

# Birthweight and gestational age by ethnic group, England and Wales 2005: introducing new data on births

Kath Moser  
*Office for National Statistics*

Kristina M Stanfield and David A Leon  
*London School of Hygiene and Tropical Medicine*

Low birthweight babies and babies born preterm are at increased risk of morbidity and mortality in the first year of life, as well as in the longer term. Since information on ethnic group is not recorded at birth registration in England and Wales, it has not been possible to produce routine statistics on birthweight or gestational age by ethnic group. A new system, introduced in 2002, for allocating NHS numbers at birth (NN4B) provided the opportunity to obtain ethnic group information. The NN4B record includes information on the ethnic group of the baby classified according to the 2001 Census categories. This paper presents the first analyses of ethnic differences in birthweight and gestational age at birth for England and Wales as a whole. Utilising NN4B records linked with birth registration records for all births occurring in England and Wales in 2005, birthweight and gestational age distributions, including the percentages low birthweight and preterm, are compared between ethnic groups. The paper also examines how parental socio-demographic circumstances vary by ethnic group.

## Introduction

Birthweight has been recorded as part of standard clinical practice in countries such as those of the UK for over a century. Aside from their clinical utility these data have been used as an indicator of social and economic development of populations.<sup>1</sup> Low birthweight has received particular attention as a powerful predictor of infant death, especially in the neonatal period.<sup>2,3,4</sup> Gestational age at birth is highly correlated with birthweight and babies born preterm are at increased risk of morbidity and mortality in the first year of life,<sup>5,6</sup> as well as in the longer term.<sup>7</sup> In addition, over the past 20 years there has been increasing interest in birthweight<sup>8,9</sup> and gestational age<sup>10</sup> as predictors of risk of some adult diseases.

Routinely collated national data on birthweight, gestational age and other key perinatal and obstetric variables have been available for many years in Nordic countries such as Sweden.<sup>11</sup> In the UK, the earliest comprehensive population-based data collection was initiated in the late 1940s by Dugald Baird who established the Aberdeen Maternity and Neonatal Databank,<sup>12</sup> which is still in existence. The Scotland-wide SMR2 maternity record system has collected birthweight and gestational age data since the 1970s. However, as described by Macfarlane and Mugford,<sup>13</sup> while routine collection of birthweight data in England and Wales started after the Second World War, it was only from 1975 that the Office of Population Censuses and Surveys (the predecessor of the Office for National Statistics (ONS)) included birthweight on all registrations of live births. However, 2005 was the first year for which statistics on gestational age for all births in England and Wales became available.<sup>14,15</sup>

In 2001 one in eight people in England and Wales belonged to an ethnic group other than White British.<sup>16,17</sup> However, neither the ethnic group of parent nor child is collected when a birth is registered, which means that until now there have been no routine statistics for England and Wales as

a whole on birth outcomes by ethnicity. This represents an important gap in our capacity to monitor and study the perinatal and infant health and welfare of different ethnic groups. It should be noted that while routine data on birthweight and infant mortality according to the mother's country of birth do exist, this is not the same as looking at ethnic variation.<sup>18,19</sup>

Despite the absence of routine statistics on ethnicity at birth, there have been a number of ad hoc studies of birthweight and gestational age in relation to ethnicity based on hospital or regional populations or national samples.<sup>20,21,22,23,24,25,26,27</sup> These include analyses of representative samples of UK populations, including the ONS Longitudinal Study – a 1 per cent sample of the population of England and Wales – which has been used to study ethnic differences in birthweight<sup>25</sup> in which ethnicity of the mother was determined from Census data. The Millennium Cohort Study – a sample of live births delivered in the UK in 2000/1 – has also been used to look at ethnic differences in size at birth.<sup>26</sup> What is evident from these various studies is that there are systematic variations in birthweight and gestational age between ethnic groups in Britain. However, many of these studies were of insufficient size for estimating birthweight or gestational age for specific ethnic minority groups, and few were based on nationally representative samples.

This paper uses a new dataset covering all births in England and Wales making it possible to look at ethnic differences in birth outcomes for the first time. First, the source of these new data is described, followed by an examination of ethnic differences in birthweight and gestational age for babies born in 2005.

## Methods

### Data sources

Each individual registered with the National Health Service has a unique NHS number. Until 2002 this was allocated when the birth was registered, which could have been up to 6 weeks after birth. However, since 2002 the NHS number has been allocated at birth for all babies born in England, Wales and the Isle of Man. This involves electronic notification of each birth to the Central Issuing System which allocates NHS numbers.<sup>28</sup> Through this system key birth notification details are collected centrally on what is known as the NHS Numbers for Babies (NN4B) dataset. This includes ethnicity, as well as gestational age, another data item not collected (for live births) at registration. For all NHS numbers issued since the beginning of 2005, ONS has been receiving a subset of the variables contained in this dataset.

Using the NN4B dataset it has become possible to produce a range of statistics on births in England and Wales for the first time. Statistics on the distribution of live births by multiplicity and gestational age were released in 2007<sup>15</sup> with more extensive gestational age statistics published in early 2008.<sup>14</sup> Gestation-specific infant mortality rates for England and Wales as a whole, including in relation to social and biological factors, have also recently been published<sup>5</sup> and statistics on infant mortality by ethnic group were released in June 2008.<sup>29</sup>

As NN4B records include NHS number it is possible to link them with other datasets containing NHS number. The data used in the analysis presented in this paper are from a linkage of routine birth registration records for babies born in England and Wales in 2005 with NN4B records. The extract of birth registration data for 2005, taken in August 2006, included 649,371 births. Of these, 648,421 (99.9 per cent) were successfully linked to an NN4B record using the methods developed for the pilot linkage of births in the first quarter of 2005, described in detail elsewhere.<sup>30</sup> The quality and completeness of the NN4B dataset has been shown to be generally good.<sup>14</sup>

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.

## Ethnic group

The NN4B record requests information on the 'ethnic category (baby) as defined by the mother' using specified categories (Box One) which match those used in the 2001 Census. Most of the analysis in this paper 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, plus a White Other (including White Irish) and an 'All Others' group, the latter including Chinese, Other Asian, Other Black, Other, and all Mixed groups. We use White British as the reference group. Although the NN4B data specification asks for the baby's ethnic group as defined by the mother, it is unclear whether in practice this is what is actually recorded by the health professional notifying the birth. It is possible that the mother's ethnic group is recorded rather than the baby's and that the health professional decides what to record rather than asking the mother.

As this is the first time this ethnic group information has been used, to assess its quality, the ethnic group distribution of the linked birth registration-NN4B dataset was compared against ethnic group data from the Maternity Hospital Episode Statistics (HES). However, in order to fully validate the data on ethnicity an ad hoc study is clearly required to establish whose ethnic group is recorded, and whether the mother or the health professional supplies the information.

## Box one

### Ethnic group categories

Used in NN4B dataset	Collapsed categories sometimes used in this paper
<b>White</b>	
British	White British
Irish	White Other
Any other White background	White Other
<b>Mixed</b>	
White and Black Caribbean	All Others
White and Black African	All Others
White and Asian	All Others
Any other mixed background	All Others
<b>Asian or Asian British</b>	
Indian	Asian or Asian British, Indian
Pakistani	Asian or Asian British, Pakistani
Bangladeshi	Asian or Asian British, Bangladeshi
Any other Asian background	All Others
<b>Black or Black British</b>	
Caribbean	Black or Black British, Caribbean
African	Black or Black British, African
Any other Black background	All Others
<b>Other ethnic groups</b>	
Chinese	All Others
Any other ethnic group	All Others
<b>Not stated</b>	Not stated

## Statistical analysis

A summary of the 2005 birth records is shown in Table 1. In this paper the word 'birth' refers to a baby. 'All births' includes babies which are born alive or stillborn, and which are singleton, twin, triplet or from a higher order birth. Information on whether a birth is live or stillborn, is a singleton or multiple, together with information on birthweight, maternal age, marital

**Table 1** Birth records in 2005: summary of counts

England and Wales		
	Number	Percentage
<b>Birth registration records: all births (live and stillbirths)</b>	<b>649,371</b>	
linked to an NN4B record	648,421	99.9 per cent of all births
not linked to an NN4B record	950	
live births	645,887	99.5 per cent of all births
stillbirths	3,484	
singleton births	630,139	97.0 per cent of all births
multiple births	19,232	
<b>Birth registration records: live singletons</b>	<b>626,917</b>	
linked to an NN4B record	626,066	99.9 per cent of live singletons
not linked to an NN4B record	851	
with known gestational age	621,793	99.2 per cent of live singletons
not known gestational age <sup>1</sup>	5,124	
with stated birthweight	624,821	99.7 per cent of live singletons
not stated birthweight	2,096	

<sup>1</sup> See Methods.

status/registration type, and National Statistics Socio-economic Classification (NS-SEC) based on paternal occupation, is taken from the birth registration data. Birthweight is one of several data items also collected in the NN4B data. However, the birthweight distributions of live births agree closely between the registration and NN4B data except for a higher proportion of births weighing 1–499g in the NN4B data.<sup>14</sup> The pilot linkage<sup>30</sup> showed 98.6 per cent of linked birth records were in the same 500g birthweight group according to both sources. 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.

The analysis is undertaken in three stages. **Section A** examines the distribution of all births by ethnic group. It investigates how maternal age, marital status/registration type, and NS-SEC distributions of births vary by ethnic group. 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 the father's occupation and is therefore only available for births occurring in marriage or jointly registered by both parents. As NS-SEC is coded for only 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.

The analysis of gestational age and birthweight by ethnic group presented in **Section B** focuses on live singletons only. These birth outcomes are very different for multiple births and stillbirths and so these will be examined separately at a later date. Live singletons accounted for 96.5 per cent of all births in 2005. The main gestational age outcome considered is the percentage born preterm, as defined by the World Health Organization (WHO).<sup>31</sup> 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. Mean gestational age is also calculated.

The NN4B data specification asks for gestation length in weeks 'calculated from relevant menstrual data held within the maternity system'. However, given the very widespread use of ultrasound dating, it is likely that the recorded gestational age will often come from such examinations. No information is held in the NN4B record on the method used to assess

gestational age. More detail on gestational age measurement is given elsewhere.<sup>14</sup> All the gestational age statistics were calculated using only births of known gestational age. Thus of the 626,917 live singleton births in England and Wales in 2005 the gestational age analysis includes 621,793 live singletons (99.2 per cent). The births that were not included, because gestational age was not known, included: registrations of live singletons that could not be linked to an NN4B record (n=851); live singletons where gestational age was not stated (n=4,181); and live singletons with gestational age under 22 weeks with birthweight 1,000g and above or not stated (n=92). Regarding this last group, our earlier work<sup>5</sup> indicated that for births recorded as under 22 weeks gestational age and with birthweights that were not very low, either gestational age or birthweight or both were wrongly recorded. For this reason we classify births of under 22 weeks with implausibly high or not stated birthweight as of not known gestational age.

In addition to considering ethnic differences in the birthweight distribution, and mean birthweight, we also consider differences in the percentage of low birthweight babies, defined by the WHO as those born weighing under 2,500g.<sup>31</sup> All the birthweight statistics were calculated using only births with stated birthweight. Thus of the 626,917 live singleton births in England and Wales in 2005, the birthweight analysis included 624,821 live singletons (99.7 per cent) after excluding the births with birthweight not stated.

**Section C** compares the distribution of births by ethnic group with the distribution of deliveries (also known as maternities) from the Maternity HES data.<sup>32</sup> Maternity HES data cover deliveries in England by financial year but are missing for most deliveries taking place at home or in private hospitals (accounting for 2.5 per cent of deliveries in total). Furthermore, as some maternity units fail to contribute data, information is missing for one-quarter of hospital deliveries. Women are asked to self-select their ethnic group from a given list (using 2001 Census categories). However not all agree to do so with the result that coverage is incomplete. Comparison of HES deliveries in 2000/01 with 2001 Census data on women with children under age 1 year indicated that the ethnic group distribution of HES deliveries was broadly accurate as long as cases where ethnic group was not stated were grouped together with those where ethnic group was stated as White.<sup>32</sup>

Maternity HES data were obtained on all NHS hospital deliveries by ethnic group for two years 2004/05 and 2005/06 (data from NHS Information for Health and Social Care, personal communication). In order for comparisons to be made with the 2005 linked birth registration-NN4B data, these two Maternity HES datasets were combined to give data for 2004 to 2006, that is the 24 month period running from 1 April 2004 until 31 March 2006.

## Results

### A. Distribution of all births by ethnic group

Table 2 shows the distribution of all 649,371 births in 2005 by all the ethnic group categories available. An ethnic group was recorded for 89.0 per cent of births, was not stated for 10.8 per cent of births and was unavailable for the 950 birth registrations that could not be linked to an NN4B record. As discussed in more detail below, the characteristics of those with ethnicity not stated are similar to those of the White British. Just under two-thirds (64.4 per cent) of all births in 2005 were recorded as White British, 8.6 per cent as Asian/Asian British, and 5.0 per cent as Black/Black British.

### Maternal age

There were large variations between ethnic groups in the distribution of births by maternal age as shown by the cumulative distribution of births by mothers' age (Figure 1). There was a five-fold difference across these ethnic groups in the percentage of babies born to mothers under age 20, ranging from 1.6 per cent in the Indian group to 9.5 per cent in

**Table 2** Distribution of all births by ethnic group, 2005

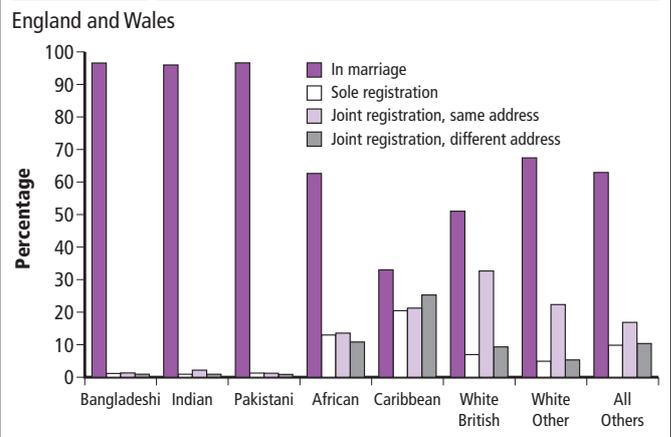
England and Wales		
Ethnic group	Number	Percentage
<b>White</b>		
British	418,052	64.4
Irish	2,231	0.3
Any other White background	31,231	4.8
<b>Mixed</b>		
White and Black Caribbean	5,778	0.9
White and Black African	3,535	0.5
White and Asian	5,139	0.8
Any other mixed background	8,154	1.3
<b>Asian or Asian British</b>		
Indian	16,053	2.5
Pakistani	24,290	3.7
Bangladeshi	8,241	1.3
Any other Asian background	7,481	1.2
<b>Black or Black British</b>		
Caribbean	7,517	1.2
African	19,756	3.0
Any other Black background	5,428	0.8
<b>Other ethnic groups</b>		
Chinese	2,320	0.4
Any other ethnic group	12,912	2.0
<b>Not stated</b>	70,303	10.8
<b>Not linked to an NN4B record</b>	950	0.1
<b>Total</b>	<b>649,371</b>	<b>100.0</b>

the Caribbean group. Half of all births in the White British and African groups were to women under age 30 compared to 68 per cent of births in the Pakistani and 71 per cent in the Bangladeshi groups. The maternal age distribution of the births with ethnicity not stated (not shown) is similar to that of the White British group.

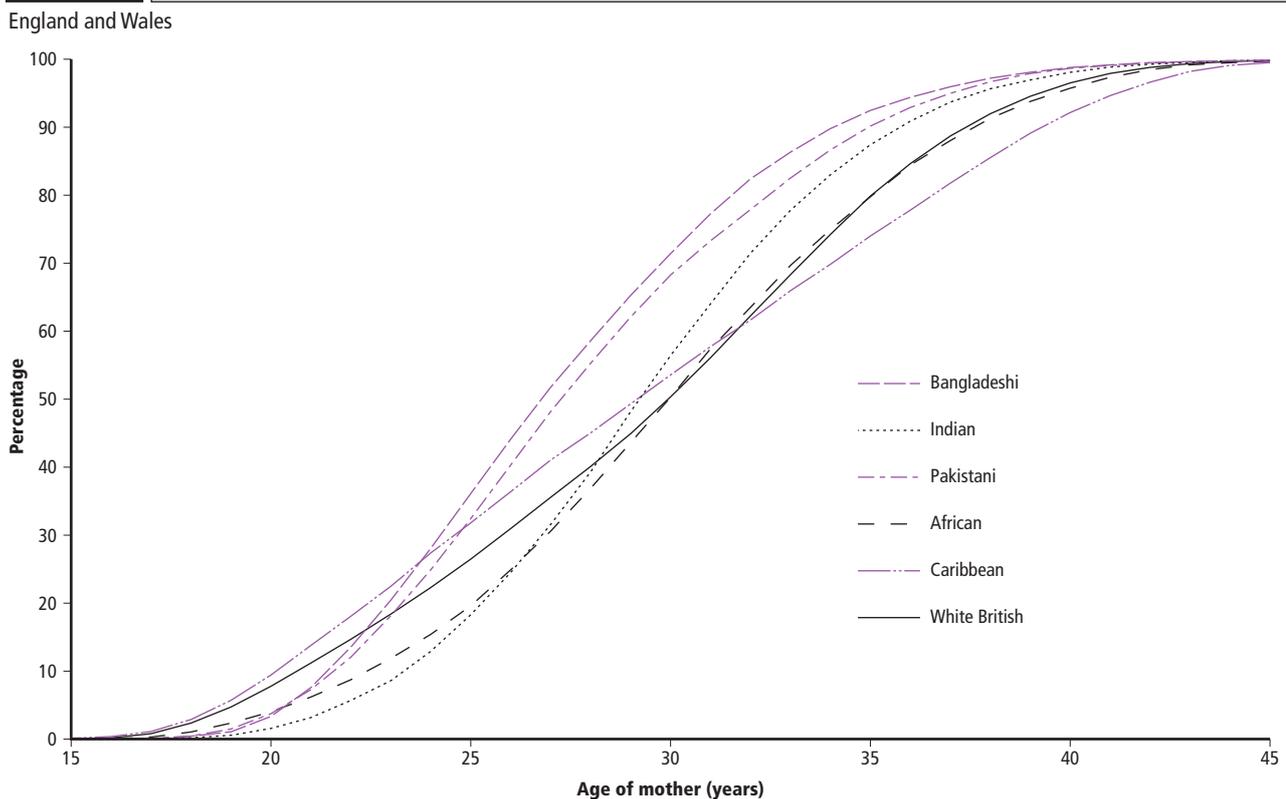
**Marital status/registration type**

There are marked ethnic group differences in the marital status/ registration type of births (Figure 2). Almost all births in each of the Asian groups were registered within marriage as compared with only one-third of births in the Caribbean group and just over half in the White British group. The proportion of babies registered by the mother alone

**Figure 2** Distribution of all births by marital status/ registration type, by ethnic group, 2005



**Figure 1** Cumulative distribution of all births by age of mother, for selected ethnic group: 2005



was highest in the Caribbean group (20.5 per cent) followed by the African (13.0 per cent) and White British (7.0 per cent) groups. In each of the three Asian groups less than 1.5 per cent of births were registered by the mother alone.

### Socio-economic classification (NS-SEC)

As mentioned above, only births in marriage and joint registrations can be classified to an NS-SEC and only 10 per cent of live births (and all stillbirths) are coded to an NS-SEC. Amongst the 63,470 births for which there is NS-SEC information, the distributions across NS-SEC categories varied greatly by ethnic group (Table 3). In the White British group, 38.1 per cent of births had fathers in managerial and professional occupations and 38.3 per cent in routine and manual occupations, with a further 19.5 per cent in intermediate occupations. The NS-SEC distributions of births in the Asian groups differed from that of the White British group and also from each other. In the Bangladeshi group 56.0 per cent of births had fathers in routine and manual occupations and 19.6 per cent in managerial and professional occupations while in the Pakistani group the corresponding figures were 42.9 per cent and 21.6 per cent. In contrast, in the Indian group the largest group were babies with fathers in managerial and professional occupations (47.4 per cent). Of the births in marriage

or jointly registered in the African group, a particularly high percentage (26.9 per cent) were to fathers who were unemployed, students, in inadequately described or not stated occupations. In the White and Asian groups the percentages in this residual group were below 10 per cent. The NS-SEC distribution of the births without stated ethnicity was very similar to the White British.

### B. Gestational age and birthweight by ethnic group: live singleton births only

#### Gestational age

The gestational age distribution of live singleton births varied by ethnic group (Table 4). The Caribbean group had the highest percentage (9.7 per cent) of live singletons born at under 37 weeks (that is, preterm) followed by the Indian, Pakistani and African groups with between 6.8 per cent and 7.0 per cent. Comparing the Caribbean group with White British, 3.6 more births out of every 100 in the Caribbean group were born before 37 weeks as compared to the White British group. The Caribbean group also had the highest percentage (1.1 per cent) born at under 28 weeks followed by the African group (0.8 per cent). This contrasted with 0.3 per cent in the White British group and between 0.4 per cent and 0.5

**Table 3** Distribution of all births by National Statistics Socio-Economic Classification (NS-SEC),<sup>1</sup> by ethnic group, 2005 (births in marriage/joint registrations only)

England and Wales

	Asian, Asian British			Black, Black British		White		All Others <sup>2</sup>	Not stated	Not linked	Total
	Bangladeshi	Indian	Pakistani	African	Caribbean	White British	White Other				
NS-SEC (per cent)											
Managerial & professional occupations	19.6	47.4	21.6	28.3	25.2	38.1	43.7	33.4	40.3	32.5	37.1
Intermediate occupations	15.1	17.9	26.6	12.1	24.1	19.5	18.8	17.7	18.7	15.6	19.3
Routine & manual occupations	56.0	29.3	42.9	32.6	38.3	38.3	30.3	34.7	36.4	35.7	37.4
Unemployed, students, not stated, not classified	9.4	5.3	8.9	26.9	12.4	4.1	7.1	14.3	4.7	16.2	6.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of births (n)	854	1,633	2,679	1,923	651	40,544	3,317	4,828	6,887	154	63,470

1 Only 10 per cent of live births are coded to an NS-SEC.

2 Chinese, Other Asian, Other Black, Other, and all Mixed groups (see Box One).

**Table 4** Gestational age at birth by ethnic group: live singletons,<sup>1</sup> 2005

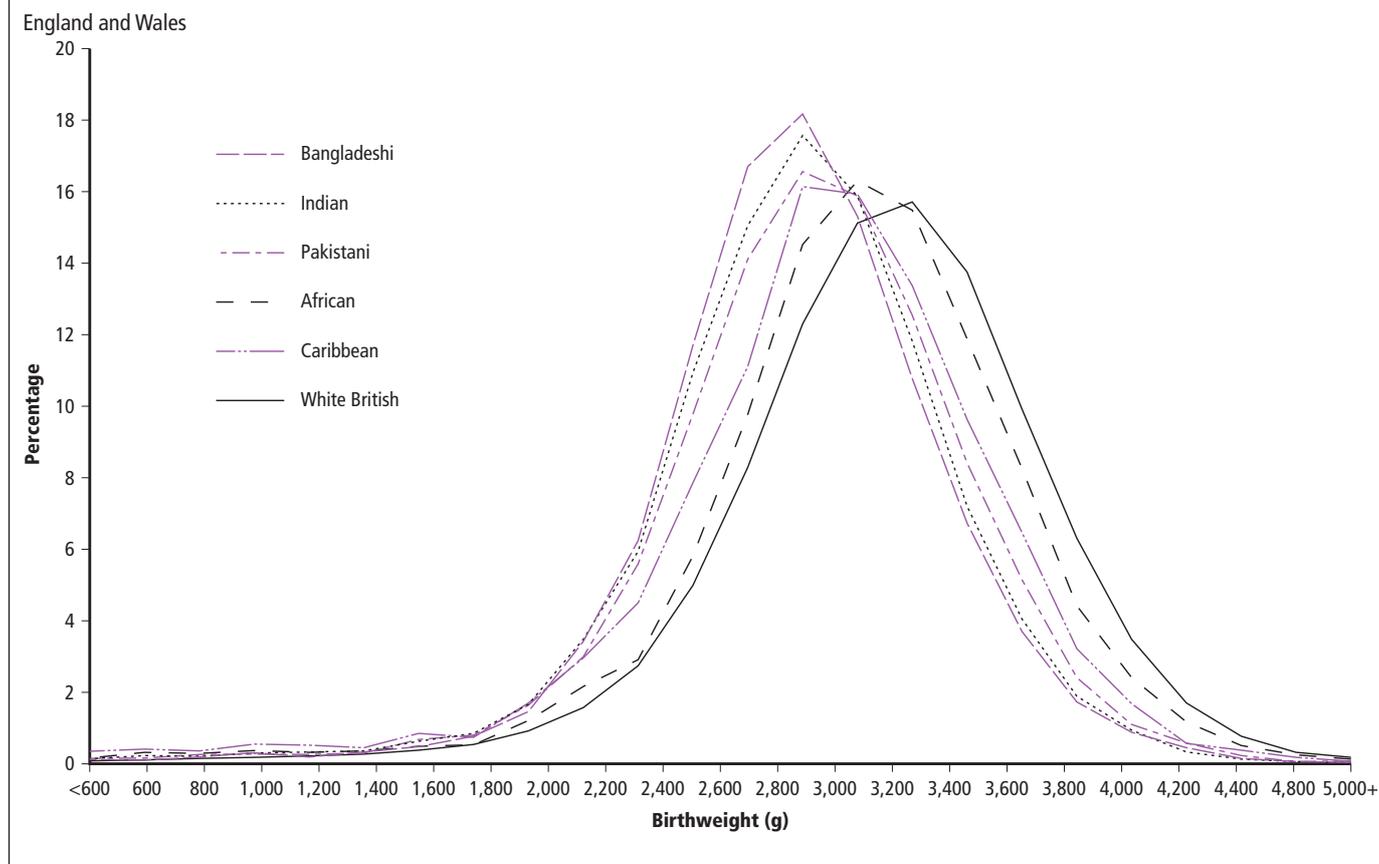
England and Wales

	Asian, Asian British			Black, Black British		White		All Others <sup>2</sup>	Not stated	Total
	Bangladeshi	Indian	Pakistani	African	Caribbean	White British	White Other			
Gestational age, weeks (per cent)										
Under 24	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.1
24-27	0.3	0.3	0.3	0.7	0.8	0.3	0.3	0.4	0.3	0.3
28-31	0.7	0.8	0.7	1.0	1.5	0.7	0.7	0.8	0.7	0.7
32-36	4.8	5.6	5.7	5.1	7.2	5.1	4.4	5.1	5.0	5.1
37-41	88.6	90.4	90.1	86.8	86.8	89.4	89.8	89.3	89.4	89.4
42 and over	5.5	2.7	3.0	6.2	3.5	4.5	4.8	4.2	4.5	4.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 28 weeks (per cent)	0.4	0.4	0.5	0.8	1.1	0.3	0.4	0.5	0.4	0.4
Under 37 weeks (per cent)	5.9	6.9	6.8	7.0	9.7	6.1	5.5	6.5	6.1	6.2
Mean gestational age, weeks	39.04	38.96	39.00	39.12	38.76	39.31	39.34	39.13	39.25	39.25
Number of births (n)	8,005	15,501	23,358	18,902	7,221	400,360	32,321	48,879	67,246	621,793
Row percentage	1.3	2.5	3.8	3.0	1.2	64.4	5.2	7.9	10.8	100.0

1 Births of known gestation only.

2 Chinese, Other Asian, Other Black, Other, and all Mixed groups (see Box One).

**Figure 3** Birthweight distributions for selected ethnic groups: live singletons, 2005



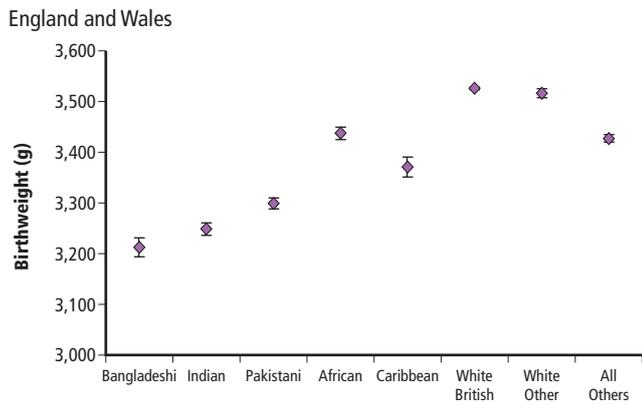
**Table 5** Birthweight by ethnic group: live singletons,<sup>1</sup> 2005

England and Wales											
	Asian, Asian British			Black, Black British		White		All Others <sup>2</sup>	Not stated	Not linked	Total
	Bangladeshi	Indian	Pakistani	African	Caribbean	White British	White Other				
Birthweight, grams (per cent)											
Under 1,000	0.4	0.6	0.6	0.8	1.1	0.3	0.4	0.5	0.4	1.3	0.4
1,000-	0.7	0.8	0.7	0.9	1.3	0.5	0.5	0.6	0.6	0.3	0.6
1,500-	1.4	1.7	1.6	1.2	1.9	1.1	0.9	1.2	1.1	0.9	1.1
2,000-	7.5	7.5	7.0	4.5	6.7	3.6	3.1	4.6	3.8	2.8	4.0
2,500-	32.0	29.6	27.2	17.3	21.4	14.9	14.3	19.6	16.3	15.2	16.6
3,000-	39.5	40.0	39.4	39.1	39.0	35.6	37.2	39.4	36.4	36.2	36.5
3,500-	15.2	16.5	19.1	27.3	22.5	31.2	31.9	25.7	29.7	32.1	29.4
4,000-	2.9	3.1	3.9	7.5	5.3	10.8	10.0	7.1	10.0	9.3	9.7
4,500 and over	0.4	0.3	0.6	1.4	0.8	2.0	1.7	1.2	1.8	1.8	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 1,500g (per cent)	1.1	1.4	1.2	1.7	2.4	0.9	0.9	1.1	1.0	1.6	1.0
Under 2,500g (per cent)	10.0	10.5	9.8	7.4	10.9	5.6	4.9	7.0	5.9	5.3	6.1
Mean birthweight, g	3,075	3,082	3,130	3,288	3,162	3,393	3,393	3,272	3,360	3,363	3,352
(95 per cent confidence interval)	(3,063, 3,086)	(3,073, 3,090)	(3,123, 3,137)	(3,279, 3,297)	(3,147, 3,176)	(3,391, 3,394)	(3,387, 3,399)	(3,267, 3,278)	(3,356, 3,365)	(3,317, 3,409)	(3,351, 3,354)
Number of births (n)	7,963	15,477	23,475	18,708	7,137	402,942	32,107	48,720	67,616	676	624,821
Row percentage	1.3	2.5	3.8	3.0	1.1	64.5	5.1	7.8	10.8	0.1	100.0

1 Births of stated birthweight only.  
 2 Chinese, Other Asian, Other Black, Other, and all Mixed groups (see Box One).

Figure 4

Mean birthweight (and 95 per cent confidence intervals) of babies born at 40 weeks gestational age, by ethnic group: live singletons, 2005



per cent in all other groups. The percentage born at 42 weeks and over was highest in the African (6.2 per cent) and Bangladeshi (5.5 per cent) groups, and lowest in the Indian and Pakistani groups (2.7 per cent and 3.0 per cent, respectively). The mean gestational age was highest in the White groups. The gestational age distribution of those without stated ethnicity was very similar to that of the White British.

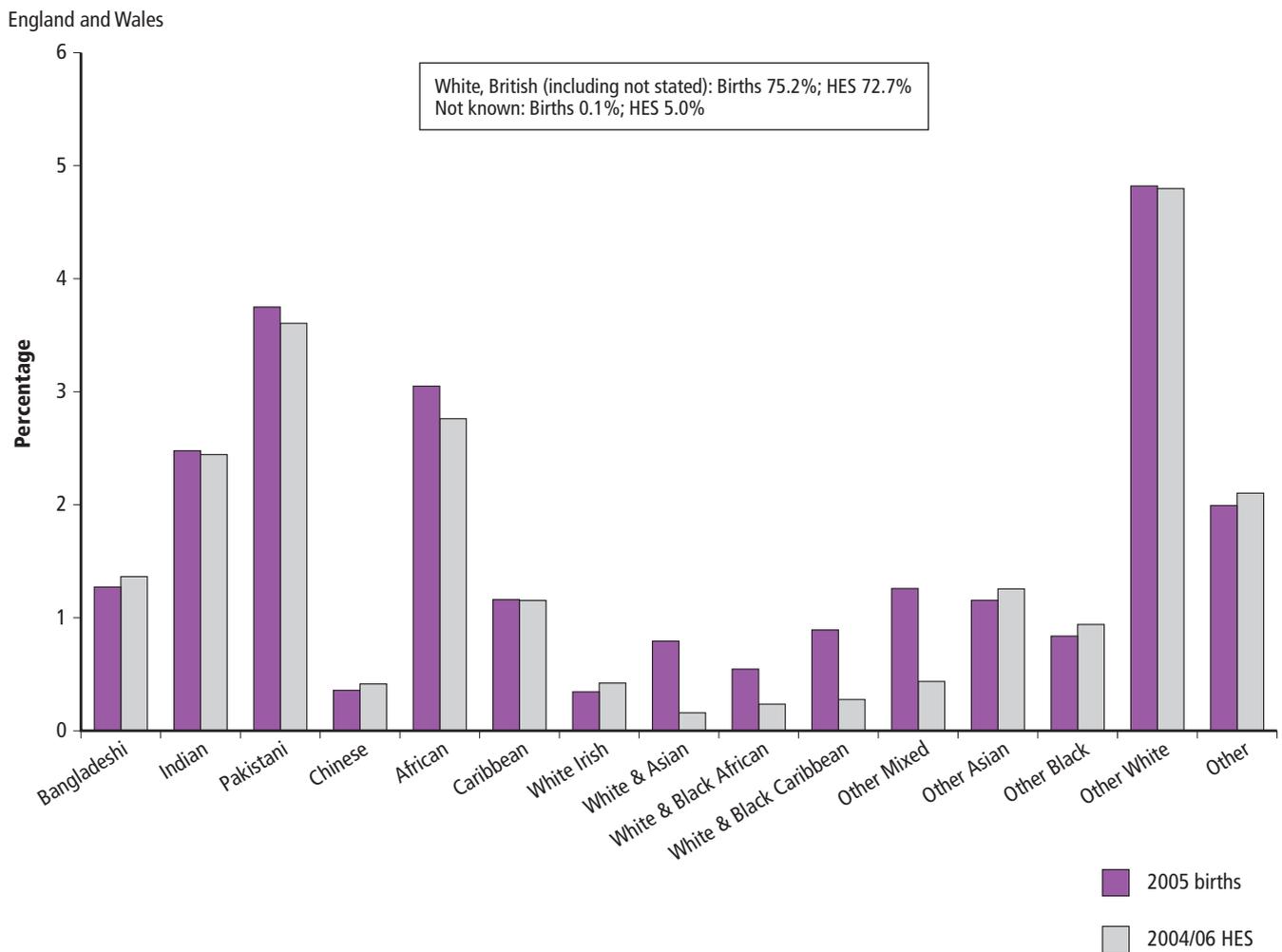
### Birthweight

Figure 3 illustrates the contrasting birthweight distributions of the main ethnic groups analysed in this paper. The distributions vary in terms of shape and location. The Bangladeshi, Indian and Pakistani distributions are located to the left (that is, towards lower birthweights), the White British distribution is located to the right (towards higher birthweights), while the Caribbean and African distributions occupy an intermediate position. There is also less variability in birthweights for the Bangladeshi and Indian groups with more peaked distributions compared to the other groups.

Further birthweight statistics are given in Table 5. The percentage of babies born weighing under 2,500g was much higher in the Caribbean and all three Asian groups compared to the White groups. It ranged from 5.6 per cent in the White British group to 10.9 per cent in the Caribbean group and between 9.8 per cent and 10.5 per cent in the three Asian groups. In the African group 7.4 per cent were born weighing under 2,500g. There was considerable variation in the percentage of babies weighing under 1,500g at birth, the highest percentage in the Caribbean (2.4 per cent) and African (1.7 per cent) groups, with all other groups in the range 0.9 per cent to 1.4 per cent. There was a 300g difference between the mean birthweight of live singleton babies in the White groups (3,393g) and those in the Bangladeshi (3,075g) and Indian (3,082g) groups. The birthweight distribution of those with no stated ethnicity was most similar to that of the White British.

Figure 5

Ethnic group distribution: comparing all births and HES deliveries



The differences in birthweight between ethnic groups may be partly accounted for by differences in gestational age. However, as can be seen in Figure 4, there were substantial ethnic group differences in birthweight when one considers only those live singleton births delivered at 40 weeks (the modal gestational age in completed weeks for live singletons). For example, whereas at 40 weeks mean birthweight was 3,212g in the Bangladeshi group in the White British group it was 3,526g.

### C. Assessing quality of NN4B ethnic group information

In the 2005 linked birth registration-NN4B data 64.4 per cent of babies were identified as White British. This compares with 57.8 per cent of deliveries in the Maternity HES data for the period 2004/06. Earlier work suggested (see Methods) that deliveries recorded with ethnic group 'not stated' were White.<sup>32</sup> If the 'not stated' groups in the birth and HES datasets are assumed to be White British, then the percentages White British increase to 75.2 per cent of births and 72.7 per cent of deliveries.

A comparison of the percentage in each of the other ethnic groups, according to the 2005 births data and the HES data for 2004/06, is shown in Figure 5. In each of the Bangladeshi, Indian, Pakistani, Chinese, African, Caribbean and Other White groups there was a close match between the percentage of births and the percentage of deliveries. The agreement is less good for the mixed ethnic groups each of which contained a slightly higher percentage of births than of deliveries.

## Discussion

This paper presents the first data on ethnic differences in birthweight and gestational age for births in England and Wales as a whole. These new statistics indicate important differences in birthweight and gestational age among ethnic groups. Compared to the White groups, the percentage of low birthweight live singletons was much higher in the Caribbean and all the Asian groups. Live singleton babies in the White groups were on average heavier at birth than those in other ethnic groups with babies from the Indian and Bangladeshi groups weighing about 300g less than those classified as White. Some of the ethnic group differences in birthweight will be explained by ethnic group differences in the gestational age distributions. However, a similar pattern of difference in birthweight was seen even when the analysis was restricted to live singleton babies born at 40 weeks completed gestation. This indicates that these birthweight differences are not purely due to ethnic differences in gestational age. Ethnic differences in preterm birth were evident but less pronounced than for low birthweight. The Caribbean group had a much higher rate of preterm birth than any other ethnic group.

The very substantial numbers available for analysis in this dataset for England and Wales allow us for the first time to start to see finer differences between the ethnic minority groups showing, for example, variation between the Indian, Pakistani and Bangladeshi groups. Low birthweight, while high in all the Asian groups, varied between the three groups as did mean birthweight. The Indian and Pakistani groups had higher percentages of preterm births than the Bangladeshi group.

Our findings are consistent with data from the other, mainly regional or hospital-based, studies conducted in the UK demonstrating shorter gestational ages and lower birthweights among ethnic minority groups in the UK and in particular among Asians.<sup>20, 21, 22, 23, 24, 25, 26, 27</sup> Overall these smaller studies suggest that birthweights among Asian and Black groups in the UK were about 300g less than those of the white British population and that Asian and Black groups were more likely to deliver babies preterm compared with those categorised as White. Nevertheless, many of these studies were small and therefore ethnic groups were often combined (for example Black African and Black Caribbean combined in a single 'Black' category) with the result that important ethnic differences in birth outcomes (that can be clearly seen in the complete data for the whole of England and Wales) were obscured.<sup>20,21,24,27</sup>

The statistics presented in this paper are derived from all births in England and Wales, not a select geographical, or hospital-based, population. The combination of this vast database of almost 650,000 births, combined with the unique ethnic profile of babies born in England and Wales, results in a powerful and invaluable set of new data on ethnic differences in birthweight and gestational age. The sheer size of the dataset makes it possible to provide valid and reliable statistics for smaller ethnic groups rather than grouping together all Asian, and all Black, as has been done, of necessity, in most previous studies.

A key limitation of this analysis is the uncertainty surrounding the recording of ethnic group in the NN4B dataset. The ethnic group information recorded is likely to be a mixture of reports by mother and reports by health care professionals. Although the ethnic group of the baby is requested in NN4B, it is not possible to know whose ethnic group was actually recorded, the mother's or baby's. This is a consideration as the ethnic group of a mother and her baby can differ. A further consideration is that identification to an ethnic group is not always straightforward and individual responses, whether self-reported or not, may vary according to the circumstances and over time. The comparison of the NN4B ethnic group information with Maternity HES data indicates the ethnic group distributions to be in broad agreement. This is generally reassuring as to the quality of the NN4B information. However, differences in the way in which the information from the two datasets was derived may contribute to this comparison. Firstly, NN4B data requests ethnic group of baby, while HES data collects mother's ethnic group. Secondly, NN4B data are for babies born in England and Wales, while the HES data are for deliveries in NHS hospitals in England only. In the case of multiple births (3 per cent of all babies born in England and Wales in 2005) a baby and a delivery differ as a delivery will include more than one baby. Lastly, HES data are missing for over one quarter of births.

This analysis has shown great ethnic diversity in the socio-demographic characteristics of births, providing an important basis from which to start exploring the origin of the observed ethnic group differences in birthweight and gestational age. For example, there are striking differences across ethnic groups in the marital status/registration type distribution of births. In the Bangladeshi, Indian and Pakistani groups nearly all births occurred in marriage in contrast to the Caribbean group where only about a third occurred in marriage. Other important factors to consider include mother's age and the socio-economic position. Births to women aged 35 years and older were more prevalent among the Indian, African, Caribbean and all White groups compared with the Bangladeshi and Pakistani groups. The Caribbean group had the greatest proportion of births to women under the age of 20 years. These differences in the maternal age distribution of births may reflect ethnic differences in fertility rates as well as age distributions. The socio-economic distribution of births differed greatly by ethnic group, including across the three Asian groups. However, interpreting the NS-SEC data is complex. Firstly, occupation is only coded, and therefore available, for 10 per cent of live births (and all stillbirths). Secondly, father's occupation (and therefore the derived NS-SEC) is available only for births in marriage or jointly registered. It is not available for births registered by the mother alone and, as we have seen, the percentage of such sole registrations varied considerably by ethnic group between under 2 per cent in each of the Asian groups to 13 per cent in the African and 20 per cent in the Caribbean groups. As a result the NS-SEC distribution for the three Asian groups is more representative of the ethnic group as a whole than it is for the Caribbean and African groups where a high percentage of births are sole registrations and therefore cannot be assigned an NS-SEC on the basis of the father's occupation. As a consequence, untangling the contribution that NS-SEC makes to the observed ethnic differences in birth outcomes is challenging.

This first investigation of ethnic group differences in birthweight and gestational age has been confined to univariate analyses. As such it is limited in how far it can go in explaining the observed differences in birthweight and gestational age across ethnic groups. Multivariate analyses are planned and will help to determine if the observed ethnic differences in these birth outcomes can be explained in part by other known factors such as maternal age, marital status, socio-economic position and maternal country of birth.

Despite the limitations of the analysis, these data provide new insights into the extent and nature of ethnic differences in birthweight and gestational age. In particular, while the information available on each birth in England and Wales may be more restricted than in Nordic countries, the much greater size of this population, and its considerably greater ethnic diversity, allows for more detailed and statistically precise analyses of differences between ethnic groups and how these change over time.

These new data also start to fill an important gap in the routine birth data for England and Wales. They add to what is already known about health inequalities in birth outcomes and, as such, will inform the delivery of the national health inequalities infant mortality target.<sup>33</sup> Given the regional clustering of certain ethnic populations across the country, they have the potential to contribute to the understanding of local variations in birthweight and infant mortality.

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## Key findings

- Ethnic group was recorded for 89.0 per cent of births in England and Wales in 2005. Of the total, 64.4 per cent were recorded as White British, 8.6 per cent as Asian/Asian British (Bangladeshi 1.3 per cent, Indian 2.5 per cent, Pakistani 3.7 per cent) and 5.0 per cent as Black/Black British (African 3.0 per cent, Caribbean 1.2 per cent)
- The percentage of low birthweight live singleton births in the Caribbean group and all three Asian groups was almost twice that in the White groups; it ranged from 5.6 per cent in the White British group to 10.9 per cent in the Caribbean group
- Live singleton births recorded as Indian or Bangladeshi weighed 300 grams less on average than those recorded as White. A similar birthweight difference was seen among those born at 40 weeks gestational age
- The percentage of live singletons born preterm varied from 9.7 per cent in the Caribbean group to 6.1 per cent in the White British group and 5.9 per cent in the Bangladeshi group
- There was a five-fold difference across ethnic groups in the percentage of babies born to mothers under age 20. It was 1.6 per cent in the Indian group, 7.8 per cent in the White British group and 9.5 per cent in the Caribbean group

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