5.2 [4.4, 6.0]	1.7 [1.3, 2.2]
Northern Ireland	3.1 [2.5, 3.9]	4.3 [3.6, 5.3]	1.6 [1.2, 2.2]
East Midlands	4.4 [3.8, 5.0]	6.1 [5.5, 6.8]	2.6 [2.2, 3.0]
East of England	3.4 [2.9, 3.8]	4.7 [4.2, 5.2]	1.8 [1.5, 2.2]
London	4.7 [4.3, 5.1]	6.5 [6.0, 6.9]	2.4 [2.1, 2.7]
North East	4.5 [3.8, 5.3]	6.6 [5.7, 7.6]	2.8 [2.3, 3.5]
North West	4.2 [3.8, 4.7]	6.1 [5.6, 6.6]	2.5 [2.2, 2.9]
South Central	3.7 [3.2, 4.3]	5.0 [4.4, 5.6]	1.5 [1.2, 1.9]
South East Coast	3.5 [3.1, 4.1]	4.8 [4.2, 5.5]	1.8 [1.5, 2.3]
South West	3.7 [3.2, 4.2]	5.0 [4.5, 5.7]	1.9 [1.5, 2.3]
West Midlands	4.0 [3.6, 4.5]	5.8 [5.3, 6.4]	2.5 [2.1, 2.9]
Yorkshire and Humberside	4.3 [3.8, 4.9]	6.4 [5.8, 7.0]	2.7 [2.4, 3.2]

a Rate per 1000 total births.

b Rate per 1000 live births.

Sources: CEMACH 2006 & 2007

ONS 2006

NISRA-GRO 2006

Note: These data has been adjusted by removing all terminations, lethal/severe malformations, babies <22 weeks' gestation and babies <500g.

Appendix C

Maternal age-specific stillbirth, perinatal and neonatal mortality rates, England, Wales and Northern Ireland, 2006

	Maternities	Stillbirths		Perinatal deaths		Neonatal deaths		
	Number	Number	Rate [95% CI] ^a	Number	Rate [95% CI] ^a	Number	Rate	[95% CI] ^a
Total	686,581	3,493	5.1 [4.9, 5.3]	5,075	7.4 [7.2, 7.6]	2,070	3.0	[2.9, 3.1]
<20	46,897	262	5.6 [4.9, 6.3]	391	8.3 [7.6, 9.2]	172	3.7	[3.2, 4.3]
20-24	131,250	637	4.9 [4.5, 5.2]	951	7.2 [6.8, 7.7]	413	3.1	[2.9, 3.5]
25-29	177,641	882	5.0 [4.6, 5.3]	1,290	7.3 [6.9, 7.7]	533	3.0	[2.8, 3.3]
30-34	194,083	880	4.5 [4.2, 4.8]	1,267	6.5 [6.2, 6.9]	497	2.6	[2.3, 2.8]
35-39	112,642	631	5.6 [5.2, 6.1]	876	7.8 [7.3, 8.3]	324	2.9	[2.6, 3.2]
40-44	22,908	185	8.1 [7.0, 9.3]	269	11.7 [10.4, 13.2]	104	4.5	[3.7, 5.5]
45+	1,156	16	13.8 [8.5, 22.6]	23	19.9 [13.2, 29.9]	9	7.8	[4.1, 15.0]
Not known	4	-	..	8	..	18	..	..

a Rate per 1000 maternities.

Sources: CEMACH 2006 & 2007
ONS 2006
NI CHS 2006

Note 1: second or subsequent deaths from pregnancies with multiple losses excluded from this table.

Note 2: Total number of live births by maternal age has been obtained from ONS and Northern Ireland Child Health System.

There are 137 cases recorded by NI Child Health System and not by NI General Registrar Office, hence the increase in number of total live births for the year 2006 when compared to earlier tables in this report.

Appendix D - Methodology

i Data sources

It is a government requirement that all perinatal deaths from 22 weeks' gestation to 28 days after birth are notified to the Confidential Enquiry into Maternal and Child Health (CEMACH). These deaths are notified by NHS Trusts caring for pregnant women and newborn babies.

Every maternity unit within England, Wales and Northern Ireland has a CEMACH coordinator who notifies the CEMACH regional office of any deaths within the age range collected. This is done using a standard data collection tool known as the Perinatal Death Notification (PDN) form (Appendix F) which collects a minimum dataset of epidemiological and clinical information on each death. In addition to notifying deaths, Trusts also return denominator information, including the total number of live births and other unit based data used in this report.

Deaths are also notified by child health systems, local congenital anomaly registers where these exist and perinatal pathologists. This multiple source reporting leads to a very high level of ascertainment of deaths.

Post mortem reports are also obtained, where possible, to supplement the information on the cause of death provided on the PDN.

In 2006 CEMACH agreed to collaborate with the EPICure2 study. EPICure2 is a national study of extreme prematurity which aims to provide survival and rates of disability in addition to identifying factors at birth, which could give an indication as to the long term outcome for survivors⁵⁹. This resulted in a change to the standard CEMACH data collection process in 2006. All late fetal losses, stillbirths and neonatal deaths delivering before 27+0 weeks in England were notified to the EPICure2 study first using their Perinatal Notification Form (PN:E2) and/or their Case Record Form (CRF)⁵⁹. A subset of this data was then passed to CEMACH. Cases < 27+0 weeks' gestation were then added to the CEMACH 2006 PDN data set.

ii Data validation and cleaning

Data are compiled nationally and cross-matched with registration data on stillbirths and neonatal deaths from the Office for National Statistics (ONS). This allows for verification of the CEMACH data and assessment of the data ascertainment. Any cases that have been identified by one organisation but not the other are established and investigated to ascertain whether they meet the inclusion criteria for surveillance. Where a new case is identified, the normal procedure would be to collect the required minimum data set by sending out a PDN to the relevant NHS Trust.

Data cleaning is then performed to ensure minimisation of errors. This process includes: a) identifying systematic errors of coding or errors in data entry and b) detecting cases that may have been duplicated within a region or across regions.

iii Data reporting and analysis

Data are reported on the 2006 birth cohort based on date of delivery and including deaths during the neonatal period in 2007 of babies who were born in 2006. Mortality rates displayed in the funnel plots are based on place of death. The response rate for questions on the PDN form that were used in the analysis varied from 78% to 100% and missing/not known responses are given for each table. Denominator data on all live births were obtained from the Office for National Statistics (ONS) for England and Wales using ONS Vital Statistics (VS) and Health Statistics Quarterly (HSQ)²⁷. General Registrar's Office (GRO)⁶⁰ and Child Health System (CHS) for Northern Ireland and National Community Child Health Database, maintained by Health Solutions Wales (NCCHD) for Wales. Additional information for England was obtained from an extension to the core dataset of Hospital Episode Statistics (HES) called the "maternity tail"²⁶. These data sources are referenced throughout the report.

There are two sources of data for Northern Ireland, GRO and CHS. The GRO provide CEMACH with a live births figure only whereas the CHS provide live births broken down by a number of variables (e.g. birth weight, gestation). The total live births differs between the two sources but the GRO figure is more widely reported and so the GRO figure has been used when a total number is required and the CHS figure has been used when the number of live births needs to be broken down by another variable.

Data are presented as rates when denominators are known, and otherwise as percentages, excluding 'missing' or 'not known' values. Figures, including pie/bar charts, funnel and scatter plots are used to illustrate relationships between data items.

Data were analysed using statistical computer software STATA 8. Bivariate analysis was used to explore relationships between variables and these are presented in the form of contingency tables. Rates are shown per 1000 births with their 95% confidence intervals (under the assumption of a Poisson distribution). Historical trends are explored statistically with formal chi squared tests for trends. Bar graphs illustrate distributions of frequencies, percentages, rates and their 95% confidence intervals within variables. Funnel plots are used to show the variations between Trusts and Networks.

iv Classification of stillbirths and neonatal deaths

The cause of death is currently classified using the Extended Wigglesworth classification³⁷ supplemented by the Aberdeen Obstetric classification³⁸ and the Fetal and Neonatal classification⁵⁷ recorded on the PDN forms. Details of these classification systems can be found at www.cemach.org.uk/Programmes/Maternal-and-Perinatal/Maternal-and-Perinatal-Mortality-Surveillance.aspx.

CEMACH regularly receives post mortem reports from hospital pathologists for all cases matching CEMACH criteria. Additionally, some regional managers have established contact with coroners who provide them with a list of perinatal cases from their system according to CEMACH reporting criteria, adding the cause of death. These reports were used to validate and confirm the cause of death suspected at the time the death was reported. Some reports were also received for cases that were not already notified to CEMACH and were used as new notifications.

In 2007 a new classification system for stillbirths and neonatal deaths was developed which will be incorporated into a new PDN form for 2008. A pilot for this new system was completed including cases from January to March 2007 in three regions of England (East Midlands, East of England and Yorkshire and Humberside), the results of this pilot can be found in section 5.4 of the focus issues in this report.

v Additional methodology

v.i Case definition

In 2004, the Royal College of Obstetricians and Gynaecologists (RCOG) published guidance stating that a baby born without signs of life after 24 completed weeks of pregnancy and known to have died before 24 completed weeks did not require registration as a stillbirth³. The stillbirths throughout this report for 2005 and 2006 are defined using this guidance. The data for the other years are defined as babies born without signs of life after 24 completed weeks of pregnancy regardless of at what gestation the babies actually died.

v.ii Mortality variation

The data is represented at three different levels, by SHA, by Neonatal Network and by Trust. An SHA is a defined geographical area and so cases are assigned to an SHA by the maternal postcode, whereas Trusts and Networks are focussed on maternity and neonatal units and so cases are assigned to a Trust and Network by the place of death.

This year, to allow for a more meaningful comparison, a number of exclusions have been applied to the data within the mortality variation chapter (Chapter 2). The exclusions are to remove all terminations of pregnancy, all lethal and severe malformations, all neonatal deaths below 22 weeks' gestation and all babies with birth weight below 500g.

v.iii Deprivation

The classification of deprivation used is the Index of Multiple Deprivation 2004 (IMD) score²³ specifically the overall indicator. This is based on the postcode of maternal residence and the corresponding Super Output Area (SOA) as defined by the ONS and is based on the entire population of England. These IMD scores were ranked and quintiles of deprivation derived for the national population. Cases were then allocated to the appropriate quintile of deprivation. As these scores were based on the mothers, not babies, for multiple pregnancies only one baby was assigned a deprivation score, to avoid double counting. Rates were calculated using ONS 2006 data on all maternities by IMD deprivation quintiles in England, excluding those whose usual residence was outside England.

v.iv Ethnicity

Information on maternal ethnicity has been collected in England, as part of the "maternity tail" of the Hospital Episodes Statistics (HES), since 1995. Coverage of hospital deliveries remains incomplete, 74% of all NHS Trusts submit their data to HES for the period 2006-07²⁶. Comparison of deliveries recorded on HES and census information on women with children less than one year of age suggested that if deliveries with ethnic group not stated were included with those where ethnic group was stated to be White, the distribution of deliveries in HES broadly approximated that expected from census information. The data that HES provide is numbers of finished delivery episodes by ethnic group of women between 11 and 59, the proportions are then applied to the ONS number of maternities to give estimated maternity figures within each ethnic group.

v.v Gestational age

This year ONS published an article in Health Statistics Quarterly 35 Autumn 2007 called "Introducing new data on gestation-specific infant mortality among babies born in 2005 in England and Wales"²⁷. This article included data on all live births by gestational age for 2005. So for the England and Wales part of the denominator the proportions within each gestational age was used and applied to the total live births figure for 2006. This data was used instead of the HES data as the HES data is only 74% complete and although the ONS data was from 2005 it is a complete dataset and by using the proportions it will be a more accurate reflection of the population being looked at.

v.vi SGA

This year the Child Growth Foundation's (CGF) algorithm²⁹ has been used to look at whether the babies are small for their gestational age (SGA) when looking at causes of death. This algorithm uses a number of data items, including babies' sex, gestation and birth weight, from the CEMACH PDN form to calculate a z score which is then converted to a centile. Within this report the babies less than the 10th centile and less than the 3rd centile have been highlighted and looked at.



For Office use only: PDN CODE FOR CASE 08

Confidential Enquiry into Maternal and Child Health
Improving the health of mothers, babies and children

PERINATAL DEATH NOTIFICATION FORM

2008

CHOOSE Type of Case (TICK)

☐ **STILLBIRTH:** A baby delivered without life **after** 23⁺⁶ weeks of pregnancy i.e. no signs of life at birth and where no heartbeat was ever detected.

If the birth occurred unattended and there was no lung aeration seen at PM and no other circumstantial evidence of life at birth it should be assumed that the baby was stillborn.

In all cases where there is evidence that the fetus has died prior to the 24th week of pregnancy the death **should not** be notified as a stillbirth. Where there is any doubt about the gestational age at which the fetus died, the default position would be to notify as a stillbirth.

OR

☐ **EARLY NEONATAL DEATH:** Death, following live birth at ALL GESTATIONS, of a baby before the age of 7 completed days.

OR

☐ **LATE NEONATAL DEATH:** Death of a baby occurring from the 7th day of life & before the age of 28 completed days.

Brief Instructions and Guidance

1. Fill in the form using the information available in the maternity case notes and discharge summary.
2. Guidance for completing Cause of Death is found on the folder enclosing this form.
3. There are no "not known" codes as all the information should be contained in the notes, ***if you do not know the answer to a question please indicate this in Section 12.***
4. Please complete all dates in the format DD/MM/YY, & all times using the 24hr clock e.g. 17.45.
5. Do NOT wait for the Post Mortem to complete and return this form.

Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)

SECTION 1. WOMAN'S DETAILS

1.1 NHS No: - -

1.2 Surname: _____ First name: _____

1.3 Hospital No:

1.4 Usual residential address at time of delivery/birth: _____

1.5 Postcode: -

1.6 Date of Birth: / / or estimated age

1.7 Ethnic group:

White: ☐ British ☐ Irish ☐ Any Other White background, specify _____

Mixed: ☐ White & Black Caribbean ☐ White & Black African ☐ White & Asian ☐ Any Other mixed

Asian or Asian British: ☐ Indian ☐ Pakistani ☐ Bangladeshi ☐ Any Other Asian

Black or Black British: ☐ Caribbean ☐ African ☐ Any other Black background

Other ethnic groups: ☐ Chinese ☐ Any Other, specify _____

Not stated: ☐

1.8 Was the woman in paid employment at booking? YES ☐ NO ☐

If Yes, what is her occupation (Transcribe from her notes)? _____

1.9 Was the woman's partner in paid employment at booking? YES ☐ NO ☐ N/K ☐

If Yes, what is his occupation (transcribe exactly what is in notes)? _____

1.10 Height at booking (cm) .

1.11 Weight at booking (kg): .

If weight is unavailable was the woman too heavy for hospital scales? YES ☐ NO ☐

1.12 Body Mass Index at booking (BMI):

1.13 Smoking status: ☐ Never ☐ Gave up prior to pregnancy ☐ Current ☐ Gave up in pregnancy

SECTION 2. PREVIOUS PREGNANCIES

2.1 Did the woman have any previous pregnancies? (if no go to Section 3) YES ☐ NO ☐

2.2 No. of completed pregnancies beyond 24 weeks (all live & stillbirths)

2.3 No. of pregnancies less than 24 weeks

2.4 Were there any previous pregnancy problems? (If yes, tick all that apply below) YES ☐ NO ☐

☐ 3 or more miscarriages ☐ Pre-term birth or mid trimester loss ☐ Stillbirth

☐ Neonatal death ☐ Baby with congenital anomaly ☐ Infant requiring intensive care

☐ Placenta praevia ☐ Placental abruption ☐ Pre-eclampsia (hypertension & proteinuria)

☐ Post-partum haemorrhage requiring transfusion

☐ Other, specify _____

Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)

SECTION 3: PREVIOUS MEDICAL HISTORY

- 3.1 Were there any pre-existing medical problems? (If yes, tick all that apply below)** YES ☐ NO ☐
- | | |
|---|--|
| <input type="checkbox"/> Cardiac Disease (congenital or acquired) | <input type="checkbox"/> Epilepsy |
| <input type="checkbox"/> Endocrine disorders e.g. hypo or hyperthyroidism | <input type="checkbox"/> Renal Disease |
| <input type="checkbox"/> Haematological disorders e.g. sickle cell disease | <input type="checkbox"/> Psychiatric Disorders |
| <input type="checkbox"/> Inflammatory Disorders e.g. inflammatory bowel disease | <input type="checkbox"/> Drug or Substance Abuse |
| <input type="checkbox"/> Diabetes | <input type="checkbox"/> Other, specify _____ |

SECTION 4: THIS PREGNANCY

- 4.1 Final Estimated Date of Delivery (EDD).** Use best estimate (ultrasound scan or date of last menstrual period) based in a 40 week gestation. Or the final date agreed in the notes.
DD/MM/YY
- 4.2 Was this a multiple pregnancy at the onset of pregnancy?** YES ☐ NO ☐
- 4.3 Date of first booking appointment?** DD/MM/YY NOT BOOKED ☐
- 4.4 Intended place of delivery at booking?**
A midwifery led unit can be a free standing midwifery unit (geographically distinct from with or without links to an obstetric led unit) or a stand alongside midwifery unit (i.e. located on the same site as an obstetric led unit)
Name/unit of place _____
Obstetric Led Unit ☐ Midwifery Led Unit ☐ Home ☐ Other ☐

SECTION 5: DELIVERY

- 5.1 Intended place of delivery at onset of labour?** Never in Labour ☐
Name/unit of place _____
Obstetric Led Unit ☐ Midwifery Led Unit ☐ Home ☐ Other ☐
- 5.2 Actual Place of Delivery?** Name/unit of place _____
Obstetric Led Unit ☐ Midwifery Led Unit ☐ Home ☐ Other ☐
- 5.3 Date & time of delivery/birth** DD/MM/YY:
- 5.4 What was the FINAL Mode of Delivery**
☐ Spontaneous vaginal ☐ Ventouse ☐ Lift-out forceps ☐ Rotational forceps ☐ Other forceps
☐ Pre-labour caesarean section ☐ Caesarean section after onset of labour
- 5.5 What was the presentation at delivery?**
☐ Face ☐ Brow ☐ Breech ☐ Vertex ☐ Compound (includes transverse and shoulder presentations)

CAESAREANS ONLY (non-Caesareans go to Section 6)

- 5.6 Was a caesarean section** ☐ Planned prior to labour? or ☐ Unplanned prior to labour?
- 5.7 Was the caesarean an emergency?** YES ☐ NO ☐
If YES, was the caesarean ☐ emergency pre-labour? or ☐ emergency after onset of labour?
- 5.8 What was the grade of urgency of the caesarean?**
☐ Immediate threat to life of woman or fetus ☐ Maternal or fetal compromise not immediately life-threatening
☐ Needing early delivery but no maternal or fetal compromise ☐ A time to suit the woman & maternity team

Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)

SECTION 9: ASSOCIATED FACTORS & CAUSE OF DEATH - STILLBIRTH and NEONATES			
9.1. Please TICK ALL the maternal or fetal conditions that arose during pregnancy or were associated with death - REFER TO SEPARATE CAUSE OF DEATH GUIDANCE ON THE FOLDER.			
1. MAJOR CONGENITAL ANOMALY			
<input type="checkbox"/> Central Nervous System	<input type="checkbox"/> Cardiovascular System	<input type="checkbox"/> Respiratory System	<input type="checkbox"/> Gastro-Intestinal System
<input type="checkbox"/> Musculo-Skeletal Anomalies	<input type="checkbox"/> Multiple Anomalies	<input type="checkbox"/> Chromosomal Disorders	<input type="checkbox"/> Metabolic Diseases
<input type="checkbox"/> Urinary Tract	<input type="checkbox"/> Other, specify _____		
2. ISO-IMMUNISATION:			
<input type="checkbox"/> Rhesus	<input type="checkbox"/> Other, specify _____		
3. PRE-ECLAMPTIC TOXEMIA			
<input type="checkbox"/> Gestational Hypertension (Includes Pre-eclampsia)	<input type="checkbox"/> HELPP syndrome	<input type="checkbox"/> Eclampsia	
4. ANTEPARTUM or INTRAPARTUM HAEMORRHAGE:			
<input type="checkbox"/> Praevia	<input type="checkbox"/> Abruption	<input type="checkbox"/> Uncertain	
5. MECHANICAL:			
Cord Compression:	<input type="checkbox"/> Prolapse Cord	<input type="checkbox"/> Cord around neck	<input type="checkbox"/> Other cord entanglement or knot
Uterine Rupture:	<input type="checkbox"/> Before labour	<input type="checkbox"/> During labour	
Mal-presentation:	<input type="checkbox"/> Breech	<input type="checkbox"/> Face	<input type="checkbox"/> Compound
	<input type="checkbox"/> Other, please specify _____		
6. MATERNAL DISORDER:			
<input type="checkbox"/> Pre-existing Hypertensive Disease	<input type="checkbox"/> Diabetes	<input type="checkbox"/> Endocrine diseases	<input type="checkbox"/> Primary Thrombophilias
<input type="checkbox"/> Cholestasis	<input type="checkbox"/> Drug misuse	<input type="checkbox"/> Uterine anomalies	
<input type="checkbox"/> Other, please specify _____			
7. INFECTION:			
Maternal infection:	<input type="checkbox"/> Bacterial	<input type="checkbox"/> Syphilis	<input type="checkbox"/> Viral diseases
	<input type="checkbox"/> Protozoal		
	<input type="checkbox"/> specify organism if known _____		
Ascending infection:	<input type="checkbox"/> Chorioamnionitis	<input type="checkbox"/> Other, specify _____	
8. SPECIFIC FETAL CONDITIONS:			
<input type="checkbox"/> Twin-twin transfusion	<input type="checkbox"/> Feto-maternal haemorrhage	<input type="checkbox"/> Non immune hydrops	<input type="checkbox"/> Other, specify _____
9. SPECIFIC PLACENTAL CONDITIONS:			
<input type="checkbox"/> Placental infarction	<input type="checkbox"/> Massive perivillous fibrin deposition	<input type="checkbox"/> Vasa praevia	<input type="checkbox"/> Velamentous insertion
<input type="checkbox"/> Other, specify _____			
10. INTRA-UTERINE GROWTH RESTRICTION: <input type="checkbox"/>			
11. ASSOCIATED OBSTETRIC FACTORS			
Birth Trauma:	<input type="checkbox"/> Intracranial haemorrhage	<input type="checkbox"/> Birth injury to scalp	<input type="checkbox"/> Other, specify _____
Intrapartum Asphyxia	<input type="checkbox"/>		
Other:	<input type="checkbox"/> Polyhydramnios	<input type="checkbox"/> Oligohydramnios	<input type="checkbox"/> Premature Rupture of membranes
	<input type="checkbox"/> Other specify _____		
12. NO ANTECEDENT OR ASSOCIATED OBSTETRIC FACTORS: <input type="checkbox"/>			
13. UNCLASSIFIED (Use this category as sparingly as possible): <input type="checkbox"/>			
9.2. Which condition/s, indicated in 9.1 as being present, was the <u>MAIN</u> condition/s causing or associated with the death? (NB 'non-MAIN' conditions are best described as the 'Other clinically relevant maternal or fetal conditions/ factors that were associated with but not necessarily causing the death'). Please list the MAIN Condition/s:			
<ul style="list-style-type: none"> • _____ • _____ 			

Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)

SECTION 10: CAUSE OF DEATH - NEONATES ONLY (Stillbirths go to Section 11)

10.1 Please TICK ALL the neonatal conditions causing and associated with death

PLEASE REFER TO SEPARATE CAUSE OF DEATH GUIDANCE ON THE ENCLOSING FOLDER

1. MAJOR CONGENITAL ANOMALY:

- ☐ Central Nervous System ☐ Cardiovascular System ☐ Respiratory System ☐ Gastro-Intestinal System
☐ Urinary Tract ☐ Musculo-Skeletal System ☐ Multiple Anomalies ☐ Chromosomal Disorders
☐ Metabolic Disorders ☐ Other, specify _____

2. EXTREME PREMATURITY(only less than 21+6 weeks): ☐

3. RESPIRATORY DISORDERS:

- ☐ Severe Pulmonary Immaturity ☐ Surfactant Deficiency Lung Disease ☐ Pulmonary hypoplasia
☐ Meconium Aspiration Syndrome ☐ Primary Persistent Pulm Hypertension
☐ Chronic Lung Disease / Bronchopulmonary dysplasia (BPD)
☐ Other (includes pulmonary haemorrhage), specify _____

4. GASTRO-INTESTINAL DISEASE:

- ☐ Necrotising Enterocolitis (NEC) ☐ Other, specify _____

5. NEUROLOGICAL DISORDER:

- ☐ Hypoxic-Ischaemic Encephalopathy (HIE) ☐ Intraventricular / Periventricular haemorrhage
☐ Other, specify _____

6. INFECTION:

- ☐ Generalised (sepsis) ☐ Pneumonia ☐ Meningitis ☐ Other, specify _____

7. INJURY / TRAUMA (postnatal):

Specify _____

8. OTHER SPECIFIC CAUSES:

- ☐ Malignancies / Tumours ☐ Specific conditions _____

9. SUDDEN UNEXPECTED DEATHS:

- ☐ SIDS ☐ Infant Deaths – Cause Unascertained

10. UNCLASSIFIED (Use this category as sparingly as possible): ☐

10.2 Which condition/s, that are indicated in 10.1 as being present, was the MAIN condition/s causing or associated with the death?

(NB 'non-MAIN' conditions are best described as the 'Other clinically relevant conditions/ factors that were associated with but not necessarily causing the death'). Please list the MAIN Condition/s:

- _____
- _____

SECTION 11: POST MORTEM (Please do not wait for postmortem results before sending in this form)

11.1 Was a Post Mortem offered? YES ☐ NO ☐

11.2 Was consent given for a Post Mortem? YES, FULL ☐ YES, LIMITED ☐ NO CONSENT ☐

11.2.1 If PM was limited what was consent given for?

- ☐ MRI ☐ X-Ray ☐ Other, specify _____

11.3 Was the placenta sent for histology? YES ☐ NO ☐

11.4 Was this a Coroners Case? YES ☐ NO ☐

Appendix E - The CEMACH 2008 Perinatal Death Notification Form (PDN)

SECTION 12: ANY OTHER RELEVANT DETAILS

SECTION 13. DETAILS OF PERSON WHO COMPLETED THE FORM *(information not passed to central office)*

Name: _____

Positions: _____

Addresses: _____

Tel/number/email address: _____

Date of notification: DD/MM/YY

REGIONAL OFFICE USE ONLY

Please code the causes of death that were given and the clinically derived single main cause of death
(Refer to the coding sheet)

1. Cause of Death: Associated Maternal & Fetal Factors & Cause of Death - STILLBIRTH & NEONATES (section 9)

1.1 Single Main Cause .

1.2 Other Cause(s) (no more than 3): . , . , .

2. Cause of Death: Associated Neonatal Factors & Cause of Death - NEONATES ONLY (section 10)

2.1 Single Main Cause .

2.2 Other Cause(s) (no more than 3): . , . , .

3. Maternal death: YES ☐ NO ☐

4. Was a Post Mortem Performed? YES ☐ NO ☐

If yes, was it a partial PM? MRI SCAN ☐ X-RAY ☐ OTHER LIMITED ☐ NO ☐

If yes, was it a coroners PM? YES ☐ NO ☐

5. Was cause of death coding completed using a Placental Histology or Post Mortem?

PM ☐ PH ☐ NO ☐

Appendix F - The CEMACH 2006 Perinatal Death Notification Form (PDN)

CEMACH - Confidential Enquiry into Maternal and Child Health - 2006 Perinatal Death Notification					
Use this form for each fetus delivering from 27+0 weeks of pregnancy and each live birth delivering from 27+0 weeks dying before 28 completed days of life , including legal abortions.					Survey Number Office use only
					<div style="border: 1px solid black; display: inline-block; width: 40px; height: 30px; line-height: 30px; font-size: 24px;">06</div>
<div style="display: flex; justify-content: space-between;"> 1. Case definition Stillbirth (27+ weeks) <input type="checkbox"/> Early neonatal death (age 0-6 days) <input type="checkbox"/> Late neonatal death (age 7-27 days) <input type="checkbox"/> </div> <p style="font-size: 0.8em;">For 2006, late fetal losses, stillbirths less than 27+0 and all neonatal deaths delivering at gestation <27+0 should be notified to EPICure 2 using the EPICure 2 notification form</p>					
MOTHER			BABY		
2. NHS No. <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div>			20. NHS No. <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div>		
3. Surname _____			21. Surname _____		
4. First name _____			22. First name _____		
5. Hospital No. _____			23. Hospital No. _____		
6. Usual residential address at time of delivery/birth _____			24. Postcode (if different from Q6) <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> N/K <input type="checkbox"/>		
7. Postcode <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> N/K <input type="checkbox"/>			25. Sex of fetus / baby Male <input type="checkbox"/> Female <input type="checkbox"/> Indeterminate <input type="checkbox"/> N/K <input type="checkbox"/>		
8. Mother's date of birth <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> <div style="margin: 0 5px;">or</div> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> </div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> Day Month Year Estimated age </div>			26. Number of fetuses / babies this delivery All identifiable fetuses at delivery, including papyraceous <input type="checkbox"/> N/K <input type="checkbox"/>		
9. Ethnic group of mother White <input type="checkbox"/> Black African <input type="checkbox"/> Black Carib. <input type="checkbox"/> Black other <input type="checkbox"/> Indian <input type="checkbox"/> Pakistani <input type="checkbox"/> Bangladeshi <input type="checkbox"/> Chinese <input type="checkbox"/> Mixed <input type="checkbox"/> Other <input type="checkbox"/> } please give details: _____ N/K <input type="checkbox"/>			27. Birth order this fetus / baby 0=singleton <input type="checkbox"/> N/K <input type="checkbox"/>		
10. Past obstetric history Number of previous live births <input type="checkbox"/> Number of previous stillbirths (24+ weeks) <input type="checkbox"/> N/K <input type="checkbox"/>			28. Birth weight (kg) <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> Never recorded <input type="checkbox"/> N/K <input type="checkbox"/>		
11. Maternal height and weight OR Body Mass Index (BMI) Height <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> cm N/K <input type="checkbox"/> Weight <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> kg N/K <input type="checkbox"/> BMI <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> N/K <input type="checkbox"/>			29. Gestation at delivery <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> weeks + <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> days N/K <input type="checkbox"/>		
12. Estimated date of delivery <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> Day Month Year N/K <input type="checkbox"/>			30. Was there evidence of fetal growth restriction? Yes <input type="checkbox"/> No <input type="checkbox"/> N/K <input type="checkbox"/>		
13. Date of first booking appt. <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> Day Month Year Never booked <input type="checkbox"/> N/K <input type="checkbox"/>			31. Gestation death confirmed - Stillbirths only <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> weeks + <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> days N/K <input type="checkbox"/>		
14. Intended place of delivery at booking Name of unit/place _____ office use only Consultant led unit <input type="checkbox"/> Midwifery led unit <input type="checkbox"/> Other <input type="checkbox"/> N/K <input type="checkbox"/>			32. Was this a legal abortion? (Notifiable under 1967/92 Abortion Act) Yes <input type="checkbox"/> No <input type="checkbox"/> N/K <input type="checkbox"/> <p style="font-size: 0.8em;">NB: a case can be both a registrable death (stillbirth or neonatal death) AND a legal abortion</p>		
15. Intended place of delivery at onset of labour Name of unit/place _____ office use only Consultant led unit <input type="checkbox"/> Midwifery led unit <input type="checkbox"/> Other <input type="checkbox"/> N/K <input type="checkbox"/>			33. When did death occur? - Stillbirths only Antepartum <input type="checkbox"/> Intrapartum <input type="checkbox"/> N/K <input type="checkbox"/>		
16. Actual place of delivery Name of unit/place _____ office use only Consultant led unit <input type="checkbox"/> Midwifery led unit <input type="checkbox"/> Other <input type="checkbox"/> N/K <input type="checkbox"/>			34. Place of death - Live births only <div style="border: 1px solid black; width: 100px; height: 20px; display: flex; align-items: center;"> </div> Name of unit/place _____ office use only N/K <input type="checkbox"/>		
17. Date and time of delivery / birth <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> <div style="margin: 0 5px;">Day Month Year</div> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> <div style="margin: 0 5px;">24hr clock</div> </div> Time N/K <input type="checkbox"/> Date & time N/K <input type="checkbox"/>			35. Date and time of death - Live births only <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> <div style="margin: 0 5px;">Day Month Year</div> <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div> <div style="margin: 0 5px;">24hr clock</div> </div> Time N/K <input type="checkbox"/> Date & time N/K <input type="checkbox"/>		
18. Mode of delivery Spontaneous vaginal <input type="checkbox"/> Forceps <input type="checkbox"/> Ventouse <input type="checkbox"/> Elective C.S. <input type="checkbox"/> Other C.S. <input type="checkbox"/> N/K <input type="checkbox"/> Other <input type="checkbox"/>			36. Cause of death - clinical details a. MAIN FETAL / INFANT disease or conditions _____ b. OTHER FETAL / INFANT diseases or conditions _____ c. MAIN MATERNAL disease or conditions affecting fetus/neonate _____ d. OTHER MATERNAL disease or conditions affecting fetus/neonate _____ e. OTHER RELEVANT causes or comments _____		
19. Was this a breech presentation? (immediately prior to delivery) Yes <input type="checkbox"/> No <input type="checkbox"/> N/K <input type="checkbox"/>			37. Extended Wigglesworth classification (see guidelines) <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div>		
Please give the details of the person who completed this form Name: _____ Position: _____ Contact address: _____ Tel. number/email address: _____			38. Fetal and Infant classification (see guidelines) <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div>		
			39. Obstetric (Aberdeen) classification (see guidelines) <div style="border: 1px solid black; width: 40px; height: 20px; display: flex; align-items: center;"> </div>		
			40. Postmortem / autopsy Held / being arranged <input type="checkbox"/> Not offered <input type="checkbox"/> Parent or guardian refused permission <input type="checkbox"/> Coroner's postmortem <input type="checkbox"/> Consent given but postmortem not performed <input type="checkbox"/> N/K <input type="checkbox"/>		



Published April 2008 by CEMACH

CEMACH, Chiltern Court, 188 Baker Street, London, NW1 5SD

Tel: **0207 486 1191** Fax: **0207 486 6543**

Email: **info@cemach.org.uk** Website: **www.cemach.org.uk**

ISBN: 978-0-9533536-6-8

UK Price £10 Ireland and rest of Europe Price 15€

To obtain further copies of this report please email **info@cemach.org.uk** or visit **www.cemach.org.uk**

Simple • Intuitive • Compact • Versatile



The new Philips Fetal Monitor

Better management of all your deliveries



Avalon FM30

Easy to read display (triplet monitoring)



Why should mum be confined to a bed? - Use WIRELESS transducers.

Why use more than one monitor? – Both FETAL and MATERNAL measurements on one easy read colour screen.

Have you ever had trouble monitoring twins? – Smart Ultra Sound transducers that monitor TRIPLETS.

Worry about running out of CTG paper? - No problem when you have an hours memory.

THE COMPLETE SOLUTION FOR MIDWIFES, MUM and BABY.

PHILIPS

For a demo or trial, contact us at

Cardiac Services Ltd
The Acumen Centre
First Avenue
Poynton, Stockport
Cheshire, SK12 1 FJ
Tel: +44 (0)1625 878 999
Fax: +44 (0)1625 878 880

Web: www.cardiac-services.com

E-mail: d-booth@cardiac-services.com

