

Introducing new data on gestation-specific infant mortality among babies born in 2005 in England and Wales

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Introduction

Babies born preterm, that is before 37 completed weeks of gestational age, are at particular risk of morbidity and mortality in the first year of life.^{1,2} It is well established from small scale studies and data from other countries^{3,4} that gestational age is highly correlated with birth outcomes including birthweight and infant mortality. However, information on the gestational age at birth is not routinely available for England and Wales since gestational age is not recorded at the registration of live births. As a result of this gap in the data it has not been possible to routinely monitor levels and trends in preterm birth and gestation-specific infant mortality rates.

In Wales it has been possible to derive national gestational age data by aggregating birth notification data from child health systems, and subsequently to use these data in deriving gestation-specific infant mortality statistics.^{5,6} It has not proved feasible to do this at the national level in England. Scotland derives gestational age data from SMR02 hospital data⁷ and Northern Ireland from child health systems with the result that England has been the only country in the United Kingdom without such data. Consequently it has not been possible to include England in Peristat comparisons of gestational age data for member states of the European Union.⁸

The opportunity to obtain gestational age information was provided by the introduction in 2002 of a system for allocating NHS numbers at birth to babies in England, Wales and the Isle of Man. This new system, the NHS Numbers for Babies Service (NN4B), involves the notification of births, by electronic submission of a small set of data including gestational age at birth, to the Central Issuing System which issues NHS numbers.⁹ The Office for National Statistics (ONS) has received daily

Gestational age is highly correlated with birth outcomes including birthweight and infant mortality. Since gestational age is not recorded at the registration of live births in England and Wales, it has not been possible to produce routine statistics on gestation-specific infant mortality rates. A new system, introduced in 2002, for allocating NHS numbers at birth (NN4B) provided the opportunity to obtain gestational age information. NN4B records have been linked with birth registration data for all births occurring in 2005, and further linked with registration records for deaths in the first year of life. Thus, for the first time, we produce gestation-specific infant mortality rates for England and Wales as a whole, including in relation to birthweight, multiplicity, age of mother, marital status/registration type, and the National Statistics Socio-Economic Classification.

downloads of a subset of these NN4B data for all NHS numbers issued from 1 January 2005. Using these data, statistics on the distribution of live births in England and Wales by multiplicity and gestational age were released for the first time in May 2007.¹⁰

Since NN4B records include babies' NHS numbers it is possible to link them with other datasets containing NHS numbers. They have now been linked with birth registration data for all births that occurred in 2005 and in this article these linked NN4B-birth registration data have been further linked with registration records for deaths in the first year of life. This makes it possible to produce gestation-specific infant mortality rates for England and Wales as a whole. Thus, for the first time, we present provisional figures on infant mortality by gestational age, including in relation to birthweight, multiplicity, age of mother, marital status/registration type, and the National Statistics Socio-Economic Classification.

Methods

Source data used in this analysis

The data used in this analysis are routine birth and death registration records, and NHS Numbers for Babies Service data.

Birth registration data

Birth registration data form the main routine source of birth information in England and Wales. They are considered complete as birth registration is a legal requirement and, moreover, a birth certificate is required in order to obtain child benefits. The data undergo extensive quality checks.^{11,12} For these reasons birth registration records form the central data used in this analysis. All birth registration records for babies born alive in England and Wales in 2005 were used. The extract of birth registration data, taken in August 2006, included 645,887 live births.

Death registration data

These data are considered complete as death registration is a legal requirement and a death certificate must be obtained before a dead child can be buried or cremated. These data undergo extensive checks on their quality.¹² Death registration records were extracted for all deaths under one year of age where the baby was born in 2005 and the death record could be linked to a birth registration record. This extract, taken in February 2007, included 3,200 deaths. A further 65 infant deaths to babies born in 2005 could not be linked to a birth registration record and

were excluded from the analysis. This proportion of unlinked deaths is comparable to that found previously.^{12,13}

NHS Numbers for Babies Service (NN4B) data

The 645,014 NHS Numbers for Babies records for babies born in England and Wales from 1 January to 31 December 2005 inclusive, and which could be linked to a birth registration record, were included in this analysis. Earlier work has shown the quality and completeness of the NN4B dataset to be generally good.¹⁴ This includes close agreement of the gestational age distribution with those from other UK datasets except that the NN4B data indicate a higher proportion of births with very low gestational ages than do the other datasets. The weight for gestational age distribution highlighted that less than 0.2 per cent of records had implausible combinations of birthweight and gestational age. These have a particular impact on very low birthweights and gestational ages. The fact that the NN4B data show that 23 per cent of live singletons born before 22 weeks had birthweights of 2,500g and over¹⁰ strongly suggests errors in the recording of either gestational age or birthweight or both for these babies.

Linkage

The linkage required for this analysis was carried out in two stages. Firstly, NN4B records were linked with the 645,887 live birth registration records. Subsequently infant death registration records were linked with this combined birth registration-NN4B dataset. These two stages of linkage are described in detail below and shown in Figure 1. Approval for the use of these data sources for linkage and the production of statistical data was given by the North East London Ethics Committee. The Patient Information Advisory Group agreed to the granting of cover under Section 60 of the Health and Social Care Act 2001.

Stage 1: linkage of NN4B records to birth registration records

The linkage of NN4B records to birth registration records was performed using the methods developed for the pilot linkage of births in the first quarter of 2005, described in detail elsewhere.¹⁵ The NHS number was the primary means of linkage, and 99.3 per cent of records linked using this identifier. The remainder linked using combinations of date of birth, birthweight, mother's date of birth, and postcode. Overall, 99.9 per cent of the 645,887 live birth registration records successfully linked with an NN4B record (Table 1). The remaining 873 birth registration records failed to link with an NN4B record. Validity testing of the linkage revealed inconsistencies that suggested that 97 apparent linkages, out of the total 645,014 linked NN4B-birth registration records, had mistakenly linked records for two different babies.

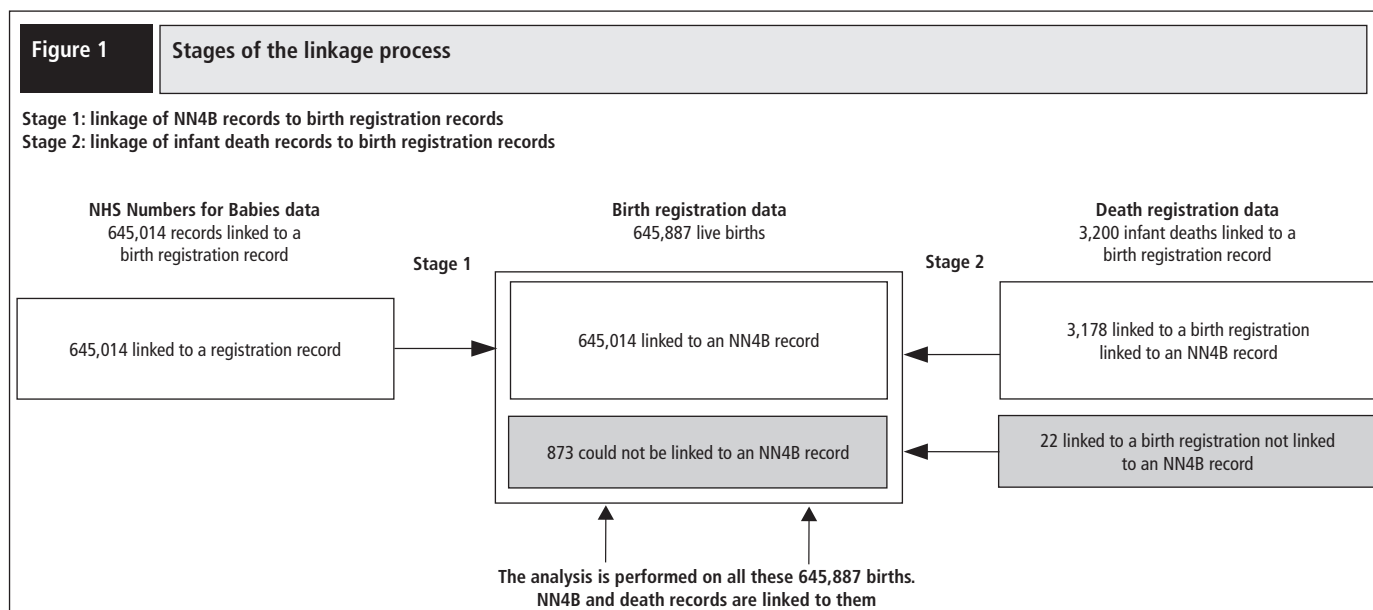


Table 1 Birth and death records used in the analysis

	Live births	Infant deaths
Birth registration record linked to an NN4B record	645,014	3,178
Birth registration record not linked to an NN4B record	873	22
Totals used in the analysis	645,887	3,200

Stage 2: linkage of infant death records to birth registration records

Deaths under the age of one year to babies born in 2005 were linked to a birth registration record using the variable that is added to a birth record by ONS to indicate a death. However, since the birth registration extract was taken in August 2006 infant deaths occurring after that date will not be indicated on the birth record. For these deaths, there was therefore the need to link using other variables; the NHS number, date of birth and sex of the baby were the variables used. Of the 3,200 infant deaths which were successfully linked to a birth registration record, 22 related to the 873 live birth registrations which could not be linked to an NN4B record (Table 1). In other words it was not possible to find an NN4B record for 0.69 per cent (22) of babies who died in the first year of life. A far smaller proportion of birth registration records, 0.14 per cent (873), could not be linked to an NN4B record.

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

As mentioned above, under *NHS Numbers for Babies Service (NN4B) data*, there are data quality concerns regarding births recorded as occurring before 22 weeks gestational age. These include inconsistencies in the recording of gestational age and birthweight information. Over one-fifth of these births are recorded with a birthweight of 2,500g and over. This is clinically implausible as it would be expected that these very low gestation babies would have very low birthweights. Data from Canada¹⁶ indicate that singleton births of 22 weeks gestational age have an upper limit for birthweight that is below 750 grams.

In order to investigate these data issues we have tabulated infant mortality by birthweight for babies born before 22 weeks of gestational age.

Table 2 shows that there is near universal mortality among babies recorded as being born before 22 weeks gestational age with birthweights below 1,000g. However babies of this gestational age with birthweights of 1,000g and over have much lower mortality rates. In particular those weighing 2,500g or over had an infant mortality rate of 46.2 deaths per 1,000 live births. It is known that survival is extremely unlikely among such early babies.¹⁷ 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, we have separated the births (and related deaths) of below 22 weeks gestational age into those with plausible birthweights (under 1,000g) and those with implausible birthweights (1,000g and over)

Table 2 Infant mortality by birthweight among births before 22 weeks of gestational age

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	312	212	8	15	65	12
Infant deaths ¹	236	209	4	8	3	12
Infant deaths per 1,000 live births	756.4	985.8	500.0	533.3	46.2	1000.0

¹ All these deaths occurred in the early neonatal period.

for this gestational age. Throughout the article the latter group plus those with not stated birthweight are not included as under 22 weeks gestational age. For example, they are excluded from the numerator and denominator when calculating the percentage of births that are preterm, and also the infant mortality rate for preterm births.

Analysis

Firstly, we examine infant mortality by single weeks of gestational age at birth. This analysis is presented in Section A of the Results.

Numbers and rates are presented for gestation-specific mortality in the periods as shown in Box one.

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

Age at death in days is derived from dates of birth and death.

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

Since gestational age is taken from the NN4B record, this information was unavailable for the 873 live births and the 22 related deaths where the birth registration record could not be linked to an NN4B record. This group is itemised separately throughout the analyses.

In Section B of the Results, we examine infant mortality by gestational age, and social/biological factors including birthweight, multiplicity, age of mother at the birth of child, marital status/registration type, and the National Statistics Socio-Economic Classification (NS-SEC) based on the father's occupation. With the exception of gestational age, information on each of these characteristics was taken from the registration record.

For each social/biological variable, we examined:

- the distribution of live births by that variable and gestational age group, presenting both numbers of births and percentages. The overall percentage born preterm (that is, under 37 weeks) is given. Data are also presented for births with low gestational age inconsistent with birthweight, births with gestational age not stated, and births not linked to an NN4B record
- neonatal, postneonatal and infant mortality by gestational age group and the variable in question, presenting both numbers of deaths and rates

More detailed tables will be available on the National Statistics website in early autumn 2007 (www.statistics.gov.uk/statbase/Product.asp?vlnk=6725).

In line with the World Health Organization definitions,¹⁸ preterm birth is defined as before 37 completed weeks of gestation, term as 37–41 completed weeks and post term as 42 or more completed weeks.

All figures which give the percentage of births or deaths in a given gestational age range include only those with known gestational age in the denominator. The 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.

Results

A. Infant mortality by single weeks gestational age

There were 3,200 deaths in the first year of life among babies born in 2005 in England and Wales, giving an infant mortality rate of 5.0 deaths per 1,000 live births. Infant mortality by gestational age at birth and subdivided by age at death into mortality in the early neonatal, late neonatal, and postneonatal periods is shown in Table 3. Gestational age was known for 99.2 per cent of live births and 97.7 per cent of infant deaths. In addition to the 27 infant deaths with gross inconsistency between birthweight

and gestational age under 22 weeks, there were 24 infant deaths with gestational age not stated on the NN4B record, and a further 22 where an NN4B record for the baby was not found.

Infant mortality was highest at the very low gestational ages, 986 deaths per 1,000 live births among babies born before 22 weeks, and 947 deaths per 1,000 live births at 22 weeks. It then decreases with gestational age to 1.3 deaths per 1,000 live births among babies born at 40 weeks gestational age. This is shown in Figure 2, and on a larger scale for gestational ages of 32 weeks and above in Figure 3. Although the overall infant mortality rate was 5.0 deaths per 1,000 live births, only term and post term births had mortality rates below this level. Despite an infant mortality rate of 1.8 deaths per 1,000 live births among babies born at term, 37 to 41 weeks, there remain within this group considerable differences in mortality by gestational age. Babies born at 37 weeks had an infant mortality rate of 4.1 per 1,000 live births that is over three times the infant mortality of babies born at 40 weeks. While 88 per cent of babies were born at term, a further 4 per cent were born post term, that is at 42 weeks and over. Infant mortality was slightly higher for babies born post term, 2.0 per 1,000 live births, than for those born at 39, 40 and 41 weeks.

The infant mortality rate among preterm births as a whole was 42 per 1,000 live births. For all gestational ages below 37 weeks the infant mortality rate exceeded the overall rate of 5.0 deaths per 1,000 live births. Below 37 weeks, infant mortality increased rapidly as gestational

Table 3 Live births and infant deaths by gestational age at birth: babies born in 2005

Gestational age (weeks)	Numbers					Rates per 1,000 live births			
	Births	Deaths				Early Neonatal	Late Neonatal	Postneonatal	Infant
		Live births	Early Neonatal	Late Neonatal	Postneonatal				
All	645,887	1,695	544	961	3,200	2.6	0.8	1.5	5.0
Under 22 weeks & birthweight under 1000g ^{1,3}	212	209	0	0	209	985.8	0.0	0.0	985.8
22 weeks	152	140	3	1	144	921.1	19.7	6.6	947.4
23	283	198	34	7	239	699.6	120.1	24.7	844.5
24	474	168	65	43	276	354.4	137.1	90.7	582.3
25	499	95	43	38	176	190.4	86.2	76.2	352.7
26	704	87	46	34	167	123.6	65.3	48.3	237.2
27	754	50	22	34	106	66.3	29.2	45.1	140.6
28	1,072	58	22	25	105	54.1	20.5	23.3	97.9
29	1,213	29	18	30	77	23.9	14.8	24.7	63.5
30	1,605	28	12	23	63	17.4	7.5	14.3	39.3
31	1,935	32	14	13	59	16.5	7.2	6.7	30.5
32	2,754	29	9	24	62	10.5	3.3	8.7	22.5
33	3,898	35	5	20	60	9.0	1.3	5.1	15.4
34	6,270	36	12	28	76	5.7	1.9	4.5	12.1
35	9,319	35	14	50	99	3.8	1.5	5.4	10.6
36	17,297	39	27	57	123	2.3	1.6	3.3	7.1
37	36,723	55	33	63	151	1.5	0.9	1.7	4.1
38	87,526	80	46	108	234	0.9	0.5	1.2	2.7
39	139,446	68	39	134	241	0.5	0.3	1.0	1.7
40	174,965	82	44	105	231	0.5	0.3	0.6	1.3
41	125,743	66	20	88	174	0.5	0.2	0.7	1.4
42 weeks and over	27,755	20	9	26	55	0.7	0.3	0.9	2.0
Gross inconsistency between birthweight and gestational age under 22 weeks ^{2,3}	100	27	0	0	27	270.0	0.0	0.0	270.0
Gestational age not stated	4,315	8	7	9	24	1.9	1.6	2.1	5.6
Not linked to NN4B record	873	21	0	1	22	24.1	0.0	1.1	25.2

1 This includes 11 babies weighing 500–999g, eight of whom died. All babies of under 22 weeks gestational age and weighing under 500g died.
 2 Under 22 weeks gestational age & birthweight 1,000g and over or not stated.
 3 See Methods for discussion of data quality issues affecting births of under 22 weeks gestational age.

Figure 2 Infant mortality by gestational age at birth: 22 weeks and above

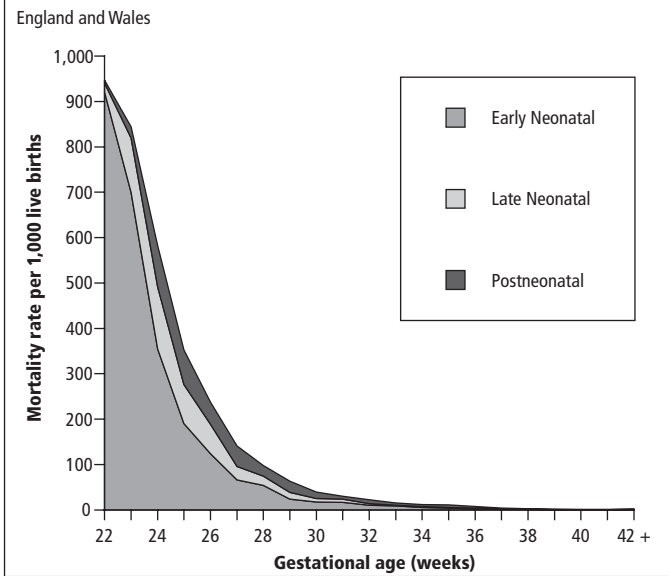
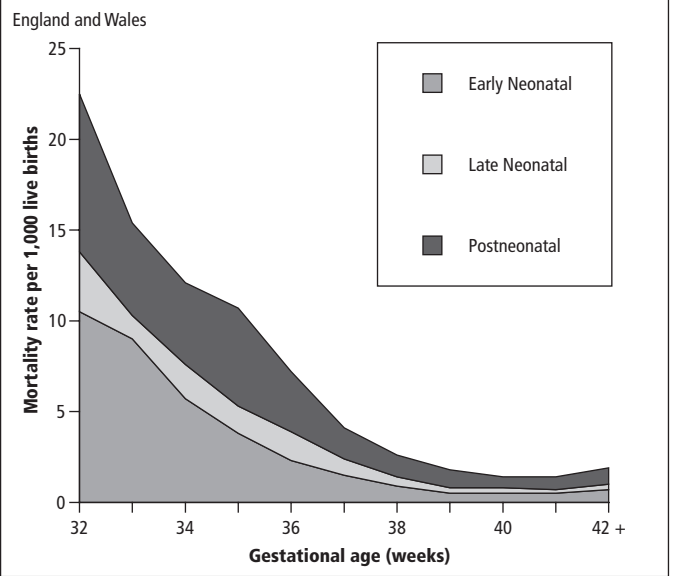


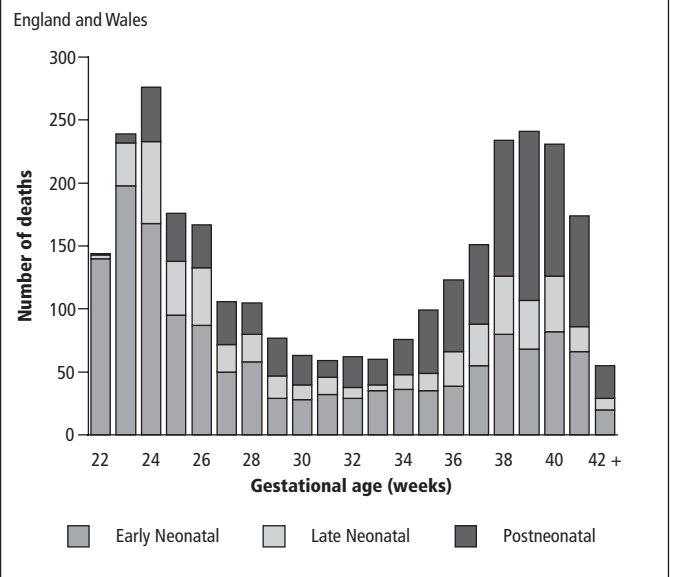
Figure 3 Infant mortality by gestational age at birth: 32 weeks and above



age decreased. Even for babies born only one to four weeks before term infant mortality was over five times that of babies born at term or post term, that is 10.6 deaths per 1,000 live births compared with 1.8 deaths per 1,000 live births. Thirty per cent of babies born at 24–27 weeks gestation died in their first year and 86 per cent of those born at 22–23 weeks died in the first month of life. Ninety-nine per cent of those born at under 22 weeks died in the first week of life.

The bi-modal distribution of deaths shown in Figure 4 resulted from very high infant mortality among the 1.8 per cent of babies born at gestational ages of 22 to 32 weeks, and the very low mortality among the 88 per cent of babies born at term. Almost two-thirds of all infant deaths occurred to babies born preterm while only 7.6 per cent of all live births were preterm. Over one-third of all infant deaths occurred to babies born at 22 to 27 weeks gestational age, a group which included only 0.4 per cent of live births. Figure 4 and Table 3 show the gradual shift from neonatal to postneonatal deaths with increasing gestational age. Among preterm births 62 per cent of infant deaths occurred in the first week of life, and a further 17 per cent in the late neonatal period. Just under half of all infant deaths among term babies occurred in the postneonatal period, that is after the first month of life.

Figure 4 Distribution of infant deaths by gestational age at birth: 22 weeks and above



B. Infant mortality by gestational age and social/biological factors

Birthweight

The distribution of births by gestational age varied considerably by birthweight (Table 4). The pattern that emerged was that 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 1,000g and 1,000–1,499g at birth, three-quarters of those weighing under 1,000g were born before 28 weeks of gestational age, compared with only 11 per cent of those weighing 1,000–1,499g.

This relationship between birthweight and gestational age is reflected in the much higher neonatal mortality rate of 358.1 per 1,000 among the babies with birthweights under 1,000g compared with only 41.6 per 1,000 among those weighing 1,000–1,499g (Table 5). The neonatal mortality of babies with birthweights of 2,500g and over was very low at only 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 not born preterm, neonatal mortality varied considerably by birthweight. Among babies born at term or post term, those weighing 1,500–2,499g at birth had a neonatal mortality rate of 5.3 deaths per 1,000 live births, while among those weighing 2,500g and over it was 0.8 deaths per 1,000 live births. Babies of this weight born at 32–36 weeks of gestational age had a higher neonatal mortality rate of 3.6 deaths per 1,000 live births.

The patterns observed in postneonatal mortality were similar to those for neonatal mortality.

Multiplicity

Singleton and multiple births have very different gestational age distributions (Table 6). Only 6.2 per cent of singleton births were born preterm as compared with over half of the multiple births. As many as 3.5 per cent of babies from multiple births were born before 28 weeks compared to only 0.4 per cent of singletons. These differences are reflected in the overall neonatal mortality of the two groups, 19.1 deaths per 1,000 multiples and 3.0 deaths per 1,000 singletons (Table 7). For singletons and multiples both neonatal and postneonatal mortality were inversely related to gestational age. Within each gestational age group, mortality rates for babies from multiple and singleton births were broadly similar except that among babies born at 32–36 weeks of gestational age the infant mortality rate for multiples was lower than that for singletons. This appeared to apply separately to neonatal and postneonatal mortality but, because of small numbers, these apparent differences were compatible with chance variation. Among babies born at term or post term the neonatal and overall infant mortality rate of multiples exceeded that of singletons.

Age of mother

The percentage of babies born preterm was highest for mothers aged under 20 and those aged 40 and over (Table 8). The proportion of babies born before 28 weeks of gestational age was highest among mothers aged under 20 at 0.7 per cent. This contributed to the high overall neonatal mortality, 4.7 deaths per 1,000 live births, among this group of young mothers (Table 9). This age group also had the highest postneonatal mortality. The slightly higher neonatal mortality among babies of mothers aged 40 and over was almost compensated for by the much lower postneonatal mortality of these babies.

Table 4 Live births by birthweight and gestational age at birth, 2005

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	645,887	3,217	4,832	40,739	594,930	2,169
Under 24	647	605	5	2	15	20
24–27	2,431	1,795	507	24	71	34
28–31	5,825	648	2,943	1,952	239	43
32–36	39,538	61	1,211	20,536	17,594	136
37 and over	592,158	73	112	17,872	572,373	1,728
<i>All with known gestational age</i>	640,599	3,182	4,778	40,386	590,292	1,961
Low gestational age inconsistent with birthweight	100	0	8	15	65	12
Gestational age not stated	4,315	26	44	311	3,925	9
Not linked to NN4B record	873	9	2	27	648	187
	Percentage of live births with known gestational age					
Under 24	0.1	19.0	0.1	0.0	0.0	1.0
24–27	0.4	56.4	10.6	0.1	0.0	1.7
28–31	0.9	20.4	61.6	4.8	0.0	2.2
32–36	6.2	1.9	25.3	50.8	3.0	6.9
Under 37	7.6	97.7	97.7	55.7	3.0	11.9
	Percentage of all live births					
Gestational age not stated	0.7	0.8	0.9	0.8	0.7	0.4
Not linked to NN4B record	0.1	0.3	0.0	0.1	0.1	8.6

Table 5 Neonatal and postneonatal mortality by birthweight and gestational age at birth, babies born in 2005

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 neonatal deaths						
All	2,239 ²	1,152	201	280	528	77
All with known gestational age ¹	2,176	1,142	196	269	522	47
Under 24	584	556	3	1	5	19
24–27	576	515	47	2	4	8
28–31	213	60	116	32	4	1
32–36	241	7	27	140	64	3
37 and over	562	4	3	94	445	16
Number of postneonatal deaths						
All	961	174	78	190	516	3
All with known gestational age ¹	951	173	76	187	512	3
Under 24	8	8	0	0	0	0
24–27	149	129	16	1	2	1
28–31	91	33	41	17	0	0
32–36	179	3	19	101	56	0
37 and over	524	0	0	68	454	2
Neonatal mortality per 1,000 live births						
All	3.5	358.1	41.6	6.9	0.9	35.5
All with known gestational age ¹	3.4	358.9	41.0	6.7	0.9	24.0
Under 24	902.6	919.0	600.0	500.0	333.3	950.0
24–27	236.9	286.9	92.7	83.3	56.3	235.3
28–31	36.6	92.6	39.4	16.4	16.7	23.3
32–36	6.1	114.8	22.3	6.8	3.6	22.1
37 and over	0.9	54.8	26.8	5.3	0.8	9.3
Postneonatal mortality per 1,000 live births						
All	1.5	54.1	16.1	4.7	0.9	1.4
All with known gestational age ¹	1.5	54.4	15.9	4.6	0.9	1.5
Under 24	12.4	13.2	0.0	0.0	0.0	0.0
24–27	61.3	71.9	31.6	41.7	28.2	29.4
28–31	15.6	50.9	13.9	8.7	0.0	0.0
32–36	4.5	49.2	15.7	4.9	3.2	0.0
37 and over	0.9	0.0	0.0	3.8	0.8	1.2
Infant mortality per 1,000 live births						
All	5.0	412.2	57.7	11.5	1.8	36.9
All with known gestational age ¹	4.9	413.3	56.9	11.3	1.8	25.5
Under 24	915.0	932.2	600.0	500.0	333.3	950.0
24–27	298.2	358.8	124.3	125.0	84.5	264.7
28–31	52.2	143.5	53.3	25.1	16.7	23.3
32–36	10.6	163.9	38.0	11.7	6.8	22.1
37 and over	1.8	54.8	26.8	9.1	1.6	10.4

Rates based on less than 10 deaths are in italics

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

2 This includes one death with birthweight not stated.

Table 6 Live births by multiplicity and gestational age at birth, 2005

England and Wales			
Gestational age (weeks)	All	Multiplicity	
		Singleton	Multiple
Number of live births			
All	645,887	626,917	18,970
Under 24	647	521	126
24–27	2,431	1902	529
28–31	5,825	4,390	1,435
32–36	39,538	31,599	7,939
37 and over	592,158	583,381	8,777
All with known gestational age	640,599	621,793	18,806
Low gestational age inconsistent with birthweight			
Gestational age not stated	100	92	8
Not linked to NN4B record	4,315	4,181	134
Percentage of live births with known gestational age			
Under 24	0.1	0.1	0.7
24–27	0.4	0.3	2.8
28–31	0.9	0.7	7.6
32–36	6.2	5.1	42.2
Under 37	7.6	6.2	53.3
Percentage of all live births			
Gestational age not stated	0.7	0.7	0.7
Not linked to NN4B record	0.1	0.1	0.1

Among term and post term births combined the postneonatal mortality of babies born to mothers aged under 20 and those aged 20–24 was twice that of babies born to mothers in each of the older age groups. Postneonatal mortality of babies born at 32–36 weeks was also higher among mothers aged under 20 and 20–24 years.

Marital status and type of registration

The percentage of babies born preterm varied by marital status/registration type (Table 10). It ranged from 7.0 per cent among babies born inside marriage to 9.2 per cent among babies born outside marriage with parents at different addresses and 9.6 per cent among sole registrations. The percentage born at under 28 weeks gestational age was twice as high among jointly registered babies with parents at different addresses than among babies born inside marriage. The percentage born at gestational ages 32–36 weeks was 7.7 per cent for sole registrations, considerably higher than in the other groups.

These differences in the gestational age distributions were reflected in the neonatal mortality of the marital status/registration type groups (Table 11). The particularly high mortality of 4.9 deaths per 1,000 live births in the joint registration/different address group reflected the high rate of preterm birth in this group. While the gestation-specific neonatal mortality rates did vary across marital status/registration type groups there was no obvious pattern to these rates although in several gestational age groups the sole registered births had the lowest mortality rate.

Postneonatal mortality was particularly high among sole registered births and the jointly registered/different address group. The rates were 2.8 and 2.3 deaths per 1,000 live births respectively, over twice the rate of 1.2 deaths per 1,000 live births observed among births in marriage. Within the gestational age groups 28–31, 32–36 and 37 weeks and over postneonatal mortality among sole registered births was much higher than in any other category. Among term and post term births combined the postneonatal mortality among sole registrations and births jointly registered by parents at different addresses was at least twice that of births inside marriage.

Table 7 Neonatal and postneonatal mortality by multiplicity and gestational age at birth, babies born in 2005

England and Wales			
Gestational age (weeks)	All	Multiplicity	
		Singleton	Multiple
Number of neonatal deaths			
All	2,239	1,876	363
All with known gestational age ¹	2,176	1,822	354
Under 24	584	470	114
24–27	576	442	134
28–31	213	161	52
32–36	241	201	40
37 and over	562	548	14
Number of postneonatal deaths			
All	961	867	94
All with known gestational age ¹	951	857	94
Under 24	8	6	2
24–27	149	117	32
28–31	91	67	24
32–36	179	153	26
37 and over	524	514	10
Neonatal mortality per 1,000 live births			
All	3.5	3.0	19.1
All with known gestational age ¹	3.4	2.9	18.8
Under 24	902.6	902.1	904.8
24–27	236.9	232.4	253.3
28–31	36.6	36.7	36.2
32–36	6.1	6.4	5.0
37 and over	0.9	0.9	1.6
Postneonatal mortality per 1,000 live births			
All	1.5	1.4	5.0
All with known gestational age ¹	1.5	1.4	5.0
Under 24	12.4	11.5	15.9
24–27	61.3	61.5	60.5
28–31	15.6	15.3	16.7
32–36	4.5	4.8	3.3
37 and over	0.9	0.9	1.1
Infant mortality per 1,000 live births			
All	5.0	4.4	24.1
All with known gestational age ¹	4.9	4.3	23.8
Under 24	915.0	913.6	920.6
24–27	298.2	293.9	313.8
28–31	52.2	51.9	53.0
32–36	10.6	11.2	8.3
37 and over	1.8	1.8	2.7

Rates based on less than 10 deaths are in italics

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

NS-SEC

Only births in marriage and those jointly registered by both parents were included in these tables as the father’s occupation is not recorded for sole registrations. As NS-SEC is coded for only a ten per cent sample of live births, the three-class version of NS-SEC was used here rather than the more detailed five- or eight-class versions.

Among babies with fathers whose occupations could be coded to a specific NS-SEC group, the percentage of preterm births was highest among babies with fathers in routine and manual occupations and lowest among those with fathers in professional and managerial occupations

Table 8 Live births by mother's age and gestational age at birth, 2005

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	645,887	44,829	122,163	164,364	188,139	104,136	22,256
Under 24	647	56	131	158	157	121	24
24–27	2,431	238	459	569	656	416	93
28–31	5,825	509	1,130	1,418	1,546	973	249
32–36	39,538	2,912	7,174	9,905	11,229	6,683	1,635
37 and over	592,158	40,580	111,990	150,917	173,281	95,267	20,123
<i>All with known gestational age</i>	<i>640,599</i>	<i>44,295</i>	<i>120,884</i>	<i>162,967</i>	<i>186,869</i>	<i>103,460</i>	<i>22,124</i>
Low gestational age inconsistent with birthweight	100	3	21	18	29	22	7
Gestational age not stated	4,315	474	1,097	1,125	998	526	95
Not linked to NN4B record	873	57	161	254	243	128	30
	Percentage of live births with known gestational age						
Under 24	0.1	0.1	0.1	0.1	0.1	0.1	0.1
24–27	0.4	0.5	0.4	0.3	0.4	0.4	0.4
28–31	0.9	1.1	0.9	0.9	0.8	0.9	1.1
32–36	6.2	6.6	5.9	6.1	6.0	6.5	7.4
<i>Under 37</i>	<i>7.6</i>	<i>8.4</i>	<i>7.4</i>	<i>7.4</i>	<i>7.3</i>	<i>7.9</i>	<i>9.0</i>
	Percentage of all live births						
Gestational age not stated	0.7	1.1	0.9	0.7	0.5	0.5	0.4
Not linked to NN4B record	0.1	0.1	0.1	0.2	0.1	0.1	0.1

(Table 12). The routine and manual group also had the highest proportion of births before 28 weeks of gestational age. The percentage of preterm births was highest however in the 'Other' group, that is births where the father's occupation could not be coded to NS-SEC as no occupational information was available. This group is heterogeneous in nature, including full-time students and young people who have yet to enter paid employment, the long-term unemployed and those with inadequately described occupations.

From 28 weeks of gestation onwards, gestation-specific neonatal and postneonatal mortality rates were consistently higher in the routine and manual group than either the intermediate or the managerial and professional groups (Table 13). The differences between the routine and manual group and the managerial and professional group were particularly large for postneonatal mortality. For babies born at 28–31 weeks and at 37 weeks and above the postneonatal mortality in the routine and manual group was almost twice that of the managerial and professional group. Among babies born at 24–27 weeks of gestational age, neonatal mortality was higher in the routine and manual group than either of the other two specific NS-SEC groups. The mortality rates for babies born at under 24 weeks should be interpreted with great caution as the number of births in the 10 per cent sample coded to an NS-SEC are extremely small and the rates therefore had wide confidence intervals. Consequently the estimated numbers of births in the denominators could actually be lower than the numbers of deaths, in which case the rates per 1,000 live births could exceed 1,000 as was the case for the intermediate and the 'Other' groups.

Discussion

This article provides the first gestation-specific infant mortality rates for England and Wales. These new statistics, derived by enhancing birth registration data with the newly available NHS Numbers for Babies dataset, fill an important gap in the routine data on births and infant mortality. They provide a useful addition to what is already known about health inequalities in infant mortality, and as such will inform the delivery

of the national health inequalities infant mortality PSA target. They also provide data for a large population and include information on 646,000 births. In contrast many of the gestational age data available to date come from countries with good quality statistical systems but small populations. In many respects, our findings are broadly similar to those from other countries, both within the UK and internationally. In theory, it is feasible to compare these findings with gestation-specific mortality data for Scotland and, using other sources, for Wales alone.^{3,6} The relatively small numbers of births in those countries, 54,678 in Scotland and 32,768 in Wales in 2005,¹² limits our ability to make useful comparisons, however.

The data presented here indicate extremely high infant mortality at the very low gestational ages, with almost 95 per cent of babies of 22 weeks gestational age dying in infancy, almost all of them in the first week of life. There was a strong inverse association between mortality and gestational age with a rate of 1.3 deaths per 1,000 live births among babies born at 40 weeks gestational age. Although infant mortality was very low among babies born at term, 37 to 41 weeks, there was considerable variation in mortality within this group with mortality among those born at 37 weeks three times that of those born at 40 weeks. The infant mortality rate of preterm births was 42 deaths per 1,000 live births and, although only 7.6 per cent of live births were born preterm, almost two-thirds of infant deaths occurred to preterm babies. While 80 per cent of deaths among preterm babies occurred in the first month of life, only just over half of all infant deaths among term babies occurred at this age.

As a consequence of the high mortality among preterm births, differences in the incidence of preterm birth, especially in the incidence of births at very low gestational ages, made a major contribution to variations in the infant mortality rates for social and biological groups. Social and biological differences in mortality can also be seen within gestational age groups. Focussing on term and post term births, which after all account for 92 per cent of live births, some clear differentials were evident. Even amongst this group of births, low birthweight babies had much higher neonatal and postneonatal mortality than did babies weighing 2,500g and over at birth. Neonatal mortality among babies weighing 1,500–2,499g

Table 9 Neonatal and postneonatal mortality by mother's age and gestational age at birth, babies born in 2005

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 neonatal deaths							
All	2,239 ²	210	452	580	576	338	82
All with known gestational age ¹	2,176	207	434	568	559	329	79
Under 24	584	48	121	147	137	109	22
24–27	576	69	115	122	168	90	12
28–31	213	24	38	62	56	24	9
32–36	241	21	41	76	59	32	12
37 and over	562	45	119	161	139	74	24
Number of postneonatal deaths							
All	961	101	253	212	221	148	26
All with known gestational age ¹	951	101	248	210	221	147	24
Under 24	8	1	2	2	2	1	0
24–27	149	12	25	31	34	43	4
28–31	91	11	18	26	23	8	5
32–36	179	18	45	43	39	27	7
37 and over	524	59	158	108	123	68	8
Neonatal mortality per 1,000 live births							
All	3.5	4.7	3.7	3.5	3.1	3.2	3.7
All with known gestational age ¹	3.4	4.7	3.6	3.5	3.0	3.2	3.6
Under 24	902.6	857.1	923.7	930.4	872.6	900.8	916.7
24–27	236.9	289.9	250.5	214.4	256.1	216.3	129.0
28–31	36.6	47.2	33.6	43.7	36.2	24.7	36.1
32–36	6.1	7.2	5.7	7.7	5.3	4.8	7.3
37 and over	0.9	1.1	1.1	1.1	0.8	0.8	1.2
Postneonatal mortality per 1,000 live births							
All	1.5	2.3	2.1	1.3	1.2	1.4	1.2
All with known gestational age ¹	1.5	2.3	2.1	1.3	1.2	1.4	1.1
Under 24	12.4	17.9	15.3	12.7	12.7	8.3	0.0
24–27	61.3	50.4	54.5	54.5	51.8	103.4	43.0
28–31	15.6	21.6	15.9	18.3	14.9	8.2	20.1
32–36	4.5	6.2	6.3	4.3	3.5	4.0	4.3
37 and over	0.9	1.5	1.4	0.7	0.7	0.7	0.4
Infant mortality per 1,000 live births							
All	5.0	6.9	5.8	4.8	4.2	4.7	4.9
All with known gestational age ¹	4.9	7.0	5.6	4.8	4.2	4.6	4.7
Under 24	915.0	875.0	938.9	943.0	885.4	909.1	916.7
24–27	298.2	340.3	305.0	268.9	307.9	319.7	172.0
28–31	52.2	68.8	49.6	62.1	51.1	32.9	56.2
32–36	10.6	13.4	12.0	12.0	8.7	8.8	11.6
37 and over	1.8	2.6	2.5	1.8	1.5	1.5	1.6

Rates based on less than 10 deaths are in italics.

- 1 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.
- 2 This includes one death with mother's age not stated.

was 5.3 deaths per 1,000 live births as compared to 0.8 deaths per 1,000 live births among those weighing 2,500g and over. The equivalent figures for postneonatal mortality were 3.8 and 0.8 deaths per 1,000 live births respectively.

Among term or post term births neonatal and overall infant mortality was higher for multiples than for singletons. However among babies born at gestational ages of 32–36 weeks multiple births actually had lower infant mortality rates than singletons. This phenomenon has been noted elsewhere¹⁹ and has also been evident in birthweight-specific survival.^{4,20} It may reflect the more rapid maturation of multiples,

the better surveillance of multiple pregnancies, or differences in the antecedents of preterm labour in multiples and singletons at these gestations.

Differences in the postneonatal mortality of babies born at term or post term were evident across groups defined by marital status/registration type, by maternal age, and by NS-SEC. Those born in marriage had postneonatal mortality half that of those registered by the mother alone or jointly registered by parents living at different addresses. Babies born to mothers aged 25–29, 30–34 or 35–39 had postneonatal mortality rates which were half those of babies whose mothers were aged under 20 or

Table 10 Live births by marital status/type of registration and gestational age at birth, 2005

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	645,887	369,373	175,571	55,778	45,165
Under 24	647	322	193	83	49
24–27	2,431	1,192	667	347	225
28–31	5,825	2,934	1,593	728	570
32–36	39,538	21,391	10,836	3,901	3,410
37 and over	592,158	341,145	160,705	50,039	40,269
All with known gestational age	640,599	366,984	173,994	55,098	44,523
Low gestational age inconsistent with birthweight	100	58	21	11	10
Gestational age not stated	4,315	1,836	1,342	581	556
Not linked to NN4B record	873	495	214	88	76
	Percentage of live births with known gestational age				
Under 24	0.1	0.1	0.1	0.2	0.1
24–27	0.4	0.3	0.4	0.6	0.5
28–31	0.9	0.8	0.9	1.3	1.3
32–36	6.2	5.8	6.2	7.1	7.7
Under 37	7.6	7.0	7.6	9.2	9.6
	Percentage of all live births				
Gestational age not stated	0.7	0.5	0.8	1.0	1.2
Not linked to NN4B record	0.1	0.1	0.1	0.2	0.2

aged 20–24 years. Term/post term babies with fathers in managerial or professional occupations had the lowest postneonatal mortality of any group identified in our analysis, 0.5 deaths per 1,000 live births. Postneonatal mortality among those with fathers in routine or manual occupations was 0.9 deaths per 1,000 live births.

It should be noted that previous studies have shown higher infant mortality rates among babies born before 24 weeks gestational age than seen in our data. In particular the EPICure study, covering births before 25 weeks gestational age in the United Kingdom and Ireland from March to December 1995, showed that babies born alive at under 22, at 22 and at 23 weeks gestational age had neonatal mortality rates of 1,000, 978 and 842 deaths per 1,000 live births respectively.¹⁷ Mortality by 30 months of age for babies born at 22 and 23 weeks of gestational age was 986 and 896 deaths per 1,000 live births respectively.²¹ More recent data are due soon from the EPICure 2 study. It is important that the information on the live births and in particular the infant deaths recorded in our data with a gestational age of less than 24 weeks is validated against other sources before the apparent decrease in the infant mortality of babies born at these very early gestational ages is taken at face value.

The World Health Organisation (WHO) and its predecessors have long made a distinction between definitions of live birth, which are based on signs of life, and criteria for including births in perinatal statistics produced for making comparisons between countries.^{18,4} Infant mortality statistics produced by ONS are based on all registrations of babies born alive in England and Wales and all deaths in the first year of life among them.^{11,12} Where comparisons are to be made with other countries, however, WHO recommends using common gestational age thresholds to produce perinatal statistics on a comparable basis.¹⁸ Up until now it has not been possible to include data for England and Wales in such comparisons. The availability of gestational age data will make this possible in the future.

As this is a new source, which relies on linking data collected for different administrative purposes, there are data quality issues, mentioned above, that require further investigation. The information available to us at this stage gives rise to serious doubt as to whether the births recorded as being of under 22 weeks gestational age with birthweights 1,000g and over really are of extremely low gestational age. Focussing on all babies recorded as born before 24 weeks gestational age, the inconsistencies in the recording of gestational age and birthweight information will be investigated further by cross-validating the information against that collected by the Confidential Enquiry into Maternal and Child Health (CEMACH).

In this first exploration of the gestation-specific infant mortality data the analyses were univariate. Multivariate analyses are clearly required in order to attempt to untangle the importance of different social and biological factors. Undertaking a multivariate analysis should allow us to strengthen our conclusions, although the high level of inter-correlation between variables will make this challenging.

The data analysed here are only a subset of variables recorded at birth registration and on the NN4B record. There is now the potential for analyses on other subjects, including parents' countries of birth, ethnicity and the site of the babies' birth. Many births at low gestational ages are stillborn and although stillbirths are not included in this article they will be the subject of future work on gestation-specific stillbirth and perinatal mortality.

Table 11

Neonatal and postneonatal mortality by marital status/type of registration and gestational age at birth, babies born in 2005

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 neonatal deaths					
All	2,239 ²	1,146	647	271	174
All with known gestational age ¹	2,176	1,120	631	264	161
Under 24	584	294	176	75	39
24–27	576	275	161	80	60
28–31	213	111	56	32	14
32–36	241	138	63	29	11
37 and over	562	302	175	48	37
Number of postneonatal deaths					
All	961	449	257	129	126
All with known gestational age ¹	951	444	254	128	125
Under 24	8	4	1	1	2
24–27	149	67	37	28	17
28–31	91	48	17	12	14
32–36	179	83	53	19	24
37 and over	524	242	146	68	68
Neonatal mortality per 1,000 live births					
All	3.5	3.1	3.7	4.9	3.9
All with known gestational age ¹	3.4	3.1	3.6	4.8	3.6
Under 24	902.6	913.0	911.9	903.6	795.9
24–27	236.9	230.7	241.4	230.5	266.7
28–31	36.6	37.8	35.2	44.0	24.6
32–36	6.1	6.5	5.8	7.4	3.2
37 and over	0.9	0.9	1.1	1.0	0.9
Postneonatal mortality per 1,000 live births					
All	1.5	1.2	1.5	2.3	2.8
All with known gestational age ¹	1.5	1.2	1.5	2.3	2.8
Under 24	12.4	12.4	5.2	12.0	40.8
24–27	61.3	56.2	55.5	80.7	75.6
28–31	15.6	16.4	10.7	16.5	24.6
32–36	4.5	3.9	4.9	4.9	7.0
37 and over	0.9	0.7	0.9	1.4	1.7
Infant mortality per 1,000 live births					
All	5.0	4.3	5.1	7.2	6.6
All with known gestational age ¹	4.9	4.3	5.1	7.1	6.4
Under 24	915.0	925.5	917.1	915.7	836.7
24–27	298.2	286.9	296.9	311.2	342.2
28–31	52.2	54.2	45.8	60.4	49.1
32–36	10.6	10.3	10.7	12.3	10.3
37 and over	1.8	1.6	2.0	2.3	2.6

Rates based on less than 10 deaths are in italics.

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

2 This includes one death with marital status/type of registration not stated.

Table 12

Live births¹ by NS-SEC (based on father's occupation) and gestational age at birth, 2005

England and Wales

Gestational age (weeks)	All ²	National Statistics Socio-Economic Classification			
		Managerial and Professional	Intermediate	Routine and Manual	Other ³
	Numbers of live births				
All	600,722	22,618	11,677	22,378	3,612
Under 24	598	19	8	37	4
24–27	2,206	65	41	88	28
28–31	5,255	171	101	222	44
32–36	36,128	1,247	701	1,457	253
37 and over	551,889	20,994	10,744	20,361	3,224
<i>All with known gestational age</i>	<i>596,076</i>	<i>22,496</i>	<i>11,595</i>	<i>22,165</i>	<i>3,553</i>
Low gestational age inconsistent with birthweight	90	2	4	5	1
Gestational age not stated	3,759	88	66	175	47
Not linked to NN4B record	797	32	12	33	11
	Percentage of live births with known gestational age				
Under 24	0.1	0.1	0.1	0.2	0.1
24–27	0.4	0.3	0.4	0.4	0.8
28–31	0.9	0.8	0.9	1.0	1.2
32–36	6.1	5.5	6.0	6.6	7.1
<i>Under 37</i>	<i>7.4</i>	<i>6.7</i>	<i>7.3</i>	<i>8.1</i>	<i>9.3</i>
	Percentage of all live births				
Gestational age not stated	0.6	0.4	0.6	0.8	1.3
Not linked to NN4B record	0.1	0.1	0.1	0.1	0.3

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

2 Inside marriage and outside marriage/joint registration only, including cases where father's occupation was not stated. Information on father's occupation is not collected for births outside marriage if the father does not attend the registration of the baby's birth.

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

Table 13

Neonatal and postneonatal mortality by NS-SEC (based on father's occupation at death registration) and gestational age at birth, babies born in 2005

England and Wales

Gestational age (weeks)	All ¹	National Statistics Socio-Economic Classification			
		Managerial and Professional	Intermediate	Routine and Manual	Other ²
Number of neonatal deaths					
All	2,064	591	356	875	208
All with known gestational age ³	2,015	582	347	850	203
Under 24	545	155	87	243	54
24-27	516	141	93	221	51
28-31	199	54	34	87	24
32-36	230	74	39	97	17
37 and over	525	158	94	202	57
Number of postneonatal deaths					
All	835	187	151	345	130
All with known gestational age ³	826	184	148	342	130
Under 24	6	0	2	4	0
24-27	132	35	30	46	18
28-31	77	15	6	37	18
32-36	155	37	22	68	25
37 and over	456	97	88	187	69
Neonatal mortality per 1,000 live births					
All	3.4	2.6	3.0	3.9	5.8
All with known gestational age ³	3.4	2.6	3.0	3.8	5.7
Under 24	911.4	815.8	1087.5	656.8	1350.0
24-27	233.9	216.9	226.8	251.1	182.1
28-31	37.9	31.6	33.7	39.2	54.5
32-36	6.4	5.9	5.6	6.7	6.7
37 and over	1.0	0.8	0.9	1.0	1.8
Postneonatal mortality per 1,000 live births					
All	1.4	0.8	1.3	1.5	3.6
All with known gestational age ³	1.4	0.8	1.3	1.5	3.7
Under 24	<i>10.0</i>	<i>0.0</i>	<i>25.0</i>	<i>10.8</i>	<i>0.0</i>
24-27	59.8	53.8	73.2	52.3	64.3
28-31	14.7	8.8	5.9	16.7	40.9
32-36	4.3	3.0	3.1	4.7	9.9
37 and over	0.8	0.5	0.8	0.9	2.1
Infant mortality per 1,000 live births					
All	4.8	3.4	4.3	5.5	9.4
All with known gestational age ³	4.8	3.4	4.3	5.4	9.4
Under 24	921.4	815.8	1112.5	667.6	1350.0
24-27	293.7	270.8	300.0	303.4	246.4
28-31	52.5	40.4	39.6	55.9	95.5
32-36	10.7	8.9	8.7	11.3	16.6
37 and over	1.8	1.2	1.7	1.9	3.9

Rates based on less than 10 deaths are in italics

- 1 Inside marriage and outside marriage/joint registration only, including cases where father's occupation was not stated.
- 2 Students; occupations inadequately described, occupations not classifiable for other reasons; never worked and long-term unemployed.
- 3 Excludes those with low gestational age inconsistent with birthweight, or gestational age not stated, or not linked to an NN4B record.

Key findings

- Gestational age is known for 99.2 per cent of live births in 2005.
- In 2005 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 42, 1.8, and 2.0 deaths per 1,000 live births respectively.
- Infant mortality was highest at the very low gestational ages, 947 deaths per 1,000 live births among babies born at 22 weeks. It then decreased with gestational age to 1.3 deaths per 1,000 live births among babies born at 40 weeks gestation.
- Infant mortality varied considerably among term births. The infant mortality rate of babies born at 37 weeks was over three times that of babies born at 40 weeks.
- Among babies born at 37 weeks and above, the neonatal mortality rate of those weighing 1,500–2,499g at birth was 5.3 deaths per 1,000 live births as compared to 0.8 deaths per 1,000 live births for those weighing 2,500g and over.
- For babies born at 37 weeks and above, the postneonatal mortality among babies with fathers in routine and manual occupations was almost twice that of babies whose fathers had managerial and professional occupations.

Acknowledgements

The authors thank Andy Sneddon for help in preparing the tables for this article.

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