

PERINATAL MORTALITY
SURVEILLANCE REPORT 2004

England, Wales and Northern Ireland

March 2006



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.

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CEMACH, Chiltern Court, 188 Baker Street, London NW1 5SD
Tel: 020 7486 1191; fax 020 7486 6543; email: info@cemach.org.uk
Website: www.cemach.org.uk

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Definitions

Late fetal loss	A child delivering between 22 ⁺⁰ and 23 ⁺⁶ weeks of gestation who did not at any time after being expelled from its mother breathe or show any other signs of life
Stillbirth	A child that has issued forth from its mother after the 24th week of pregnancy and who did not at any time after being completely expelled from its mother breathe or show any other signs of life
Early neonatal death	Death of a live born baby occurring less than 7 completed days from the time of birth
Late neonatal death	Death of a live born baby occurring from the 7th day of life and before 28 completed days from the time of birth
Stillbirth rate	Number of stillbirths per 1000 live births and stillbirths
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

1 Introduction

Health professionals involved in caring for pregnant women and their babies have long been at the forefront of clinical audit in the UK. Mortality rates are fundamental to the audit process: death is undeniably important, the diagnosis is unarguable and the figures are easily collectable. At its crudest level, monitoring mortality rates is one of the most basic ways of checking the effectiveness of a clinical service.

Clearly there is much more to modern maternity care than ensuring that mother and baby survive pregnancy and childbirth. Practising healthcare professionals across the country now contribute to a wide range of Confidential Enquiry activity that extends beyond the remit of mortality. Nevertheless, safety remains paramount. In developing countries, maternal and perinatal mortality rates are the main indicators of the quality of maternity services and they demand constant vigilance even in developed countries.

This report represents the first annual perinatal mortality surveillance report conducted under the auspices of the Confidential Enquiry into Maternal and Child Health (CEMACH). Its primary focus is perinatal mortality surveillance, although reference is made to other CEMACH studies and activities which have previously been reported or are planned for the future. This report is also intended to stimulate discussion at unit meetings in order to identify local issues, which these data may highlight, so that measures can be put in place to address areas of concern.

CEMACH is the successor organisation to two previous national confidential enquiries, the Confidential Enquiry into Maternal Deaths (CEMD) and the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). It has taken on the programme of national confidential enquiries started by CEMD in 1952 and by CESDI from 1992 and is building on this well-established foundation by extending its remit to encompass morbidity and the establishment of a new national enquiry into child health. In essence, CEMACH runs three programmes: maternal health, perinatal health and child health. More information on this work can be found in Sections 8 and 9 of this report.

CEMACH is run as a self-governing body and is managed by its own Board with members from seven Royal Colleges (RCOG, RCPCH, RCM, FPH, RCPATH, RCA and RCGP) and an independent Chair. There is a national advisory panel for each of its major programmes of work (maternal, perinatal and child health) and extensive lay and voluntary sector involvement. Multidisciplinary involvement is at the centre of the Enquiry's work.

Why confidential? Confidentiality is a fundamental principle in the way CEMACH operates. The aim is to learn lessons for general application by enquiring into individual cases. This is based on a non-blaming approach, where individuals can be frank in discussing what went wrong and make suggestions about how care can be improved. The results of CEMACH enquiries are made available in national reports, which do not identify individual patients, clinicians or the units in which care has been provided.

Full copies of recent reports can be found on the CEMACH website www.cemach.org.uk.

And finally, THANK YOU! The CEMACH programme is only possible because of the commitment and involvement of practising health professionals throughout the nations covered by the enquiry, by providing data, by participating as assessors and finally closing the loop by advocating the implementation of recommendations into trust practice. CEMACH cannot thank enough the many clinicians and staff who continue to provide this support for our work.

2 Data collection methodology

From 2004, CEMACH has collected epidemiological and clinical data on each baby delivering after 22 completed weeks of gestation showing no signs of life and each live birth resulting in a neonatal death using its Perinatal Death Notification (PDN) form. The PDN form for 2004 can be seen as Appendix A.

These data are collected by a network of local health professionals coordinated by the CEMACH regional offices. Every maternity unit within England, Wales and Northern Ireland has a CEMACH co-ordinator who notifies the CEMACH regional office of any deaths within the age range collected. This data collection is supplemented by additional reporting of deaths from child health systems and from local congenital anomaly registers where data sharing arrangements have been in place for many years. This multiple source reporting leads to a very high level of ascertainment of deaths.

Data are then compiled centrally and cross-validated with registration data on stillbirths and neonatal deaths from the Office for National Statistics (ONS). Any cases that have been omitted from usual reporting sources are then included in CEMACH figures.

Perinatal mortality data collected by CEMACH differ from registration data collected by the ONS with a higher number of cases reported to CEMACH. CEMACH is currently conducting a linkage exercise with registration data collected by the ONS to determine the exact nature of this difference and the possible explanations for it.

Data in this report are presented using birth cohorts based on date of delivery. Denominator data on all live births used to calculate rates are obtained from the ONS for England and Wales,^{1,2} the General Registrar's Office (GRO) for Northern Ireland³ and additional information for England is obtained from the delivery record of Hospital Episode Statistics.⁴ Data sources are referenced throughout the report.

3 Recent trends in perinatal mortality

From 1954 until the mid 1990s, stillbirth and neonatal death rates in England and Wales fell steadily (Figure 1). 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. Stillbirth rates then plateaued at this level until 2002 while neonatal rates continued to fall slightly.

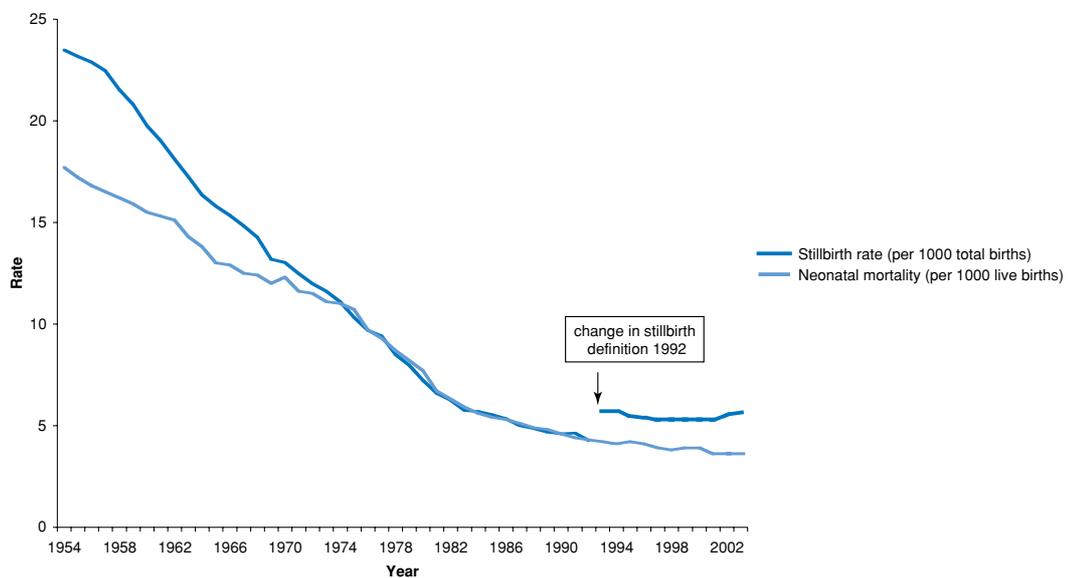


Figure 1: Stillbirth and neonatal mortality, England and Wales, 1954–2003. (Source: ONS)

More detailed information on the cases reported to CEMACH from 2000–2003 can be seen in Table 1. In 2002, there was a significant increase in the stillbirth rate from 5.4 per 1000 total births in 2001 to 5.7 per 1000. This increase was sustained in 2003. By contrast, the neonatal rate mortality rate remained relatively stable across this period.

Table 1: Perinatal deaths, 2000–2003, England, Wales and Northern Ireland

	Year of birth							
	2000		2001		2002		2003	
	N	Rate	N	Rate	N	Rate	N	Rate
Total reports	8470		8178		8430		8844	
<i>Legal abortion</i>	1602	–	1542	–	1525	–	1639	–
Late fetal loss ^a	2668	–	2608	–	2674	–	2764	–
Stillbirth ^b	3366	5.4	3320	5.4	3542	5.7	3730	5.8
Perinatal death ^b	5220	8.3	5023	8.1	5257	8.5	5564	8.6
Neonatal death ^c	2436	3.9	2250	3.7	2214	3.6	2350	3.7
Total live births	625642		616322		617299		642899	

^a Includes babies delivering from 20⁺⁰ to 23⁺⁶ completed weeks of gestation showing no signs of life
^b Rate per 1000 live births and stillbirths
^c Rate per 1000 live births

Sources: RRF 2000, 2001, 2002, 2003
 CEMACH death notification 2004
 ONS 2000, 2001, 2002, 2003
 Northern Ireland GRO 2000, 2001, 2002, 2003

4 Perinatal mortality surveillance 2004

KEY FINDINGS

- The stillbirth rate in 2004 remained high (5.7 per 1000 births) after a significant increase between 2001 and 2002.
- Three-quarters of stillbirths delivered after 28 completed weeks of gestation.
- Multiple births had a higher stillbirth rate and neonatal mortality rate than singletons, 3.2 and 7.0 times higher, respectively.
- A high proportion of stillbirths and neonatal deaths were born to women living in socially deprived areas.
- Both the stillbirth rate and neonatal mortality rate were higher in women of Black, Asian or Other ethnicity.
- Postmortem examination rates have plateaued at 42% after a significant fall throughout the 1990s and early 2000s.

4.1 Total death notifications

In 2004, there were 3791 stillbirths and 2257 neonatal deaths in England, Wales and Northern Ireland reported to CEMACH (Table 2).

Table 2: Notifications, 2004, England, Wales and Northern Ireland

	Number	Rate [95% CI]
Total live births	662039	–
Total notifications	7152 *	–
Late fetal loss	1102	–
Stillbirth ^a	3791	5.7 [5.5, 5.9]
Neonatal death ^b	2257	3.4 [3.3, 3.6]
Perinatal death (UK) ^a	5562	8.4 [8.1, 8.6]
Perinatal death (WHO) ^a	6664	10.0 [9.8, 10.2]

^a Rate per 1000 total births
^b Rate per 1000 live births
 * includes 2 cases where cases definition is uncertain

Sources: CEMACH PDN 2004, 2005
 ONS 2004
 Northern Ireland GRO 2004

The stillbirth rate for 2004 was 5.7 per 1000 total births equating to more than one in every 200 babies born. Following a significant increase in the stillbirth rate in 2002 (from 5.4 in 2001 to 5.7 in 2002), the rate remained high in 2003 (5.8 per 1000 total births) and in 2004 is still higher than at any point seen since the change in registration of stillbirths from 28 weeks of gestation onwards to 24 weeks of gestation onwards in 1992.⁵

The neonatal mortality rate in 2004 was 3.4 per 1000 live births. This represents a decrease from 2003 of 0.3 per 1000 live births.

Also presented in Table 2 are the total number of late fetal losses and perinatal deaths. Perinatal deaths are presented in two ways. Firstly, according to the definition in use in the UK, that is all stillbirths and early neonatal deaths. Secondly, the perinatal mortality rate is presented according to the World Health Organization definition, which includes all babies delivering from 22 weeks of gestation showing no signs & life (i.e. late fetal losses and stillbirths) and all early neonatal deaths.⁶

4.2 Mortality in singleton and multiple births

Multiple births are at a greater risk than singleton births of adverse perinatal outcome, including stillbirth and neonatal death. Table 3 shows the stillbirth and neonatal mortality rates according to the plurality of the birth.

Table 3: Stillbirths and neonatal deaths by multiplicity, 2004, England, Wales and Northern Ireland

	Number	Rate [95% CI]
Total live births	662039	
Singleton	642596	
Multiple	19443	
Stillbirth ^a	3791	5.7 [5.5, 5.9]
Singleton	3436	5.3 [5.1, 5.5]
Multiple	339	17.1 [15.4, 19.1]
Unknown	16	–
Neonatal death ^b	2257	3.4 [3.3, 3.6]
Singleton	1841	2.9 [2.7, 3.0]
Multiple	390	20.1 [18.2, 22.2]
Unknown	26	–

^a Rate per 1000 total births
^b Rate per 1000 live births

Sources: CEMACH PDN 2004, 2005
ONS 2004
Northern Ireland GRO 2004

The stillbirth rate of multiple births was 3.2 times that for singletons. An even greater disparity is seen for neonatal death with the neonatal mortality rate for multiple births 7.0 times that for singletons.

In 2004, there was a decrease in both the stillbirth rate and neonatal mortality rate for multiple births compared with the rates seen in 2003 of 3.1 per 1000 total births and 0.8 per 1000 live births, respectively.

4.3 Cause of death

4.3.1 Stillbirths

The cause of death for stillbirths is currently classified using the Extended Wigglesworth classification supplemented by the Obstetric (Aberdeen) classification. Details of these classification systems can be found at www.cemach.org.uk/pdn_classifications.htm.

Figure 2 shows the cause of death of all stillbirths. The largest identifiable group is deaths due to severe/lethal congenital anomalies accounting for 15.1% of all stillbirths. This is followed by antepartum haemorrhage (10.0%) and death from intrapartum causes (7.3%). Just over 50% of stillbirths are antepartum fetal deaths that remain unexplained using the current classification systems. This situation is clearly unsatisfactory and CEMACH will be reviewing the classification systems currently in use in order to improve the reporting of the cause of death for stillbirths.

From 2005, CEMACH will report on fetuses that were small for gestational age and will also include information on the presence of fetal growth restriction.

Cause-specific stillbirth rates according to timing of death (antepartum versus intrapartum) are shown in Appendix B.

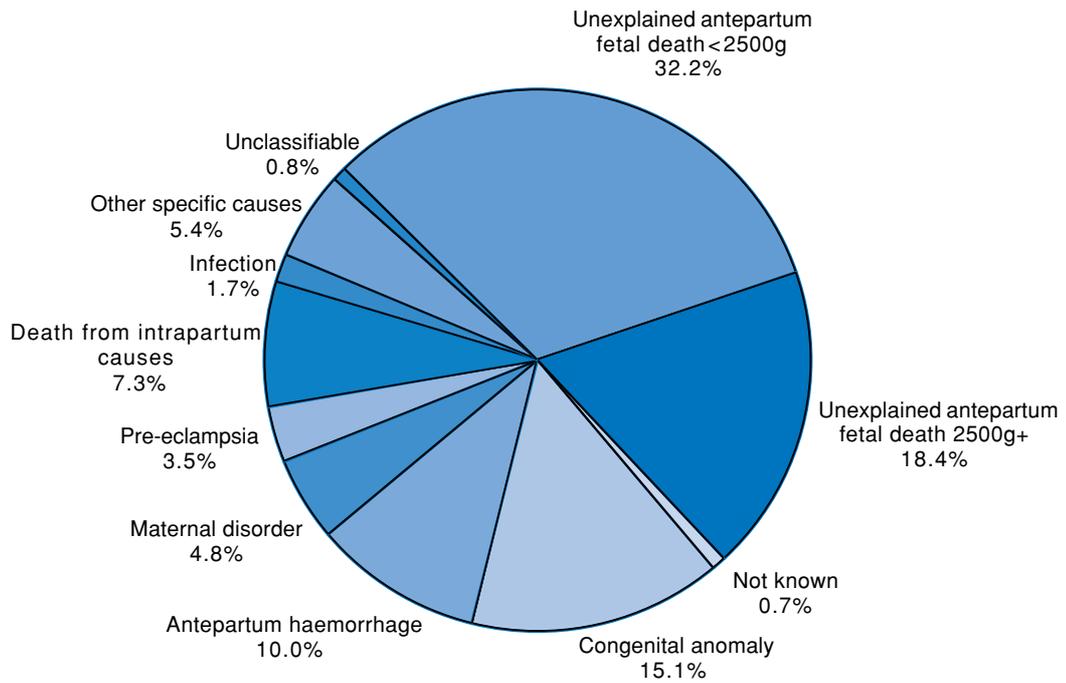


Figure 2: Cause of death of stillbirths by Wigglesworth and Obstetric classifications, 2004. (Source: CEMACH)

4.3.2 Neonatal deaths

The cause of death for neonatal deaths is classified according to the extended Wigglesworth classification. For 2004, the largest proportion of neonatal deaths was classified as death due to immaturity, 48% (Figure 3). This was followed by lethal/severe congenital anomalies (22%) and death due to intrapartum causes (11%).

Cause-specific early and late neonatal mortality rates can be found in Appendix B.

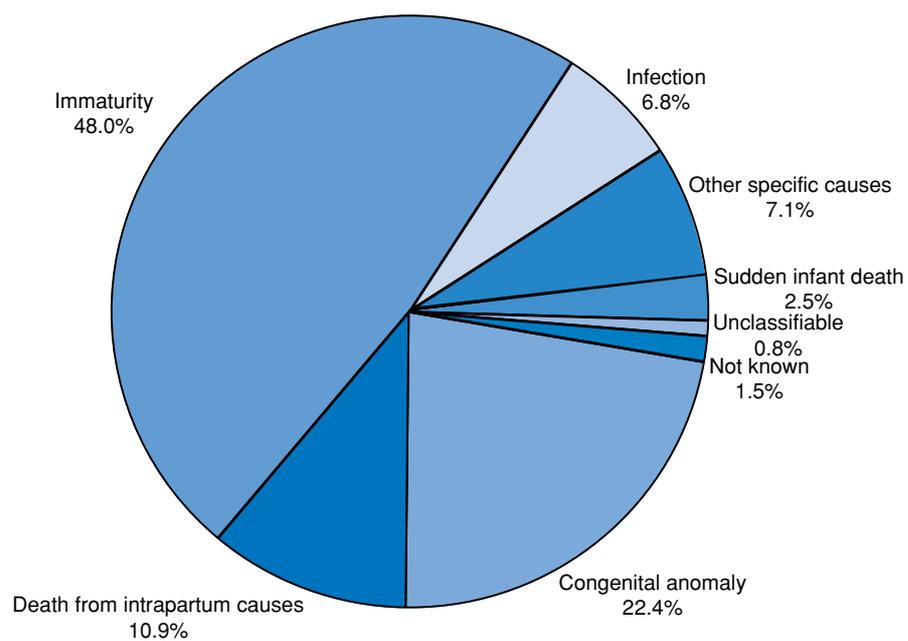


Figure 3: Cause of death of neonatal deaths by Wigglesworth classification, 2004. (Source: CEMACH)

4.4 Maternal risk factors

4.4.1 Maternal age

The association of maternal age with stillbirth rate and neonatal mortality rate is well documented with higher rates of both being experienced by women of very young ages and those of older ages.

Age-specific stillbirth and neonatal mortality rates are shown in Figure 4. Data used to create this figure can be found in Appendix B.

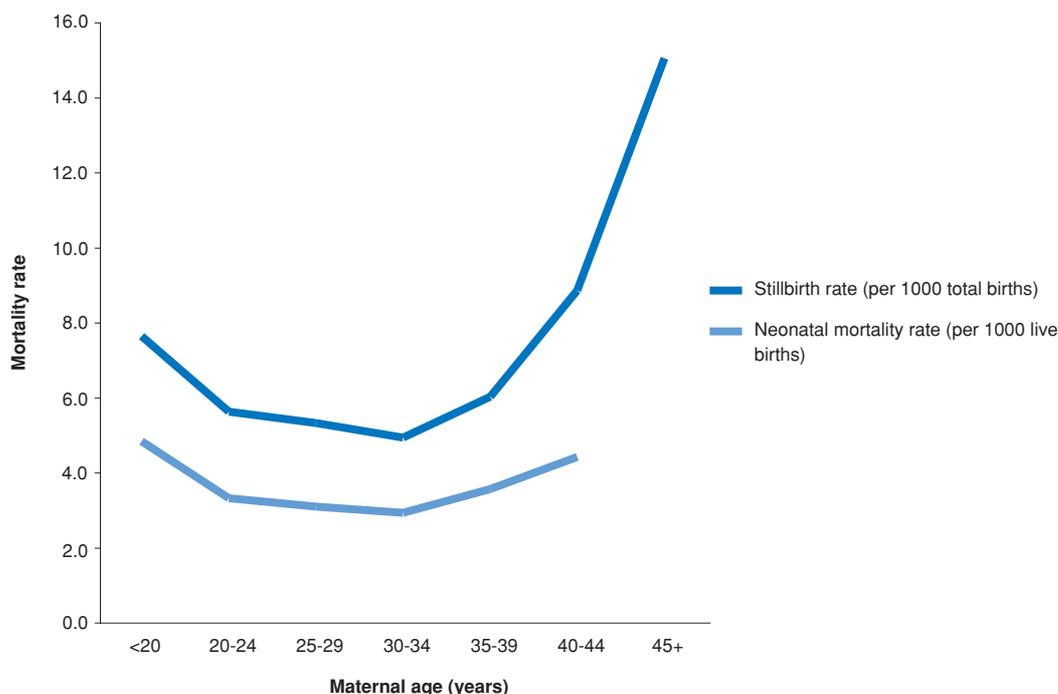


Figure 4: Stillbirth rate and neonatal mortality rate by maternal age at delivery, 2004. (Sources: CEMACH, ONS and GRO)

4.4.2 Ethnicity

CEMACH collects self-reported maternal ethnicity in order to explore the association between ethnicity and perinatal death.

The distribution of maternal ethnicity for all reported late fetal losses, stillbirths and neonatal deaths is shown in Table 4.

The calculation of ethnicity-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, however, attempted to calculate them using the information on maternal ethnicity collected in England as part of the delivery record of the Hospital Episodes Statistics (HES).⁴ There are a number of problems with doing this, not least that the data collection of maternal ethnicity on HES remains incomplete with 75% of all birth records having a stated ethnicity for the period 2003–04. The resulting rates should therefore be considered as an approximation only. The methodology used to calculate these estimated rates is further described in Appendix C.

Estimated maternal ethnic-specific mortality rates (Table 5) show significantly higher stillbirth rates and neonatal mortality rates for women of Black ethnicity (2.8 and 2.7 times higher, respectively), Asian ethnicity (2.0 and 1.6 times higher, respectively) and Chinese and other

Table 4: Total notifications by ethnicity, England, Wales and Northern Ireland, 2004

	N	Percentage (of records with stated ethnicity)
White	4920	69.2
Black African	435	6.1
Black Caribbean	210	3.0
Black other	43	0.6
Indian	250	3.5
Pakistani	457	6.4
Bangladeshi	120	1.7
Chinese	34	0.5
Mixed	274	3.9
Other	71	1.0
Not known	293	4.1
<i>Missing</i>	45	

Sources: CEMACH PDN 2004, 2005

Table 5: Estimated maternal ethnicity-specific stillbirth rates and neonatal mortality rates, England only, 2004

	Live births		Stillbirths		Neonatal deaths		
	N	N	Rate ^b	Rate ratio ^d	N	Rate ^c	Rate ratio ^d
Total	607184	3470	5.7		2033	3.4	
White	482000 ^a	2323	4.8	–	1359	2.8	–
Black	26000 ^a	359	13.6	2.8 [2.5, 3.1]	198	7.6	2.7 [2.3, 3.1]
Asian	49000 ^a	486	9.8	2.0 [1.8, 2.2]	227	4.6	1.6 [1.4, 1.8]
Chinese and other	20000 ^a	185	9.2	1.9 [1.6, 2.2]	109	5.5	1.9 [1.6, 2.3]
Not known	30000 ^a	99	–		140	–	

^a Estimated distribution according to maternity HES
^b Rate per 1000 total births
^c Rate per 1000 live births
^d Rate ratio using White ethnicity as baseline

Sources: CEMACH PDN 2004, 2005
Maternity HES 2003–04

ethnicity (1.9 times higher in both cases) when compared with rates for women of White ethnicity.

4.4.3 Deprivation

The relationship of stillbirths and neonatal deaths with social deprivation was explored by the application of an Index of Multiple Deprivation (IMD 2004)⁷ score, a measure of deprivation at the small area level. The relative distribution of stillbirths and neonatal deaths according to quintile of deprivation is shown in Table 6 and the methodology further described in Appendix C.

Over one-third of all stillbirths and neonatal deaths were born to mothers resident in the most deprived quintile (compared with expected 20%). While this would appear to substantiate previous work that shows that deprivation is associated with adverse perinatal outcome it is not possible to draw any firm conclusions from this data in the absence of published information about deprivation in the general maternity population.

These deprivation scores are derived from area of residence-based statistics. For future reports, CEMACH hopes to look at individual level occupation and social class data by linkage with registration data collected by the ONS and NI GRO.

Table 6: Stillbirths and neonatal deaths by quintiles of deprivation, 2004

	Stillbirth		Neonatal death	
	N	%	N	%
1 (least deprived)	445	13.0	220	11.1
2	439	12.8	252	12.7
3	546	16.0	341	17.2
4	789	23.1	454	22.9
5 (most deprived)	1202	35.1	719	36.2
<i>Wales and Northern Ireland</i>	295	–	175	–
<i>Missing information</i>	6	–	8	–

Note: second or subsequent deaths from pregnancies with multiple losses are excluded from this table. Sources: CEMACH PDN 2004, 2005

4.5 Characteristics of the baby

4.5.1 Birth weight

Table 7 shows the distribution of all live births, stillbirths and neonatal deaths according to birth weight. At the time of writing, birth weight data for live births were not available split by multiplicity and these figures therefore include singleton and multiple births. Two-thirds of all stillbirths and over 70% of all neonatal deaths had a birth weight of less than 2500 g compared with only 7.6% of all live births in England, Wales and elsewhere. Birth weight specific mortality rates can be seen in Table 8.

Table 7: Birth weight distribution of live births, stillbirths and neonatal deaths, England and Wales, 2004

Birth weight (g)	Live births		Stillbirths		Neonatal deaths	
	N	%	N	%	N	%
Total	639721		3652		2160	
<1000	3156	0.5	1240	34.8	1073	51.6
1000–1499	4747	0.7	425	11.9	197	9.5
1500–1999	9754	1.5	362	10.2	118	5.7
2000–2499	30937	4.8	410	11.5	148	7.1
2500–2999	109437	17.1	425	11.9	184	8.9
3000–3499	227944	35.7	392	11.0	191	9.2
3500–3999	181667	28.4	190	5.3	116	5.6
4000+	70926	11.1	116	3.3	52	2.5
Not known	1153		92		81	

Sources: CEMACH PDN 2004, 2005
ONS 2004

Figures for birth weight displayed in this section are for cases resident in England, Wales and elsewhere as denominator data for all live births in Northern Ireland were not available at the time of writing.

4.5.2 Gestational age

Figures for gestational age displayed in this section are for cases resident in England only as denominator data for all live births in Wales and Northern Ireland were not available at the time of writing.

Table 9 shows the distribution of all live births (singletons and multiples) according to gestational age at delivery. Nearly three-quarters of stillbirths were delivered after 28 completed

Table 8: Birth weight-specific stillbirth and neonatal mortality rates, England and Wales, 2004

Birth weight (g)	Live births	Stillbirths		Neonatal deaths	
	N	N	Rate ^a	N	Rate ^b
Total	639721	3652	5.7	2160	3.4
<1000	3156	1240	282.1	1073	340.0
1000–1499	4747	425	82.2	197	41.5
1500–1999	9754	362	35.8	118	12.1
2000–2499	30937	410	13.1	148	4.8
2500–2999	109437	425	3.9	184	1.7
3000–3499	227944	392	1.7	191	0.8
3500–3999	181667	190	1.0	116	0.6
4000+	70926	116	1.6	52	0.7
Not known	1153	92	–	81	–

^a Rate per 1000 total births
^b Rate per 1000 live births

Sources: CEMACH PDN 2004, 2005
ONS 2004

Table 9: Gestation distribution of all live births, stillbirths and neonatal deaths, England, 2004

Gestation at delivery (completed weeks)	Live births	Stillbirths		Neonatal deaths	
	%	N	%	N	%
Total	100.0	3470	100.0	2055	100.0
<24 ⁺	0.1	–		540	26.3
24 ⁺ –27 ⁺	0.5	934	26.9	496	24.1
28 ⁺ –31 ⁺	0.9	551	15.9	200	9.7
32 ⁺ –36 ⁺	6.0	817	23.5	243	11.8
37 ⁺ –41 ⁺	87.9	1084	31.2	481	23.4
42+	4.7	33	1.0	22	1.1
Not known		51	1.5	73	3.6

Sources: CEMACH PDN 2004, 2005
Maternity HES 2003–04

weeks of gestation. Over 70% of all neonatal deaths were born preterm, i.e. before 37 completed weeks of gestation.

Gestational age-specific stillbirth rates and neonatal mortality rates are shown in Table 10.

Table 10: Estimated gestation specific stillbirth and neonatal mortality rates, England, 2004

Gestation at delivery (completed weeks)	Live births	Stillbirths		Neonatal deaths	
	N	N	Rate ^b	N	Rate ^c
Total	607184	3470	5.7	2055	3.4
<24	600 ^a	–		540	900.0
24–27	3000 ^a	934	237.4	496	165.3
28–31	5300 ^a	551	94.2	200	37.7
32–36	36300 ^a	817	22.0	243	6.7
37–41	533800 ^a	1084	2.0	481	0.9
42+	28300 ^a	33	1.2	22	0.8
Not known		51	–	73	–

^a Estimated distribution according to maternity HES
^b Rate per 1000 total births
^c Rate per 1000 live births

Sources: CEMACH PDN 2004, 2005
Maternity HES 2003–04

In future reports, CEMACH intends to present figures showing distribution of stillbirths and neonatal deaths by birth weight adjusted for gestational age. This will enable a greater exploration of the association of being small for gestational age with stillbirth and neonatal death.

4.6 Commentary on findings

Perinatal mortality rates have been falling since the 1950s but throughout this period stillbirths have been and remain the largest contributor accounting for nearly 70% of perinatal deaths in 2004. By the 1990s, the stillbirth rate had stabilised and it was therefore of particular concern when an increase was observed in 2002. This report finds that these higher rates continued to be observed in 2004.

Nearly three-quarters of stillbirths deliver after 28 completed weeks of gestation, a time when a baby could be expected to survive if delivered alive in a good condition. Confidential enquiry assessments of maternity care in over 400 stillbirths in 1996–1997 noted that care had been suboptimal in 45% of cases.⁸ Concerns regarding the quality of risk assessment antenatally and the management of fetal wellbeing were recurring themes in previous confidential enquiry work. The current classification system of perinatal deaths is also limited as half of stillbirths are categorised as ‘unexplained’. In particular the role of identification of intrauterine growth restriction (IUGR) in stillbirth and neonatal deaths needs further study, especially with respect to the accurate diagnosis antenatally and at postmortem examination. To further our understanding of the causes of perinatal deaths two areas need improvement: the classification of stillbirths and neonatal deaths and the standardisation of the observations and measurements made at perinatal postmortem (see Section 5).

Data gathered about perinatal deaths are used to identify risk factors relevant to clinical practice and the planning of future services to improve the health and wellbeing of mothers and their babies. This report finds that mothers living in socially disadvantaged areas had a higher proportion of stillbirths and neonatal deaths than might be expected. Babies born to women of Black, Asian or Other ethnicity had higher stillbirth rates and neonatal mortality rates than women of White ethnic origin. Risk factors are not uniform across the various ethnic minority groups and further research is required to increase understanding of the socio-demographic profiles and determinants of health and wellbeing in pregnancy among Britain’s ethnic minorities.

High-quality relevant information is fundamental to the identification of risk factors. It is a tribute to maternity professionals in England, Wales and Northern Ireland that CEMACH has continued to achieve such high ascertainment levels of perinatal deaths despite the challenges of reorganisation. However, assessing risk is also dependent on the provision of denominator data on all births. Information relating to maternity care based on all births is widely recognised to be inadequate and maternity information has been identified as a priority for the implementation of the National Service Framework for Maternity Services. CEMACH looks forward to working with the relevant national initiatives to improve the quality of maternity data for audit and surveillance activities.

From 2005 onwards, CEMACH plans to develop the reporting of perinatal mortality data in order to provide a more comprehensive picture of the factors associated with perinatal deaths in England, Wales and Northern Ireland (see Section 7). This, combined with improvements in maternity data on all births, will provide a more extensive and relevant picture of maternity and neonatal care in the future.

5 The postmortem investigation

Information is collected by CEMACH about whether a postmortem has been held or is being arranged. Postmortem reports are then obtained by the CEMACH regional offices in order to confirm the cause of death. Postmortem rates (per 100 cases) by region are displayed in Table 11.

Table 11: Postmortem rates by region, 2004

	Late fetal loss N (%)	Stillbirth N (%)	Neonatal death N (%)	Total N (%)
E,W & NI ^a	497 (45.1)	1773 (46.8)	746 (33.1)	3018 ^b (42.2)
North East	13 (41.9)	88 (52.1)	23 (30.7)	124 (45.1)
Yorkshire and Humberside	23 (30.3)	171 (44.2)	56 (26.5)	250 (37.1)
North West	23 (22.8)	143 (31.3)	65 (22.4)	231 (27.2)
West Midlands	43 (41.7)	174 (45.5)	74 (23.9)	291 (36.6)
East Midlands	35 (43.2)	126 (48.1)	58 (35.2)	219 (43.1)
East of England	35 (42.7)	140 (41.7)	68 (35.8)	243 (40.0)
London	143 (53.4)	406 (52.7)	155 (39.6)	704 (49.2)
South East	94 (52.8)	248 (53.3)	105 (40.5)	447 (49.6)
South West	44 (47.8)	130 (53.9)	74 (45.1)	248 (49.9)
Wales	24 (43.6)	88 (48.4)	35 (33.3)	148 ^c (43.1)
Northern Ireland	14 (56.0)	52 (44.4)	20 (26.0)	86 (39.3)
Elsewhere	6 (60.0)	7 (31.8)	13 (65.0)	27 ^c (50.9)

^a includes cases from 'Elsewhere'
^b includes 2 cases where case definition uncertain
^c includes 1 case where case definition uncertain

Sources: CEMACH PDN 2004, 2005

Overall, the postmortem rate for all cases was 42.4%. This represents an increase since 2003, when only 39.0% of cases was a postmortem examination carried out. This slight increase is encouraging, given the longstanding decline in postmortem examinations seen in the 1990s and early 2000s.⁹ Regionally, the reported uptake of postmortem examination varied from 49.9% in the South West to only 27.2% in the North West.

In those cases where a postmortem examination was not performed, 62% of these were due to parents or guardians declining permission. A further 37% were not requested with the remaining 1% not being performed even after consent was obtained.

A postmortem examination is useful not only for ascertaining the correct cause of death of *in utero* losses and neonatal deaths which may lead to greater exploration of potential preventive measures but can also be useful to parents when planning future pregnancies.

There is a need to develop consistent and reliable pathological observations related to stillbirths to achieve standardisation nationally of postmortem reporting and interpretation. Progress here has stalled as a result of the extensive reduction in postmortem uptake that occurred in the 1990s. Rates fell from 58% in 1993 to 39% in 2003. It will be likely to take some time before public confidence returns and for improvements in recruitment, training and retention of specialist paediatric perinatal pathologists to take effect. However, it is of some reassurance that this fall in postmortem rates appears to be at least plateauing at 42% in 2004.

6 Variation in stillbirth and neonatal mortality rates

It is standard practice for hospitals in the UK to monitor the number of stillbirths and neonatal deaths and review such cases through regular perinatal mortality meetings. Any increase in the perinatal mortality rate should be a cause of local concern and initiate discussion on the reasons for high rates locally. These might include referral patterns, the case mix of the population served or, on occasions, standards of care.

In addition to reporting on perinatal mortality on a nationwide basis, CEMACH aims to support local processes wherever possible through the provision of timely information. To this end we have provided stillbirth rates and neonatal mortality rates at regional, strategic health authority and trust levels in Sections 6.1, 6.2 and 6.3, respectively. With this report, we have also sent each NHS trust a separate report providing individualised trust-specific summary figures. We hope that this will enable trusts to compare themselves with other trusts and that they will be willing to share their trust-specific reports with other providers and commissioners to assist in benchmarking and local review.

In future years, the provision of this information will become more sophisticated by adjusting for referral patterns and the distribution of risk factors in the population served by individual trusts. Perinatal mortality rates for individual trusts will also be grouped according to organisational facilities available, such as the level of neonatal intensive care provision, to enable appropriate comparisons to be made.

6.1 Variation in mortality by region

Using the postcode of the normal residential address of the mother, stillbirth rates and neonatal mortality rates by the government offices for the regions are shown in Figures 5 and 6. Numbers used for the construction of these figures are shown in Appendix B.

The crude stillbirth rate in London was higher than that observed in England, Wales and Northern Ireland as a whole (Figure 5). The stillbirth rate in the South East and the South West was lower than that of the population of England, Wales and Northern Ireland as a whole. Figure 6 shows a higher crude neonatal mortality rate in the West Midlands and a lower neonatal mortality rate in the South East than that seen in the whole of England, Wales and Northern Ireland.

These mortality rates have not been adjusted for the distribution of risk factors or case mix in the population of the region and are therefore crude measures of mortality. They should not be interpreted as direct indicators of standards of care as there are many factors that can influence outcomes. CEMACH hopes to explore obtaining appropriate data on live births to allow analysis of adjusted mortality rates by region in the future.

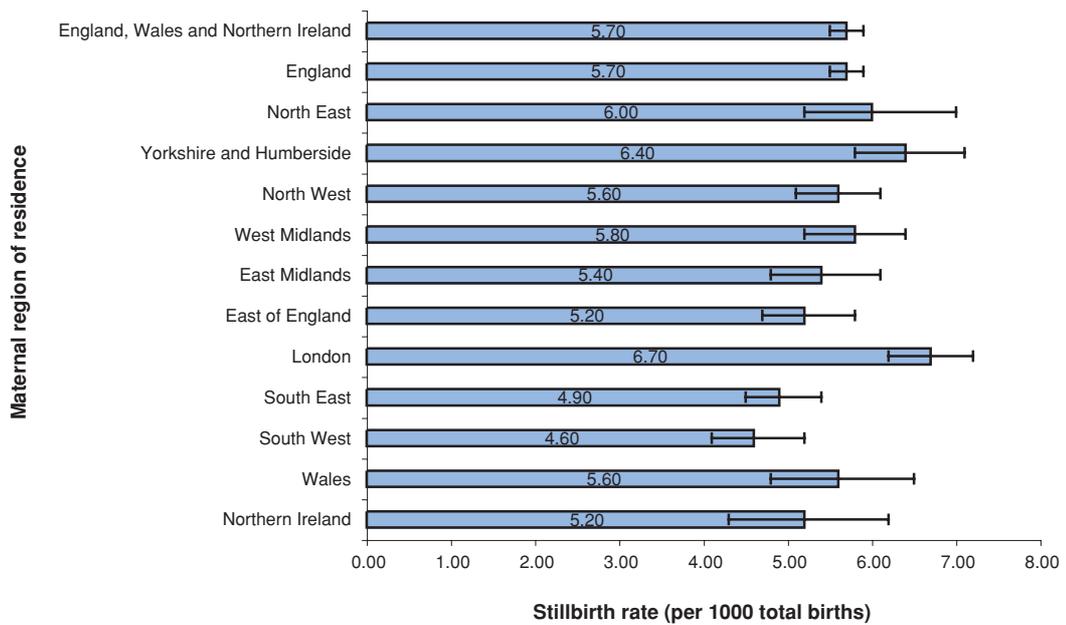


Figure 5: Stillbirth rate by maternal region of residence with associated 95% confidence intervals, 2004. Note: mortality figures for North West include cases from the Isle of Man; figures for South East include cases from the Channel Islands. (Sources: CEMACH and ONS)

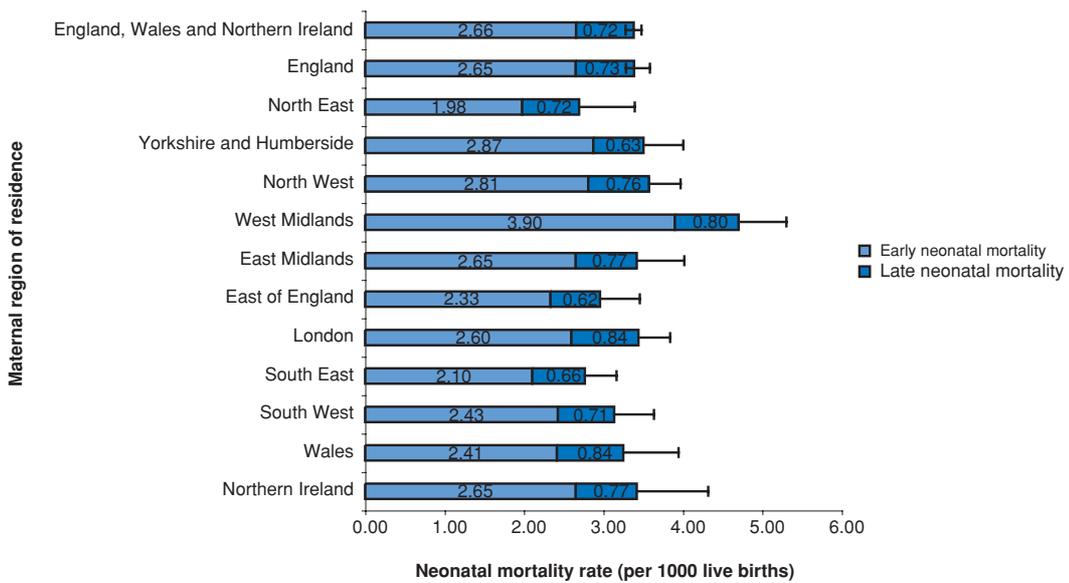


Figure 6: Early and late neonatal mortality rate by maternal region of residence with associated 95% confidence intervals for total neonatal mortality rate, 2004. Note: The West Midlands Perinatal Institute has been investigating the high early neonatal mortality rates in their region. There appears to be a high proportion of recorded deaths at very early gestations (e.g. < 24 weeks and even < 22 weeks). Further analysis is available on www.perinatal.nhs.uk/pnm (Sources: CEMACH and ONS)

6.2 Variation in mortality by strategic health authority

Using the postcode of the normal residential address of the mother, stillbirth rates and neonatal mortality rates by NHS strategic health authority are shown in Figures 7 and 8. Data used to create these figures are shown in Appendix B.

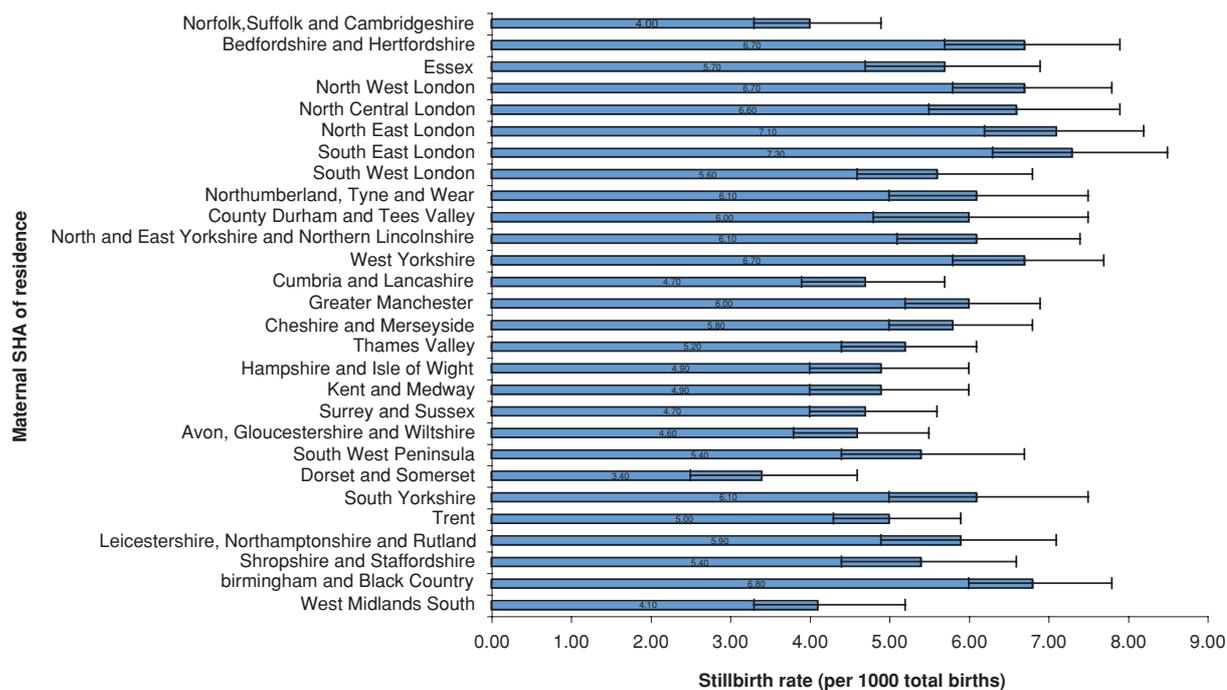


Figure 7: Stillbirth rate by maternal region of residence with associated 95% confidence intervals, 2004. (Sources: CEMACH and ONS)

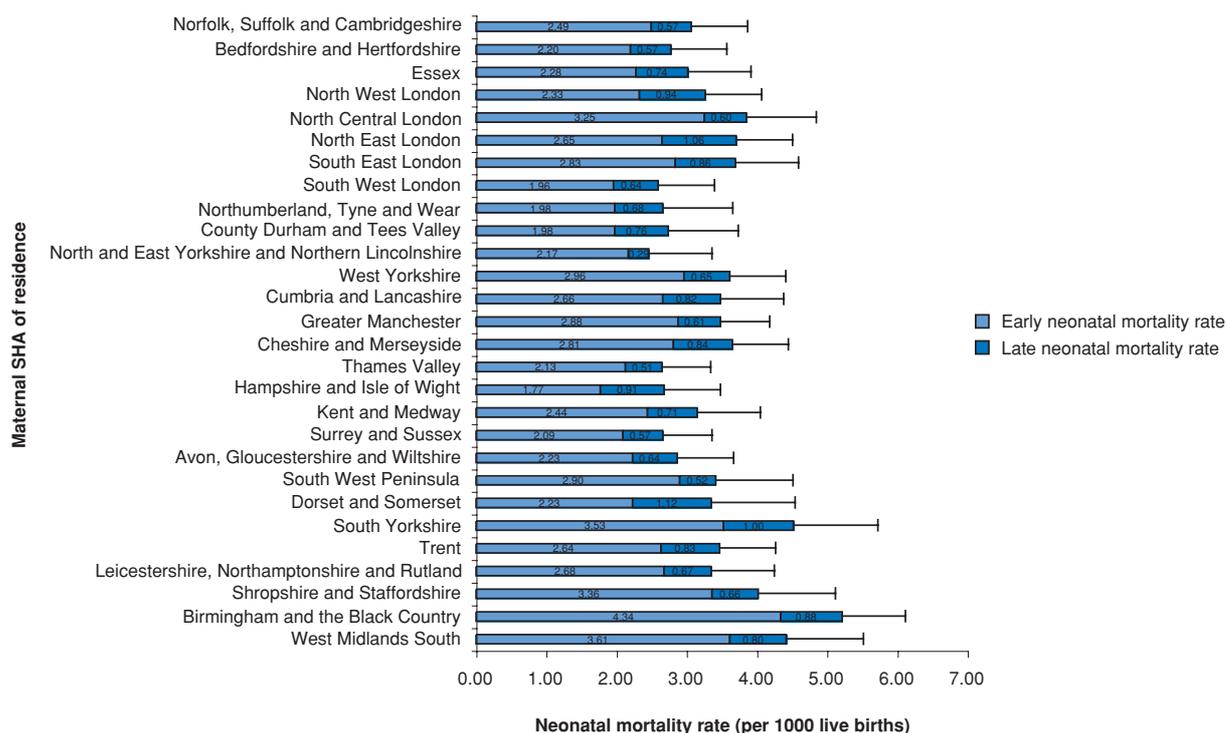


Figure 8: Early and late neonatal mortality rate by maternal region of residence with associated 95% confidence intervals for total neonatal mortality rate, 2004. (Sources: CEMACH and ONS)

6.3 Variation in mortality by hospital trust

Stillbirth and neonatal mortality rates for trusts with 1000 live births or more in 2004 are presented in Figures 9 and 10. These figures (known as funnel plots) show each individual trust's mortality rate plotted against the number of live births in that trust, the national mortality rate (solid line) and associated 95% confidence intervals (thin dotted lines) dependant on size of trust. Each marker represents one trust.

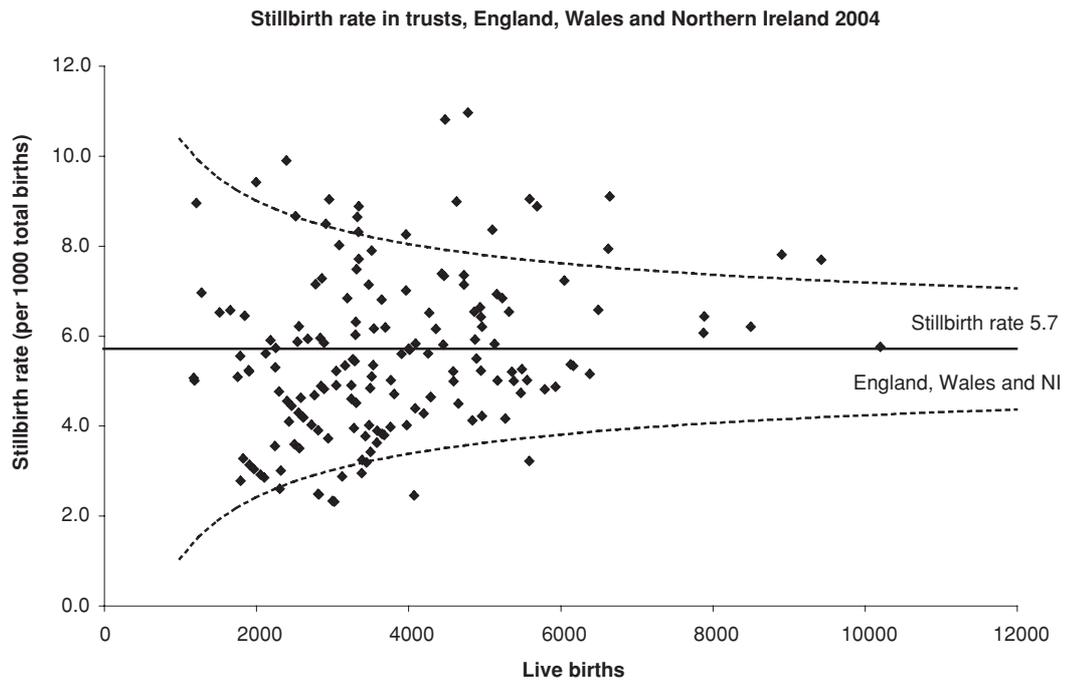


Figure 9: Stillbirth rate by trust, England, Wales and Northern Ireland, 2004. Note: owing to high variance in rates calculated using events numbering less than five, this figure is based on trusts with five or more stillbirths delivering in the trust during 2004; --- = 95% CI. (Sources: CEMACH)

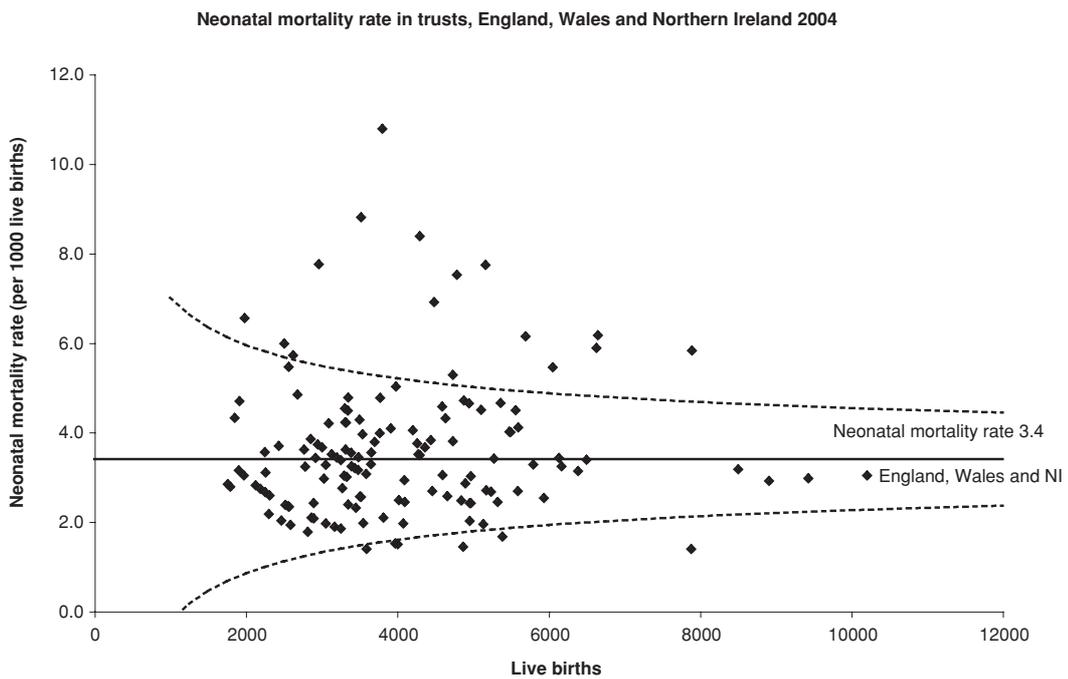


Figure 10: Neonatal mortality rate by trust, England, Wales and Northern Ireland, 2004. Note: owing to high variance in rates calculated using events numbering less than five, this figure is based on trusts with five or more neonatal deaths occurring in the trust in 2004; --- = 95% CI. (Sources: CEMACH)

If a trust lies within the 95% confidence limits, it has a crude mortality rate that is statistically consistent with the national rate. If a trust lies outside the 95% confidence limits, then the trust has a crude rate that is significantly different from the national rate. However, care should be taken in the interpretation of these figures as data displayed are crude mortality rates. They do not take into account the risk factors and case mix of the population served by the individual trust nor the transfer of mothers and babies between hospitals due to medical or other reasons.

From 2005, CEMACH has collected intended place of delivery as well as actual place of delivery and place of death. This will allow more detailed trust specific reports to be produced to take into account the effects of transfers before and after delivery in the future.

In addition, from 2005 onwards, CEMACH will present trust mortality data by type of provider. This will allow organisations to compare their mortality rates with other organisations with similar facilities.

7 Future developments to perinatal mortality surveillance

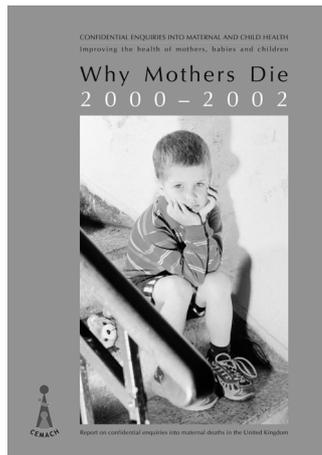
From 2005 onwards, CEMACH hopes to continue to expand and improve the reporting of perinatal mortality data in order to provide a more comprehensive picture of the factors associated with perinatal deaths in England, Wales and Northern Ireland.

Planned developments include the presentation of:

- **Numbers and rates of ‘preventable’ stillbirths and neonatal deaths**
The International Federation of Gynecology and Obstetrics (FIGO) advocates the presentation of perinatal mortality data of infants weighing 1000g or more only to allow international comparisons. Together with the presentation of data showing the relative contribution to mortality of congenital anomaly this classification allows the reporting of a notional ‘preventable mortality’. This will be reported from 2005 onwards.
- **Maternal height and weight**
From January 2005 onwards, CEMACH has collected information on maternal height, weight and/or BMI. CEMACH therefore hopes to report the association between maternal BMI and stillbirth rate and neonatal mortality rate in its next annual report.
- **Gestation specific birth weight centiles**
From January 2005 onwards, CEMACH has collected adequate information to allow the application of appropriate gestation-specific birth weight centiles to stillbirths and neonatal deaths. This will enable us to estimate the number of deaths that are of babies who are small for gestational age. This, coupled with a further question on evidence of fetal growth restriction, will allow some exploration of the association between growth restriction and stillbirth and neonatal death at a national level.
- **Gestation at which death was confirmed**
In January 2005, guidance issued by the Royal College of Obstetricians and Gynaecologists recommended that if a fetus had died prior to 24 completed weeks of pregnancy but had not delivered until after 24 completed weeks of pregnancy that fetus need not be registered as a stillbirth.¹⁰ CEMACH has continued to collect information on all babies delivering after 24 completed weeks of pregnancy showing no signs of life but also asks specific details about the known gestation of death. CEMACH will therefore endeavour to produce statistics based on gestation at delivery and gestation at death in order to try to enumerate the potential change this guidance may have on registration statistics.
- **Trust-specific data on transferred cases**
During 2005, CEMACH resumed collection of ‘intended place of delivery at booking’. This will enable CEMACH to provide more robust data on the numbers of stillbirths and neonatal deaths that were transferred into trusts to take some account of transfer rates as a component of perinatal mortality. This will form part of the reporting of trust-specific data that are provided as an insert to this national report.

8 Other CEMACH studies reported in 2004 and 2005

8.1 Why Mothers Die 2000–2002. Report on confidential enquiries into maternal deaths in the United Kingdom



This report, published in November 2004, marked the first 50 years of national reports on confidential enquiries into maternal deaths and the first published following the merger of the Confidential Enquiry into Maternal Deaths (CEMD) and the Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI). Over the period 2000–2002, the UK direct and indirect maternal mortality rate was 13.1 per 100 000 maternities. This represented a small, but statistically insignificant increase over 1997–1999. The most common cause of direct maternal death was thromboembolism. The most common cause of indirect deaths and the largest cause of maternal deaths overall was psychiatric illness.

This report found that a disproportionate number of women who died were from vulnerable and more excluded groups of our society.

Of the 261 direct and indirect maternal deaths assessed, nearly 50% of cases were classified as having some form of substandard care. This report gives many recommendations for the improvement of clinical care, service provision and interdisciplinary communication and gives essential information to all those involved in the care of women before, during and after pregnancy.

8.2 Diabetes Organisational Survey. Maternity services in 2002 for women with type 1 and type 2 diabetes, England, Wales and Northern Ireland

Published in April 2004, the 'Diabetes organisational survey' was the first in a series of reports from the CEMACH diabetes programme. Information on the services expected to be provided to women with diabetes before during and after pregnancy was collected from 213 units throughout England, Wales and Northern Ireland. Service provision was evaluated against ten criteria derived from the Diabetes National Service Framework, Scottish Intercollegiate Guideline Network guideline No. 9 and the Consensus Statement of the British Diabetic Association and Association of Clinical Biochemists. Results from this study showed

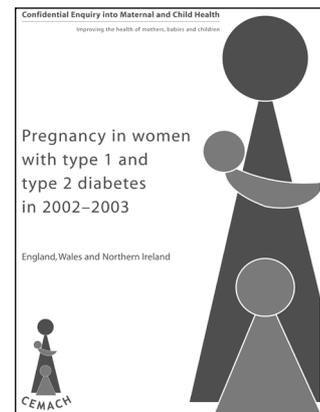
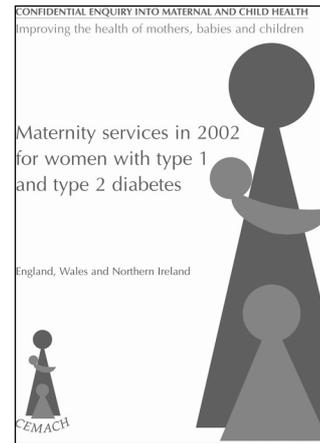
improvements in the organisation of services for women with diabetes including the availability of designated specialist staff. There remained room for improvement in some aspects of services provision with little change in the coverage of multidisciplinary preconception clinics and a significant proportion of units with policies for routine admission of babies of mothers with diabetes in the absence of a specific clinical indication.

8.3 Pregnancy in women with type 1 and type 2 diabetes, 2002–2003, England, Wales and Northern Ireland

This report, published in October 2005, on pre-existing type 1 and type 2 diabetes in pregnancy represents the largest study ever undertaken on this topic and includes information on 3808 pregnancies of women with diabetes who delivered or booked in 213 hospitals in England, Wales and Northern Ireland between 1 March 2002 and 28 February 2003. This study shows a continued increased risk of adverse outcomes in babies of women with diabetes compared with babies of mothers in the general maternity population of England, Wales and Northern Ireland. Perinatal mortality was 3.8 times higher and the prevalence of confirmed major congenital anomaly was nearly twice that expected. There was no evidence of a difference in the perinatal mortality in babies born to women with type 1 diabetes compared to babies born to women with type 2 diabetes.

Many women appeared to be poorly prepared for pregnancy with just over one third of women documented as having received prepregnancy counselling or taking folic acid supplementation before pregnancy. Women with diabetes experienced a high preterm delivery rate, high induction rate and a high caesarean section rate compared to women in the general maternity population. One-third of term babies were admitted to a neonatal unit. Two-thirds of these admissions were potentially avoidable, with 26% of all admissions of term babies described as 'routine'.

Full copies of these reports and additional information about CEMACH can be found on the CEMACH website: www.cemach.org.uk.



9 Future CEMACH work

9.1 Stillbirths 1994–2004

CEMACH has conducted a trend analysis of the risk factors associated with stillbirths between 1994–2004. This work was conducted in response to the increase in stillbirth rate seen from 2001 to 2002, which has been sustained since. A summary report containing the primary findings of this analysis will be available on the CEMACH website (www.cemach.org.uk) in early 2006.

9.2 Why Mothers Die, reports on confidential enquiries into maternal deaths

CEMACH continues its enquiry into every maternal death in the UK. The next report, to be issued in late 2007, will cover the years 2003–2005. The report will, for the first time, include specific chapters on primary care and emergency medicine.

9.3 Maternal deaths due to psychiatric causes

Due to issues identified in previous reports on confidential enquiries into maternal deaths, Why Mothers Die 1997–1999 and 2000–2002, CEMACH is conducting a detailed panel-based enquiry into all maternal deaths due to suicide or substance misuse between 2003 and 2005. The enquiry will consider issues such as the effectiveness of interprofessional communication and the availability of appropriate services to meet the postpartum needs of women with mental health problems. The report of this work is expected in 2008.

9.4 Diabetes in pregnancy

The CEMACH diabetes in pregnancy programme is expected to conclude early in 2007, with the publication of the enquiry report containing the results of an audit of over 500 pregnancies to women with diabetes. Resources permitting, we also plan to submit a number of articles for publication in appropriate specialist journals, providing analyses from our diabetes in pregnancy database.

9.5 Child Death Review

CEMACH is conducting an enquiry into all deaths of children from 28 days to 18 years of age in a number of regions in England, Wales and Northern Ireland. The intention of this pilot study is to identify the issues associated with identifying avoidable factors in childhood mortality using the enquiry approach, with a view to extending the work nationally. A report is expected in 2008.

9.6 'BEADI' project

The **BLISS** funded trial for the **E**ffect of **A**ctive **D**issemination of **I**nformation will assess whether an active strategy for dissemination of information has an impact on local policy

and care of premature neonates. Facilitations and potential barriers to dissemination of information and implementation of recommendations at a hospital level will also be explored.

9.7 New maternal enquiry topic

CEMACH is evaluating topics for an in-depth national enquiry into a major issue arising from *Why Mothers Die*. Three topics have been shortlisted (barriers to care, maternal obesity and obstetric haemorrhage). A decision is expected by June 2006. The study will include morbidity as well as mortality and may include perinatal as well as maternal outcomes.

9.8 Local reviews following a maternal death

CEMACH is considering whether to carry out a study of local investigations following a maternal death. This would be intended to enable the enquiry to advise on the standards that might be expected from NHS providers in carrying out their own reviews of maternal deaths. It would also assist CEMACH in assessing the issues to address in any local feedback mechanisms that may be introduced as part of the national enquiry.

9.9 Further information

Further information on CEMACH's plans for future work can be obtained from Richard Congdon, Chief Executive; email: richard.congdon@cemach.org.uk or Jana Kovar, National Projects Manager, email: jana.kovar@cemach.org.uk.

10 | References

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4. Department of Health. NHS Maternity Statistics, England 2003–04. Statistical Bulletin 2005/10 [http://www.dh.gov.uk/assetRoot/04/10/70/61/04107061.pdf]
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10. Royal College of Obstetricians and Gynaecologists. *Registration of stillbirths and certification of pregnancy losses before 24 weeks of gestation*. Good Practice No.4. London: RCOG; 2004.

Appendix A
CEMACH Perinatal Death Notification form 2004

CEMACH - Confidential Enquiry into Maternal and Child Health - 2004 Death Notification

Survey Number
Office use only



One form should be filled in for **each fetus born after 22 weeks of pregnancy** (or birthweight>400grams if weeks not known) and **each live birth dying before 28 completed days of life**, including legal abortions.

			0	4				
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1. **Case definition** Late fetal loss (22nd-23rd weeks) Stillbirth (24+ weeks) Early neonatal death (age 0-6 days) Late neonatal death (age 7-27 days)

MOTHER

2. NHS No. _____
 3. Surname _____
 4. First name _____ 5. Hospital No. _____
 6. Usual residential address at time of delivery/birth _____
 7. Postcode

--	--	--	--	--	--	--	--

 Not known

BABY

16. NHS No. _____
 17. Surname _____
 18. First name _____ 19. Hospital No. _____
 20. Residential address at time of death if different from Q6. _____
 21. Postcode

--	--	--	--	--	--	--	--

 Not known

8. **Mother's date of birth**

--	--	--	--

 Day Month Year or

--	--

 Estimated age Not known

22. **Sex of fetus / baby**
 Male Female Indeterminate Not known
 23. **Birthweight (kg)**

--	--	--	--

 Never recorded
 Not known

9. **Ethnic group of mother**
 White Black African Black Carib. Black other
 Indian Pakistani Bangladeshi Chinese
 Mixed Other _____ Not known

24. **Gestation at birth**

--	--

 weeks +

--

 days Not known
 25. **Was this a legal abortion?** (Notifiable under 1967/92 Abortion Act)
 Yes No Not known
NB: a case can be both a registrable death (stillbirth or neonatal death) AND a legal abortion

10. **Expected date of delivery**

--	--	--	--

 Day Month Year Not known

26. **When did death occur? - STILLBIRTHS ONLY**
 Antepartum Intrapartum Not known
 27. **Place of death - LIVEBIRTHS ONLY** office use only

--	--	--	--

 Name of unit/place _____ Not known

11. **Date and time of delivery / birth** Time not known

--	--	--	--

 Day Month Year

--	--	--	--

 24hr clock Date & time not known

28. **Date and time of death - LIVEBIRTHS ONLY** Time not known

--	--	--	--

 Day Month Year

--	--	--	--

 24hr clock Date & time not known

12. **Place of delivery** office use only

--	--	--	--

 Name of unit/place _____ Not known

29. **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 _____

13. **Number of fetuses / babies this pregnancy**
 All identifiable fetuses at delivery, including papyraceous Not known

14. **Birth order this fetus / baby (0, 1, 2, 3, etc.)**
 0=singleton Not known

15. **a. Mode of delivery**
 Spont. vaginal Forceps Ventouse
 Elective C.S. Other C.S. Not known
 Other
b. Was this a breech presentation? (immediately prior to delivery)
 Yes No Not known

30. **Extended Wigglesworth classification** (see guidelines)
 Text _____

31. **Fetal and Infant classification** (see guidelines)
 Text _____

32. **Obstetric (Aberdeen) classification** (see guidelines)
 Text _____

Please give the details of the person who completed this form
Name: _____
Position: _____
Contact address: _____
Tel. number: _____

33. **Postmortem / autopsy**
 Held / being arranged Not requested
 Requested but consent not given Coroner's postmortem
 Parental consent but no autopsy performed Not known

Appendix B

Table A: Cause-specific stillbirth rates, England, Wales and Northern Ireland, 2004

Rate ^a	Timing of death					
	Antepartum		Intrapartum		Unknown	
	N	Rate ^a	N	Rate ^a	N	Rate ^a
Total	3350	5.03	341	0.51	100	0.15
Congenital malformation	494	0.74	37	0.06	41	0.06
Antepartum haemorrhage ^b	372	0.56	0	–	7	0.01
Maternal disorder ^b	181	0.27	0	–	2	<0.01
Pre-eclampsia ^b	134	0.20	0	–	0	–
Death from intrapartum causes	0	–	276	0.41	1	<0.01
Infection	54	0.08	11	0.02	1	<0.01
Other specific causes ^c	178	0.27	15	0.02	8	0.01
Accident or non-intrapartum causes	2	<0.01	0	–	0	–
Unexplained antepartum fetal death <2500 g ^b	1216	1.83	0	–	6	0.01
Unexplained antepartum fetal death 2500 g+ ^b	694	1.04	0	–	4	0.01
Unclassifiable	23	0.03	1	<0.01	5	0.01
Not known	2	<0.01	1	<0.01	25	0.04

^a Rate per 1000 total births
^b Wigglesworth classification 'Unexplained antepartum fetal death' described by obstetric (Aberdeen) classification
^c Includes cases classified as 'Mechanical' or 'Miscellaneous' according to Obstetric (Aberdeen) classification

Sources: CEMACH PDN 2004, 2005
ONS 2004
Northern Ireland GRO 2004

Table B: Cause-specific neonatal mortality rates, England, Wales and Northern Ireland, 2004

	Early neonatal death		Late neonatal death	
	N	Rate ^a	N	Rate ^a
Total	1771	2.68	486	0.73
Congenital malformation	382	0.58	124	0.19
Death from intrapartum causes	217	0.33	29	0.04
Immaturity	920	1.39	163	0.25
Infection	83	0.13	71	0.11
Other specific causes	118	0.18	39	0.06
Accident or non-intrapartum causes	2	<0.01	1	<0.01
Sudden infant death	17	0.03	39	0.06
Unclassifiable	13	0.02	6	0.01
Not known	19	0.03	14	0.02

^a Rate per 1000 live births

Sources: CEMACH PDN 2004, 2005
ONS 2004
Northern Ireland GRO 2004

Table C: Maternal age-specific stillbirth and neonatal mortality rates, England, Wales and Northern Ireland, 2004

	Live births	Stillbirths		Neonatal deaths	
	N	N	Rate ^a	N	Rate ^b
Total	662039	3791	5.69	2257	3.41
<20	46525	356	7.59	225	4.84
20–24	124696	704	5.61	411	3.30
25–29	165900	883	5.29	510	3.07
30–34	197411	978	4.93	575	2.91
35–39	105938	640	6.00	377	3.56
40–44	20584	184	8.86	91	4.42
45+	985	15	15.00	1	–
Not known	0	31	–	67	–

^a Rate per 1000 total births
^b Rate per 1000 live births

Sources: CEMACH PDN 2004, 2005
ONS 2004
Northern Ireland GRO 2004

Table D: Regional and national summary statistics, 2004

Region of residence	Live birth	Stillbirth		Neonatal death	
	N	N	Rate [95% CI] ^a	N	Rate [95% CI] ^b
England, Wales and Northern Ireland ^c	662 039	3791	5.7 [5.5, 5.9]	2257	3.4 [3.3, 3.6]
England	607 184	3470	5.7 [5.5, 5.9]	2055	3.4 [3.2, 3.5]
North East	27 815	169	6.0 [5.2, 7.0]	75	2.7 [2.2, 3.4]
Yorkshire and Humberside	60 193	387	6.4 [5.8, 7.1]	211	3.5 [3.1, 4.0]
North West	81 164	457	5.6 [5.1, 6.1]	290	3.6 [3.2, 4.0]
West Midlands	65 911	382	5.8 [5.2, 6.4]	310	4.7 [4.2, 5.3]
East Midlands	48 245	262	5.4 [4.8, 6.1]	165	3.4 [2.9, 4.0]
East of England	64 250	336	5.2 [4.7, 5.8]	190	3.0 [2.6, 3.4]
London	113 679	771	6.7 [6.3, 7.2]	391	3.4 [3.1, 3.8]
South East	93 634	465	4.9 [4.5, 5.4]	259	2.8 [2.5, 3.1]
South West	52 293	241	4.6 [4.0, 5.2]	164	3.1 [2.7, 3.7]
Wales	32 325	182	5.6 [4.8, 6.5]	105	3.2 [2.7, 3.9]
Northern Ireland	22 318	117	5.2 [4.4, 6.2]	77	3.5 [2.8, 4.3]

^a Rate per 1000 total births (live and still)
^b Rate per 1000 live births
^c Includes cases resident 'elsewhere'

Sources: CEMACH PDN 2004, 2005
ONS 2004
Northern Ireland GRO 2004

Table E: Stillbirth rate and neonatal mortality rate by strategic health authority, England 2004

Strategic Health Authority	Live births	Stillbirths		Neonatal deaths	
	N	N	Rate [95% CI] ^a	N	Rate [95% CI] ^b
Norfolk, Suffolk and Cambridgeshire	24 459	99	4.0 [3.3, 4.9]	75	3.1 [2.4, 3.8]
Bedfordshire and Hertfordshire	20 904	128	6.1 [5.1, 7.2]	58	2.8 [2.1, 3.6]
Essex	18 887	109	5.7 [4.8, 6.9]	57	3.0 [2.3, 3.9]
North West London	26 636	179	6.7 [5.8, 7.7]	87	3.3 [2.6, 4.1]
North Central London	18 443	123	6.6 [5.6, 7.9]	71	3.8 [3.1, 4.9]
North East London	26 430	190	7.1 [6.2, 8.2]	98	3.7 [3.0, 4.5]
South East London	23 282	172	7.3 [6.3, 8.5]	86	3.7 [3.0, 4.6]
South West London	18 888	107	5.6 [4.7, 6.8]	49	2.6 [2.0, 3.4]
Northumberland, Tyne and Wear	14 669	90	6.1 [5.0, 7.5]	39	2.7 [1.9, 3.6]
County Durham and Tees Valley	13 146	79	6.0 [4.8, 7.4]	36	2.7 [2.0, 3.8]
North and East Yorkshire and Northern Lincolnshire	17 494	108	6.1 [5.1, 7.4]	43	2.5 [1.8, 3.3]
West Yorkshire	27 664	186	6.7 [5.8, 7.7]	100	3.6 [3.0, 4.4]
Cumbria and Lancashire	21 831	102	4.7 [3.8, 5.6]	76	3.5 [2.8, 4.4]
Greater Manchester	33 022	199	6.0 [5.2, 6.9]	115	3.5 [2.9, 4.2]
Cheshire and Merseyside	26 311	154	5.8 [5.0, 6.8]	96	3.6 [3.0, 4.5]
Thames Valley	27 220	143	5.2 [4.4, 6.2]	72	2.6 [2.1, 3.3]
Hampshire and Isle of Wight	19 777	98	4.9 [4.0, 6.0]	53	2.7 [2.0, 3.5]
Kent and Medway	18 424	90	4.9 [4.0, 6.0]	58	3.1 [2.4, 4.1]
Surrey and Sussex	28 213	133	4.7 [4.0, 5.6]	75	2.7 [2.1, 3.3]
Avon, Gloucestershire and Wiltshire	25 120	117	4.6 [3.9, 5.6]	72	2.9 [2.3, 3.6]
South West Peninsula	15 517	84	5.4 [4.3, 6.7]	53	3.4 [2.6, 4.5]
Dorset and Somerset	11 656	40	3.4 [2.5, 4.7]	39	3.3 [2.4, 4.6]
South Yorkshire	15 035	93	6.1 [5.0, 7.5]	68	4.5 [3.6, 5.7]
Trent	28 838	146	5.0 [4.3, 5.9]	100	3.5 [2.9, 4.2]
Leicestershire, Northamptonshire and Rutland	19 407	116	5.9 [5.0, 7.1]	65	3.3 [2.6, 4.3]
Shropshire and Staffordshire	16 666	91	5.4 [4.4, 6.7]	67	4.0 [3.2, 5.1]
Birmingham and the Black Country	31 816	219	6.8 [6.0, 7.8]	166	5.2 [4.5, 6.1]
West Midlands South	17 429	72	4.1 [3.3, 5.2]	77	4.4 [3.5, 5.5]

^a Rate per 1000 total births (live and still) Sources: CEMACH PDN 2004, 2005
^b Rate per 1000 live births ONS 2004

Appendix C

Additional methodology

Ethnicity

Information on maternal ethnicity has been collected in England as part of the delivery record of the Hospital Episodes Statistics (HES) since 1995. Data collection of maternal ethnicity remains incomplete with 75% of all birth records having a stated ethnicity for the period 2003–04.⁴ Comparison of deliveries recorded on HES and Census information for women with children under 1 year of age suggests that if deliveries with ethnic group not stated are included with those where ethnic group is stated to be White the distribution of deliveries in HES broadly approximates that expected from Census information. Accordingly, for 2003–04 the distribution of ethnicity of maternities in England was approximately as follows: White 79.3%, Black (aggregate of Black African, Black Caribbean and Black Other) 4.3%, Asian (aggregate of Indian, Pakistani and Bangladeshi) 8.1%, Chinese and other (Chinese, Other and mixed ethnic origin) 3.3% and Not known 5% (personal communication, Hospital Episodes Statistics).

Applying these proportions to the total number of live births in England for 2004 gives an estimated distribution of live births as shown in Table 5 of the main report.

Deprivation

Deprivation was based on the application of an Index of Multiple Deprivation (IMD) score.⁷ This is based on the postcode of residence and the corresponding Super Output Area (SOA) as defined by the ONS. These IMD scores were ranked and quintiles of deprivation derived for the national population of England. Cases were then placed into the appropriate quintile of deprivation. As these scores are based on the mothers, not babies, for pregnancies with multiple losses only the first death was assigned a deprivation score to avoid double counting. The distribution of deprivation scores into quintiles is based on the entire population of England rather than the maternity population.

