

Report:

Gestation-specific infant mortality by social and biological factors among babies born in England and Wales in 2006

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Key findings

- In 2006 7.6 per cent of live births were preterm (under 37 weeks gestational age), 88 per cent were born at term (37 to 41 weeks), and 4 per cent were born post term (42 weeks and above). The corresponding infant mortality rates were 41.0, 1.9, and 1.5 deaths per 1,000 live births respectively
- Among babies born at 37 weeks and above, the neonatal mortality rate of those weighing 1,500–2,499 grams at birth was 4.3 deaths per 1,000 live births as compared with 0.7 deaths per 1,000 live births among those weighing 2,500 grams and over
- Over half (53 per cent) of multiple births were born preterm as compared with only 6.2 per cent of singleton births
- The infant mortality rate of babies born at term/post term to mothers under age 20 was almost twice that of term/post term babies born to mothers aged 30–34 (2.7 deaths per 1,000 live births compared with 1.4 deaths per 1,000 live births)
- The percentage of babies born preterm varied by marital status/ registration type from 7.0 per cent among babies born inside marriage to 9.7 per cent among sole registrations
- Among babies born at 37 weeks and over, neonatal and total infant mortality in the routine and manual group was almost twice that in the managerial and professional group
- Infant mortality rates in the Pakistani and Caribbean groups were over twice the infant mortality of the White British group (9.8 deaths per 1,000 live births compared with 4.4 deaths per 1,000 live births)

Introduction

ONS publishes infant mortality statistics by social and biological factors annually using infant death records linked to their corresponding birth records.¹ Until recently it was not possible to publish these statistics by gestational age or ethnicity as this information is not recorded at birth registration in England and Wales (although gestational age is recorded for stillbirths). The opportunity to obtain these data items was provided by the introduction in 2002 of the NHS Numbers for Babies (NN4B) system for allocating NHS numbers at birth for all babies born in England, Wales and the Isle of Man.

As a result, gestation-specific infant mortality rates for England and Wales as a whole were published for the first time in 2007² and infant mortality and birth data by ethnic group were first published in 2008.^{3,4} All these statistics used 2005 data. This report presents statistics on gestation-specific infant mortality by social and biological factors for all babies born in England and Wales in 2006. It includes, for the first time, gestation-specific infant mortality rates by ethnic group.

Box one

Definitions used in infant mortality statistics

Early neonatal	Before seven days after live birth
Late neonatal	At least seven but under 28 days after live birth
Postneonatal	At least 28 but under one year after live birth
Infant	Under a year after live birth

Mortality rates are presented as deaths per 1,000 live births.

Results

Infant mortality by single weeks gestational age

There were 3,292 deaths in the first year of life among babies born in 2006 in England and Wales, giving an infant mortality rate of 4.9 deaths per 1,000 live births (Table 1). Gestational age was known for 99.3 per cent of live births and 97.2 per cent of infant deaths. In 2006, 7.6 per cent of live births were born preterm (under 37 weeks gestational age), 88 per cent were born at term (37 to 41 weeks), and 4.3 per cent were born post term (42 weeks and above). The corresponding infant mortality rates were 41.0, 1.9, and 1.5 deaths per 1,000 live births respectively. Almost two-thirds of all infant deaths occurred to babies born preterm.

Infant mortality was highest at the very low gestational ages, 985 deaths per 1,000 live births among babies born before 22 weeks, and 937 deaths per 1,000 live births at 22 weeks. It then decreased with gestational age to 1.4 deaths per 1,000 live births among babies born at 40 weeks gestation. Even among term births infant mortality varied considerably from 3.7 deaths per 1,000 live births among babies born at 37 weeks, to 1.4 and 1.5 per 1,000 live births for babies born at 40 and 41 weeks respectively.

Infant mortality by gestational age and social and biological factors

Birthweight

The distribution of births by gestational age varied considerably by birthweight (Table 2). In the lower birthweight groups proportionately

more babies were born at earlier gestational ages. Thus while the percentage born preterm was the same among babies weighing under 1,000 grams and 1,000–1,499 grams at birth, three-quarters of those weighing under 1,000 grams were born before 28 weeks of gestational age, compared with only 11 per cent of those weighing 1,000–1,499 grams. The relationship between birthweight and gestational age is reflected in the much higher neonatal mortality rate of 353 deaths per 1,000 live births among babies with birthweights under 1,000 grams compared with 41 per 1,000 among those weighing 1,000–1,499 grams. The neonatal mortality of babies weighing 2,500 grams and over at birth was very low (0.9 per 1,000 live births), reflecting the fact that only 3.0 per cent of births in this group were preterm. Within each birthweight group, neonatal mortality was inversely associated with gestational age. Similarly within each gestational age group neonatal mortality was inversely associated with birthweight. Even among babies who were born at 37 weeks and above, neonatal mortality varied considerably by birthweight; those weighing 1,500–2,499 grams at birth had a neonatal mortality rate of 4.3 deaths per 1,000 live births, compared with 0.7 deaths per 1,000 live births among babies weighing 2,500 grams and over. Babies of this weight born at 32–36 weeks of gestational age had a higher neonatal mortality rate of 4.2 deaths per 1,000 live births.

Multiplicity

Singleton and multiple live births have very different gestational age distributions (Table 3). Only 6.2 per cent of singleton births were born preterm as compared with over half of multiple births. Neonatal mortality

Table 1

Live births and infant deaths by gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	Numbers					Rates per 1,000 live births			
	Births	Deaths				Early Neonatal	Late Neonatal	Post-neonatal	Infant
		Live births	Early Neonatal	Late Neonatal	Post-neonatal				
All	669,465	1,750	555	987	3,292	2.6	0.8	1.5	4.9
Under 22 weeks and birthweight under 1,000g ^{1,3}	196	193	–	–	193	984.7	–	–	984.7
22 weeks	175	161	1	2	164	920.0	5.7	11.4	937.1
23	357	226	37	23	286	633.1	103.6	64.4	801.1
24	489	162	68	49	279	331.3	139.1	100.2	570.6
25	557	92	55	32	179	165.2	98.7	57.5	321.4
26	690	76	45	28	149	110.1	65.2	40.6	215.9
27	794	58	32	33	123	73.0	40.3	41.6	154.9
28	1,067	43	24	29	96	40.3	22.5	27.2	90.0
29	1,243	46	15	19	80	37.0	12.1	15.3	64.4
30	1,569	35	17	14	66	22.3	10.8	8.9	42.1
31	2,066	25	18	20	63	12.1	8.7	9.7	30.5
32	2,892	23	10	15	48	8.0	3.5	5.2	16.6
33	4,007	36	5	18	59	9.0	1.2	4.5	14.7
34	6,576	29	14	25	68	4.4	2.1	3.8	10.3
35	9,627	43	16	42	101	4.5	1.7	4.4	10.5
36	18,023	42	25	43	110	2.3	1.4	2.4	6.1
37	38,182	56	23	64	143	1.5	0.6	1.7	3.7
38	89,235	78	38	138	254	0.9	0.4	1.5	2.8
39	146,573	69	44	126	239	0.5	0.3	0.9	1.6
40	181,518	87	39	137	263	0.5	0.2	0.8	1.4
41	130,051	71	25	99	195	0.5	0.2	0.8	1.5
42 weeks and over	28,578	20	3	20	43	0.7	0.1	0.7	1.5
Gross inconsistency between birthweight and gestational age under 22 weeks ^{2,3}	102	38	–	–	38	372.5	–	–	372.5
Gestational age not stated	4,384	22	1	10	33	5.0	0.2	2.3	7.5
Not linked to NN4B record	514	19	–	1	20	37.0	–	1.9	38.9

1 This includes 14 babies weighing 500–999 grams, eleven of whom died. All babies of under 22 weeks gestational age and weighing under 500 grams died.

2 Under 22 weeks gestational age and birthweight 1,000 grams and over or not stated.

3 See reference 1 for discussion of data quality issues affecting births of under 22 weeks gestational age.

Table 2

Live births, neonatal and infant mortality by birthweight and gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	All	Birthweight (grams)				
		Under 1,000	1,000–1,499	1,500–2,499	2,500 and over	Not stated
Number of live births						
All	669,465	3,258	4,979	41,887	613,346	5,995
All with known gestational age ¹	664,465	3,231	4,915	41,511	609,202	5,606
Under 24	728	674	2	9	19	24
24–27	2,530	1,798	559	29	79	65
28–31	5,945	636	2,949	2,053	227	80
32–36	41,125	46	1,304	21,457	17,913	405
37 and over	614,137	77	101	17,963	590,964	5,032
Low gestational age inconsistent with birthweight ²	102	–	5	10	67	20
Gestational age not stated	4,384	25	56	353	3,904	46
Not linked to NN4B record	514	2	3	13	173	323
Per cent under 37 weeks³	7.6	97.6	97.9	56.7	3.0	10.2
Number of neonatal deaths						
All	2,305	1,150	203	273	552	127
All with known gestational age ¹	2,225	1,136	198	265	531	95
Under 24	618	585	1	3	5	24
24–27	588	488	61	3	6	30
28–31	223	52	99	59	3	10
32–36	243	3	32	123	76	9
37 and over	553	8	5	77	441	22
Number of infant deaths						
All	3,292	1,329	280	464	1,080	139
All with known gestational age ¹	3,201	1,314	274	455	1,051	107
Under 24	643	610	1	3	5	24
24–27	730	606	83	5	6	30
28–31	305	83	133	73	4	12
32–36	386	5	51	214	104	12
37 and over	1,137	10	6	160	932	29
Neonatal mortality per 1,000 live births						
All	3.4	353.0	40.8	6.5	0.9	21.2
All with known gestational age ¹	3.3	351.6	40.3	6.4	0.9	16.9
Under 24	848.9	868.0	<i>500.0</i>	<i>333.3</i>	263.2	1,000.0
24–27	232.4	271.4	109.1	<i>103.4</i>	75.9	461.5
28–31	37.5	81.8	33.6	28.7	13.2	125.0
32–36	5.9	65.2	24.5	5.7	4.2	22.2
37 and over	0.9	<i>103.9</i>	49.5	4.3	0.7	4.4
Infant mortality per 1,000 live births						
All	4.9	407.9	56.2	11.1	1.8	23.2
All with known gestational age ¹	4.8	406.7	55.7	11.0	1.7	19.1
Under 24	883.2	905.0	<i>500.0</i>	<i>333.3</i>	263.2	1,000.0
24–27	288.5	337.0	148.5	<i>172.4</i>	75.9	461.5
28–31	51.3	130.5	45.1	35.6	17.6	150.0
32–36	9.4	<i>108.7</i>	39.1	10.0	5.8	29.6
37 and over	1.9	129.9	59.4	8.9	1.6	5.8

1 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

2 See data quality issues in Methods section.

3 Live births of known gestational age only.

Note: Rates based on less than 10 deaths are in italics

was 19.0 deaths per 1,000 among multiples and 3.0 deaths per 1,000 among singletons while total infant mortality was 22.9 deaths per 1,000 multiples and 4.4 deaths per 1,000 singletons. For babies born under 28 weeks gestation, mortality rates were broadly similar for multiple and singleton births. However among babies born at 28–31 weeks infant mortality of singletons exceeded that of multiples, and at 32–36 weeks the infant mortality rate for singletons was twice that of multiples. Among term/post term births, infant mortality was considerably higher for multiple than singleton births.

Mother's age

The percentage of babies born preterm was highest for mothers aged 40 and over (9.2 per cent) followed by those under age 20 (8.2 per cent) and aged 35–39 (8.1 per cent) (Table 4). Even among term/post term births, infant mortality varied by mother's age; the infant mortality rate of babies born to mothers under age 20 was almost twice that of babies born to mothers aged 30–34. Variation by mother's age appears to be especially pronounced for postneonatal mortality.

Marital status and type of registration

The percentage of babies born preterm ranged from 7.0 per cent among babies born inside marriage to 9.7 per cent among sole registrations (Table 5). While neonatal mortality among term/post term births was 0.9 deaths per 1,000 live births in all marital status/registration type groups, total infant mortality was much more variable. Babies born at term/post term inside marriage or outside marriage jointly registered by both parents giving the same address had infant mortality of 1.7 deaths per 1,000 live births compared with 2.1 deaths per 1,000 live births outside marriage jointly registered by both parents giving different addresses and 2.9 among sole registered births. This variation reflected mortality differences in the postneonatal period.

National Statistics Socio-economic Classification

Only births in marriage and those jointly registered by both parents are included in Table 6 as father's occupation is not recorded for sole registrations. The percentage of preterm births was lowest among babies with fathers in managerial and professional occupations. The 'Other' group (where father's occupation could not be coded to National Statistics Socio-economic Classification (NS-SEC) as no occupational information was available) had a higher percentage of preterm births than any of the three occupational groups.

For babies born at 24 weeks and above, gestation-specific neonatal and total infant mortality rates were almost always higher in the routine and manual group than either the intermediate or the managerial and professional groups. Among babies born at 37 weeks and over, both neonatal and total infant mortality in the routine and manual group were almost twice that in the managerial and professional group.

Ethnic group

Asian and Black ethnic groups accounted for 12 per cent of live births in England and Wales in 2006 and 18 per cent of infant deaths (Table 7). The percentage of babies born preterm was 6.7 per cent in the White Other group, between 7.5 and 7.7 per cent in the Bangladeshi, Indian, Pakistani and White British groups, 8.6 per cent in the African group and 10.8 per cent in the Caribbean group. Babies in the Pakistani and Caribbean groups had particularly high infant mortality, 9.8 deaths per 1,000 live births, over twice that of the White British group (4.4 deaths per 1,000 live births). Even considering only babies born at term/post term, infant mortality remained very high in the Pakistani group at 5.6 deaths per 1,000 live births but less so in the Caribbean group at 2.6 deaths per 1,000; this compared with 1.6 deaths per 1,000 live births among the White British.

Table 3

Live births, neonatal and infant mortality by multiplicity and gestational age at birth, babies born in 2006

England and Wales			
Gestational age (weeks)	All	Multiplicity	
		Singleton	Multiple
Number of live births			
All	669,465	649,281	20,184
All with known gestational age ¹	664,465	644,441	20,024
Under 24	728	565	163
24–27	2,530	1,946	584
28–31	5,945	4,476	1,469
32–36	41,125	32,731	8,394
37 and over	614,137	604,723	9,414
Low gestational age inconsistent with birthweight ²	102	95	7
Gestational age not stated	4,384	4,245	139
Not linked to NN4B record	514	500	14
Per cent under 37 weeks³	7.6	6.2	53.0
Number of neonatal deaths			
All	2,305	1,922	383
All with known gestational age ¹	2,225	1,850	375
Under 24	618	480	138
24–27	588	448	140
28–31	223	174	49
32–36	243	217	26
37 and over	553	531	22
Number of infant deaths			
All	3,292	2,829	463
All with known gestational age ¹	3,201	2,747	454
Under 24	643	498	145
24–27	730	558	172
28–31	305	239	66
32–36	386	344	42
37 and over	1,137	1,108	29
Neonatal mortality per 1,000 live births			
All	3.4	3.0	19.0
All with known gestational age ¹	3.3	2.9	18.7
Under 24	848.9	849.6	846.6
24–27	232.4	230.2	239.7
28–31	37.5	38.9	33.4
32–36	5.9	6.6	3.1
37 and over	0.9	0.9	2.3
Infant mortality per 1,000 live births			
All	4.9	4.4	22.9
All with known gestational age ¹	4.8	4.3	22.7
Under 24	883.2	881.4	889.6
24–27	288.5	286.7	294.5
28–31	51.3	53.4	44.9
32–36	9.4	10.5	5.0
37 and over	1.9	1.8	3.1

¹ Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

² See data quality issues in Methods section.

³ Live births of known gestational age only.

Note: Rates based on less than 10 deaths are in italics

Table 4

Live births, neonatal and infant mortality by mother's age and gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	All	Mother's age					
		Under 20	20–24	25–29	30–34	35–39	40 and over
Number of live births							
All	669,465	45,494	127,807	172,627	189,360	110,465	23,712
All with known gestational age ¹	664,465	44,955	126,536	171,328	188,223	109,831	23,592
Under 24	728	60	138	191	203	104	32
24–27	2,530	221	508	646	631	413	111
28–31	5,945	466	1,120	1,425	1,558	1,128	248
32–36	41,125	2,943	7,672	10,103	11,327	7,289	1,791
37 and over	614,137	41,265	117,098	158,963	174,504	100,897	21,410
Low gestational age inconsistent with birthweight ²	102	8	21	25	24	16	8
Gestational age not stated	4,384	498	1,151	1,129	987	525	94
Not linked to NN4B record	514	33	99	145	126	93	18
Per cent under 37 weeks³	7.6	8.2	7.5	7.2	7.3	8.1	9.2
Number of neonatal deaths							
All	2,305	191	474	624	573	338	105
All with known gestational age ¹	2,225	187	457	598	552	330	101
Under 24	618	48	119	167	172	84	28
24–27	588	62	126	156	130	89	25
28–31	223	20	44	58	58	37	6
32–36	243	18	47	67	64	32	15
37 and over	553	39	121	150	128	88	27
Number of infant deaths							
All	3,292	304	718	865	778	486	141
All with known gestational age ¹	3,201	298	699	836	754	477	137
Under 24	643	49	129	174	177	85	29
24–27	730	81	149	183	165	121	31
28–31	305	24	64	81	75	54	7
32–36	386	33	86	104	91	51	21
37 and over	1,137	111	271	294	246	166	49
Neonatal mortality per 1,000 live births							
All	3.4	4.2	3.7	3.6	3.0	3.1	4.4
All with known gestational age ¹	3.3	4.2	3.6	3.5	2.9	3.0	4.3
Under 24	848.9	800.0	862.3	874.3	847.3	807.7	875.0
24–27	232.4	280.5	248.0	241.5	206.0	215.5	225.2
28–31	37.5	42.9	39.3	40.7	37.2	32.8	24.2
32–36	5.9	6.1	6.1	6.6	5.7	4.4	8.4
37 and over	0.9	0.9	1.0	0.9	0.7	0.9	1.3
Infant mortality per 1,000 live births							
All	4.9	6.7	5.6	5.0	4.1	4.4	5.9
All with known gestational age ¹	4.8	6.6	5.5	4.9	4.0	4.3	5.8
Under 24	883.2	816.7	934.8	911.0	871.9	817.3	906.3
24–27	288.5	366.5	293.3	283.3	261.5	293.0	279.3
28–31	51.3	51.5	57.1	56.8	48.1	47.9	28.2
32–36	9.4	11.2	11.2	10.3	8.0	7.0	11.7
37 and over	1.9	2.7	2.3	1.8	1.4	1.6	2.3

1 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

2 See data quality issues in Methods section.

3 Live birth of known gestational age.

Note: Rates based on less than 10 deaths are in italics.

Table 5

Live births, neonatal and infant mortality by marital status/type of registration and gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	All	Marital status/type of registration			
		Inside marriage	Joint registration/ same address	Joint registration/ different address	Sole registration
Number of live births					
All	669,465	378,141	185,436	60,441	45,447
All with known gestational age ¹	664,465	375,790	184,016	59,750	44,909
Under 24	728	337	220	98	73
24–27	2,530	1,199	742	340	249
28–31	5,945	2,952	1,692	731	570
32–36	41,125	21,730	11,596	4,340	3,459
37 and over	614,137	349,572	169,766	54,241	40,558
Low gestational age inconsistent with birthweight ²	102	61	20	7	14
Gestational age not stated	4,384	2,006	1,275	631	472
Not linked to NN4B record	514	284	125	53	52
Per cent under 37 weeks³	7.6	7.0	7.7	9.2	9.7
Number of neonatal deaths					
All	2,305	1,173	693	253	186
All with known gestational age ¹	2,225	1,130	667	250	178
Under 24	618	283	189	84	62
24–27	588	268	195	79	46
28–31	223	121	61	22	19
32–36	243	150	62	17	14
37 and over	553	308	160	48	37
Number of infant deaths					
All	3,292	1,660	937	377	318
All with known gestational age ¹	3,201	1,614	907	371	309
Under 24	643	296	195	86	66
24–27	730	331	232	104	63
28–31	305	164	80	34	27
32–36	386	213	103	35	35
37 and over	1,137	610	297	112	118
Neonatal mortality per 1,000 live births					
All	3.4	3.1	3.7	4.2	4.1
All with known gestational age ¹	3.3	3.0	3.6	4.2	4.0
Under 24	848.9	839.8	859.1	857.1	849.3
24–27	232.4	223.5	262.8	232.4	184.7
28–31	37.5	41.0	36.1	30.1	33.3
32–36	5.9	6.9	5.3	3.9	4.0
37 and over	0.9	0.9	0.9	0.9	0.9
Infant mortality per 1,000 live births					
All	4.9	4.4	5.1	6.2	7.0
All with known gestational age ¹	4.8	4.3	4.9	6.2	6.9
Under 24	883.2	878.3	886.4	877.6	904.1
24–27	288.5	276.1	312.7	305.9	253.0
28–31	51.3	55.6	47.3	46.5	47.4
32–36	9.4	9.8	8.9	8.1	10.1
37 and over	1.9	1.7	1.7	2.1	2.9

1 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

2 See data quality issues in Methods section.

3 Live births of known gestational age only.

Note: Rates based on less than 10 deaths are in italics

Table 6 Live births,¹ neonatal and infant mortality by NS-SEC (based on father's occupation²) and gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	National Statistics Socio-economic Classification				
	All ³	Managerial and professional	Intermediate	Routine and manual	Other ⁴
Number of live births					
All	624,018	23,573	12,123	22,952	3,795
All with known gestational age ⁵	619,556	23,441	12,049	22,747	3,739
Under 24	655	24	10	30	8
24–27	2,281	63	44	107	19
28–31	5,375	189	112	235	44
32–36	37,666	1,304	777	1,426	239
37 and over	573,579	21,861	11,106	20,949	3,429
Low gestational age inconsistent with birthweight ⁶	88	4	2	3	–
Gestational age not stated	3,912	110	65	181	50
Not linked to NN4B record	462	18	7	21	6
Per cent under 37 weeks⁷	7.4	6.7	7.8	7.9	8.3
Number of neonatal deaths					
All	2,119	561	388	941	206
All with known gestational age ⁵	2,047	545	375	906	199
Under 24	556	154	105	234	59
24–27	542	134	97	251	56
28–31	204	58	39	80	23
32–36	229	60	39	106	18
37 and over	516	139	95	235	43
Number of infant deaths					
All	2,974	753	540	1,311	322
All with known gestational age ⁵	2,892	735	527	1,269	314
Under 24	577	161	106	244	61
24–27	667	165	117	311	67
28–31	278	75	50	115	32
32–36	351	88	61	153	37
37 and over	1,019	246	193	446	117
Neonatal mortality per 1,000 live births					
All	3.4	2.4	3.2	4.1	5.4
All with known gestational age ⁵	3.3	23.2	31.1	39.8	53.2
Under 24	848.9	641.7	1,050.0	780.0	737.5
24–27	237.6	212.7	220.5	234.6	294.7
28–31	38.0	30.7	34.8	34.0	52.3
32–36	6.1	4.6	5.0	7.4	7.5
37 and over	0.9	0.6	0.9	1.1	1.3
Infant mortality per 1,000 live births					
All	4.8	3.2	4.5	5.7	8.5
All with known gestational age ⁵	4.7	3.1	4.4	5.6	8.4
Under 24	880.9	670.8	1,060.0	813.3	762.5
24–27	292.4	261.9	265.9	290.7	352.6
28–31	51.7	39.7	44.6	48.9	72.7
32–36	9.3	6.7	7.9	10.7	15.5
37 and over	1.8	1.1	1.7	2.1	3.4

1 Figures for live births in NS-SEC groups are a 10 per cent sample coded for father's occupation.

2 For births, father's occupation recorded at birth is used; for deaths, father's occupation recorded at infant death is used.

3 Inside marriage and outside marriage/joint registration only, including cases where father's occupation was not stated.

4 Students; occupations inadequately described; occupations not classifiable for other reasons; never worked and long-term unemployed.

5 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

6 See data quality issues in Methods section.

7 Live births of known gestational age only.

Note: Rates based on less than 10 deaths are in italics

Table 7

Live births, neonatal and infant mortality by ethnic group and gestational age at birth, babies born in 2006

England and Wales

Gestational age (weeks)	All ¹	Asian, Asian British			Black, Black British		White		All Others ²	Not stated
		Bangladeshi	Indian	Pakistani	African	Caribbean	White British	White Other		
Number of live births										
All	669,465	8,943	16,934	25,019	21,328	7,434	430,417	37,553	54,559	66,764
All with known gestational age ³	664,465	8,903	16,869	24,732	21,241	7,414	427,443	37,472	54,296	66,095
Under 24	728	7	10	34	66	31	365	27	86	102
24–27	2,530	16	60	108	175	67	1,450	114	257	283
28–31	5,945	62	153	230	264	115	3,783	262	527	549
32–36	41,125	591	1,060	1,525	1,320	589	26,548	2,108	3,409	3,975
37 and over	614,137	8,227	15,586	22,835	19,416	6,612	395,297	34,961	50,017	61,186
Low gestational age inconsistent with birthweight ⁴	102	–	4	5	4	1	59	6	7	16
Gestational age not stated	4,384	40	61	282	83	19	2,915	75	256	653
Not linked to NN4B record	514	–	–	–	–	–	–	–	–	–
Per cent under 37 weeks⁵	7.6	7.6	7.6	7.7	8.6	10.8	7.5	6.7	7.9	7.4
Number of neonatal deaths										
All	2,305	30	55	155	125	55	1,296	94	219	257
All with known gestational age ³	2,225	30	52	150	124	54	1,265	92	216	242
Under 24	618	6	8	29	53	25	312	22	77	86
24–27	588	4	14	23	36	12	364	31	43	61
28–31	223	4	5	10	5	3	140	15	22	19
32–36	243	2	7	28	7	4	144	7	20	24
37 and over	553	14	18	60	23	10	305	17	54	52
Number of infant deaths										
All	3,292	45	73	244	174	73	1,877	125	315	346
All with known gestational age ³	3,201	45	70	238	173	72	1,840	123	311	329
Under 24	643	6	8	32	57	26	325	22	78	89
24–27	730	6	17	30	50	19	446	38	54	70
28–31	305	6	7	12	10	4	194	18	31	23
32–36	386	2	12	37	15	6	238	12	34	30
37 and over	1,137	25	26	127	41	17	637	33	114	117
Neonatal mortality per 1,000 live births										
All	3.4	3.4	3.2	6.2	5.9	7.4	3.0	2.5	4.0	3.8
All with known gestational age ³	3.3	3.4	3.1	6.1	5.8	7.3	3.0	2.5	4.0	3.7
Under 24	848.9	857.1	800.0	852.9	803.0	806.5	854.8	814.8	895.3	843.1
24–27	232.4	250.0	233.3	213.0	205.7	179.1	251.0	271.9	167.3	215.5
28–31	37.5	64.5	32.7	43.5	18.9	26.1	37.0	57.3	41.7	34.6
32–36	5.9	3.4	6.6	18.4	5.3	6.8	5.4	3.3	5.9	6.0
37 and over	0.9	1.7	1.2	2.6	1.2	1.5	0.8	0.5	1.1	0.8
Infant mortality per 1,000 live births										
All	4.9	5.0	4.3	9.8	8.2	9.8	4.4	3.3	5.8	5.2
All with known gestational age ³	4.8	5.1	4.1	9.6	8.1	9.7	4.3	3.3	5.7	5.0
Under 24	883.2	857.1	800.0	941.2	863.6	838.7	890.4	814.8	907.0	872.5
24–27	288.5	375.0	283.3	277.8	285.7	283.6	307.6	333.3	210.1	247.3
28–31	51.3	96.8	45.8	52.2	37.9	34.8	51.3	68.7	58.8	41.9
32–36	9.4	3.4	11.3	24.3	11.4	10.2	9.0	5.7	10.0	7.5
37 and over	1.9	3.0	1.7	5.6	2.1	2.6	1.6	0.9	2.3	1.9

1 Information on ethnic group is not available for the 514 births that could not be linked to an NN4B record.

2 Chinese, Other Asian, Other Black, Other, and all Mixed groups.

3 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

4 See data quality issues in Methods section.

5 Live births of known gestational age only.

Note: Rates based on less than 10 deaths are in italics

Methods

The same approach data was adopted as that used in analysing the 2005.²

Data used in this analysis

Table 8 Birth and death records used in the analysis, babies born in 2006

England and Wales		
	Live births	Infant deaths
Birth registration record linked to an NN4B record	668,951	3,272
Birth registration record not linked to an NN4B record	514	20
Totals used in the analysis	669,465	3,292

The data used in the analysis are routine birth and death registration records, and NHS Numbers for Babies data (Table 8). All birth registration records for babies born alive in England and Wales in 2006 were used. The extract of these records, taken in November 2007, included 669,465 live births. Death registration records were extracted for all deaths under one year of age where the baby was born in 2006 and the death record could be linked to a birth registration record. This extract, taken in November 2008, included 3,292 deaths. The 668,951 NN4B records for babies born in England and Wales from 1 January to 31 December 2006 inclusive, and which could be linked to a live birth registration record, were included in this analysis.

The linkage required for this analysis was carried out in two stages. NN4B records were linked with the 669,465 live birth registration records using the methods developed for the pilot linkage of births in the first quarter of 2005.⁵ Subsequently infant death registration records were linked with this combined birth registration-NN4B dataset. Of the 3,292 infant deaths which were successfully linked to a birth registration record, 20 related to the 514 live birth registrations which could not be linked to an NN4B record.

Data quality issues for births recorded as occurring before 22 weeks gestational age

Earlier work on the 2005 data identified data quality concerns regarding births recorded as occurring before 22 weeks gestational age,² one-fifth of which were recorded with a birthweight of 2,500 grams and over. This is clinically implausible as it would be expected that these very low gestation babies would have very low birthweights.

Table 9 Infant mortality by birthweight among births before 22 weeks of gestational age, babies born in 2006

England and Wales						
Births before 22 weeks gestational age	All	Birthweight (grams)				
		Under 1,000	1,000–1,499	1,500–2,499	2,500 and over	Not stated
Live births	298	196	5	10	67	20
Infant deaths ¹	231	193	3	4	11	20
Infant deaths per 1,000 live births	775.2	984.7	600.0	400.0	164.2	1,000.0

¹ All these deaths occurred in the early neonatal period.

In order to investigate these data issues infant mortality by birthweight for babies born before 22 weeks of gestational age is tabulated (Table 9). This shows near universal mortality among babies recorded as being born before 22 weeks with birthweights below 1,000 grams. However babies of this gestational age with birthweights of 1,000 grams and over have much lower mortality rates. It is known that survival is extremely unlikely among such early babies.⁶ This strongly suggests that for births recorded as occurring

before 22 weeks gestation with birthweights anything but very low, one data item or possibly both were wrongly recorded. For this reason, births (and related deaths) of below 22 weeks gestational age were separated into those with plausible birthweights (under 1,000 grams) and those with implausible birthweights (1,000 grams and over) for this gestational age. Throughout this report the latter group plus those of below 22 weeks and with birthweight not stated are not included as under 22 weeks gestational age. This is the approach adopted in the analysis of 2005 data where further details are available.²

Analysis

Information on whether a birth is a singleton or multiple together with information on birthweight, maternal age, marital status/registration type, and NS-SEC is taken from the birth registration data. Marital status/registration type refers to whether the birth was registered inside or outside marriage and, if it was outside marriage, who registered the birth. The NS-SEC is based on fathers' occupation and is therefore only available for births occurring in marriage or jointly registered by both parents. As NS-SEC is only coded for a 10 per cent sample of live births (and all stillbirths), the three class version of NS-SEC was used here rather than the more detailed five or eight class versions.

Information on ethnic group and gestational age comes from NN4B data and is therefore only available for birth registrations which have linked to an NN4B record; these data items are therefore unavailable for 514 live births and their 20 related deaths. The NN4B record asks for the 'ethnic category (baby) as defined by the mother'. This report focuses on the larger and more clearly defined categories, that is, three Asian or Asian British groups (Bangladeshi, Indian and Pakistani), two Black or Black British groups (African, Caribbean), White British, White Other (including White Irish) and an 'All Others' group, which includes Chinese, Other Asian, Other Black, Other, and all Mixed groups. Although the NN4B data specification asks for the babies' ethnic group it is unclear whether in practice it is the mother's or the babies' ethnic group that is actually recorded. This, and the quality of the ethnic group information, is discussed further elsewhere.⁴

The NN4B record asks for gestation length in weeks 'calculated from relevant menstrual data held within the maternity system' although, given the widespread use of ultrasound dating, it is likely that the recorded gestational age will often come from such examinations. More detail on gestational age measurement is given elsewhere.^{4,7} All statistics which give the percentage of live births or deaths in a given gestational age range are calculated using only births of known gestational age in the denominator. Births (and related deaths) with gestational age under 22 weeks and implausibly high birthweight or birthweight not stated, are not included as of known gestational age. In line with the World Health Organisation definitions,⁸ preterm birth is defined as before 37 completed weeks of gestation, term as 37 to 41 completed weeks and post term as 42 or more completed weeks.

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