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Key findings

- The distribution of ethnicities overall and across age groups in the Activity Survey was similar to the general population.
- Among younger patients having anaesthesia care there was a greater proportion of non-White ethnic patients having a perioperative cardiac arrest.
- Black patients account for 6.1% of the overall obstetric population in the Activity Survey but among 28 obstetric cardiac arrests six (28%) were in Black patients.
- For patients who had a perioperative cardiac arrest reported to NAP7, there was no difference in the NAP7 panel judgement about the care provided for White and non-White patients.

What we already know

Ethnicity is multifaceted and defines how a person identifies themselves and can be based on many factors, including where they were born, their religion and their skin colour (ONS 2023a). In the UK, the Equality Act 2010 legally protects people from discrimination in the workplace and in wider society. It is against the law to discriminate against anyone based on their protected characteristics – these include a person's race including colour, nationality, ethnic or national origin. Despite this, there are longstanding inequities in healthcare based on a person's ethnicity (NHS RHO 2023). These have received greater attention in recent years in response to the global Black Lives Matter movement and the impact of the COVID-19 pandemic on Black and Asian communities (ONS 2023b). Reducing healthcare inequities based on race and ethnicity has become a priority issue.

Several studies show higher postoperative mortality in Black patients (Ly 2023). There is little research on ethnicity in the provision of anaesthetic care. Obstetric anaesthesia care has been most studied. Ethnic disparities contribute to adverse pregnancy outcomes, and there is a higher risk of maternal death for Black and Asian women in the UK (MBRRACE-UK 2022, Women and Equalities Committee 2023). Maternal mortality for

Black women is almost four times higher than for White women and significant disparities also exist for Asian and mixed-ethnicity women. A recent study of obstetric anaesthesia care in England identified disparities in the provision of anaesthesia and analgesia for labour and delivery (Bamber 2023). For elective caesarean section, women from Black Caribbean, Black African and Bangladeshi groups had a 30–60% higher incidence of general anaesthesia than White British women. Black Caribbean women also had a 17% higher incidence of receiving general anaesthesia for emergency caesarean section. Compared with White British women, Black African and Black Caribbean women had a 7% and 10% lower incidence of receiving a spinal or epidural in unassisted vaginal deliveries. There are similar findings based on the provision of obstetric care from North American data (Lee 2023). Recently published UK prospective observational data from 2799 children treated in 80 hospitals showed that Black or 'Other' (Appendix 30.1) ethnicity children had a significantly increased risk of complications after appendectomy surgery that was independent of their preoperative illness severity and their socioeconomic status (Sogbodjor 2023). Black children had four-fold increased odds and 'Other' ethnicity children two-fold increased odds of developing a complication after surgery.

There is evidence of disparities associated with ethnicity in care and outcomes for patients treated for cardiac arrest. Out-of-hospital cardiac arrest data shows that when compared with White patients, non-White patients are less likely to have bystander cardiopulmonary resuscitation (CPR) or an initial shockable rhythm, both factors that lead to worse survival (Reinier 2019). UK data show that the highest-risk neighbourhoods for a high incidence of cardiac arrest and low bystander CPR rates have high population density, increased urbanisation, greater proportions of mixed race and non-White ethnic population, a lower proportion of White ethnic population, and a greater level of deprivation (Brown 2019). North American data shows that Black patients with in-hospital cardiac arrest are less likely to survive to discharge than White patients (Chan 2009). Much of this difference was associated with the hospital in which Black patients received care.

During the COVID-19 pandemic, there was considerable interest in the impact of skin colour on the variability of performance of pulse oximetry and the detection of occult hypoxia (ie a pulse oximeter identifying normoxia when blood gases identified hypoxaemia) (Sjoding 2020, Wiles 2022, Norton 2022). Most oximeters are developed with testing predominantly on White individuals and it was established early in development that skin colour impacted oximetry results (Cecil 1988). In general, as hypoxia worsens, increasing levels of melanin lead to increasing inaccuracy and frequent overreading of oxygen saturations (Feiner 2007). In the pandemic, Black patients were reported to have three times the rate of occult hypoxaemia as White patients (Sjoding 2020) and this was considered a potential source of racial bias in triaging patients, although not all studies were consistent with this finding (Wiles 2022). Racial variation in performance of monitoring devices such as oximetry might equally impact in the critically ill in a perioperative setting and is therefore relevant to NAP7.

NAP7 collected data on patient ethnicity in both the Activity Survey ([Chapter 11 Activity Survey](#)) and for each cardiac arrest case report ([Chapter 13 Reported cases summary](#)). Ethnic group should measure how people would define themselves and we cannot be certain if the reported ethnicities are correct. Given the lack of data concerning ethnicity and anaesthesia care in the UK, the NAP7 panel judged it important to share our findings.

We have not undertaken detailed multivariate analyses to look at the impact of other factors (eg comorbidities) on our findings and we did not measure socioeconomic factors. Ethnicity is also discussed in [Chapter 27 Paediatrics](#) and [Chapter 34 Obstetrics](#).

We recognise that the language used to describe ethnicity and its effects is important and we have tried to avoid offending any particular group. Wherever possible we have tried to be specific about the ethnic groups we are referring to and have avoided using terms such as 'BAME' and 'BME'.

What we found

Activity Survey and ethnicity

The main results of the Activity Survey are presented in [Chapter 11 Activity Survey](#) and [Chapter 12 Serious complications survey](#). The ethnicity data by age of all patients in the Activity Survey for NHS sites is shown in Table 30.1. Given the very small number of cases for many ethnic groups we have combined ethnic groups according to the England and Wales 2021 Census definitions (UK Gov 2021; Appendix 30.1). The proportion of patients with White and non-White backgrounds by age is shown in Figure 30.1.

The number of complications reported in the Activity Survey varied with ethnicity but was not statistically significant on univariate analysis (Figure 30.2).

Table 30.1 Reported ethnicity in the NAP7 Activity Survey by age

Ethnicity	Reported comorbidities, n (%)													Total
	< 28 d	28 d to < 1	1–5	6–15	16–18	19–25	26–35	36–45	46–55	56–65	66–75	76–85	> 85	
White	36 (77%)	135 (69%)	801 (77%)	1349 (80%)	383 (80%)	1231 (80%)	3257 (80%)	2206 (80%)	2304 (87%)	2872 (90%)	3187 (94%)	2213 (95%)	726 (96%)	20700 (86%)
Mixed/ multiple ethnic groups	3 (6%)	8 (4%)	40 (4%)	60 (4%)	19 (4%)	43 (3%)	78 (2%)	39 (1%)	30 (1%)	21 (1%)	15 (0%)	8 (0%)	1 (0%)	365 (2%)
Asian/ Asian British	4 (9%)	26 (13%)	107 (10%)	154 (9%)	43 (9%)	168 (11%)	442 (11%)	287 (10%)	152 (6%)	149 (5%)	97 (3%)	54 (2%)	9 (1%)	1692 (7%)
Black/ African/ Caribbean/ Black British	3 (6%)	12 (6%)	41 (4%)	64 (4%)	20 (4%)	62 (4%)	177 (4%)	134 (5%)	111 (4%)	97 (3%)	34 (1%)	23 (1%)	10 (1%)	788 (13%)
Other ethnic group	1 (2%)	4 (2%)	13 (1%)	19 (1%)	0 (0%)	12 (1%)	48 (1%)	39 (1%)	15 (1%)	19 (1%)	11 (0%)	3 (0%)	1 (0%)	185 (1%)
Not known/ stated	0 (0%)	12 (6%)	32 (3%)	50 (3%)	16 (3%)	25 (2%)	81 (2%)	61 (2%)	49 (2%)	42 (1%)	41 (1%)	22 (1%)	11 (1%)	442 (2%)
Total	47 (100%)	197 (100%)	1034 (100%)	1696 (100%)	481 (100%)	1541 (100%)	4083 (100%)	2766 (100%)	2661 (100%)	3200 (100%)	3385 (100%)	2323 (100%)	758 (100%)	24172 (100%)

Figure 30.1 Proportion of patients with White and non-White backgrounds by age. Data are the relative proportion of patients by reported ethnicity within each age group in the NAP7 Activity Survey. White ■, Mixed/multiple ethnic groups ■, Asian/Asian British ■, Black/African/Caribbean/Black British ■, Other ethnic group ■, Not known/stated ■.

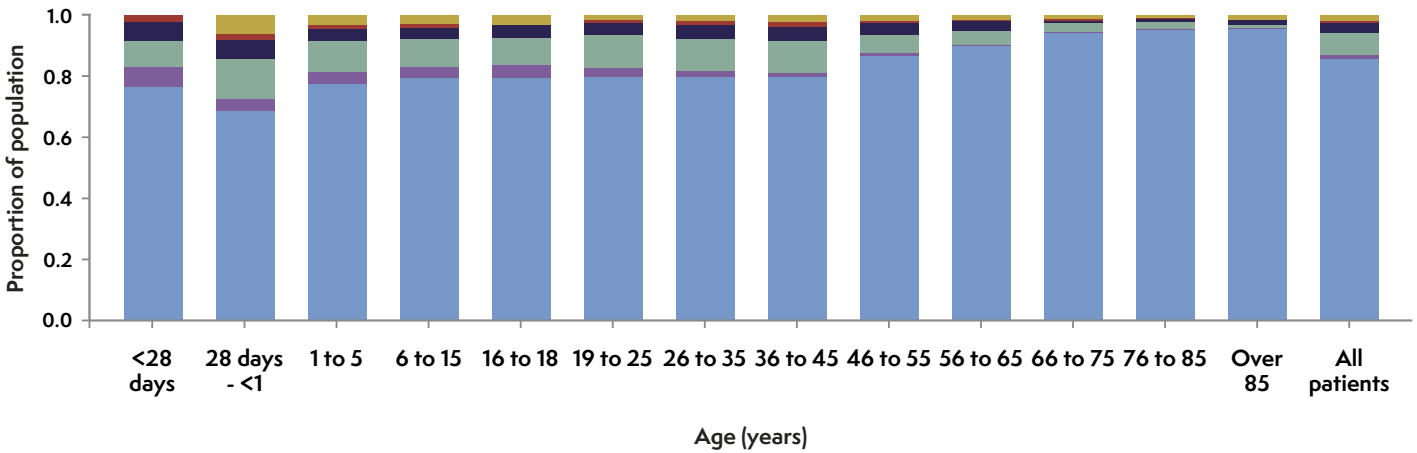
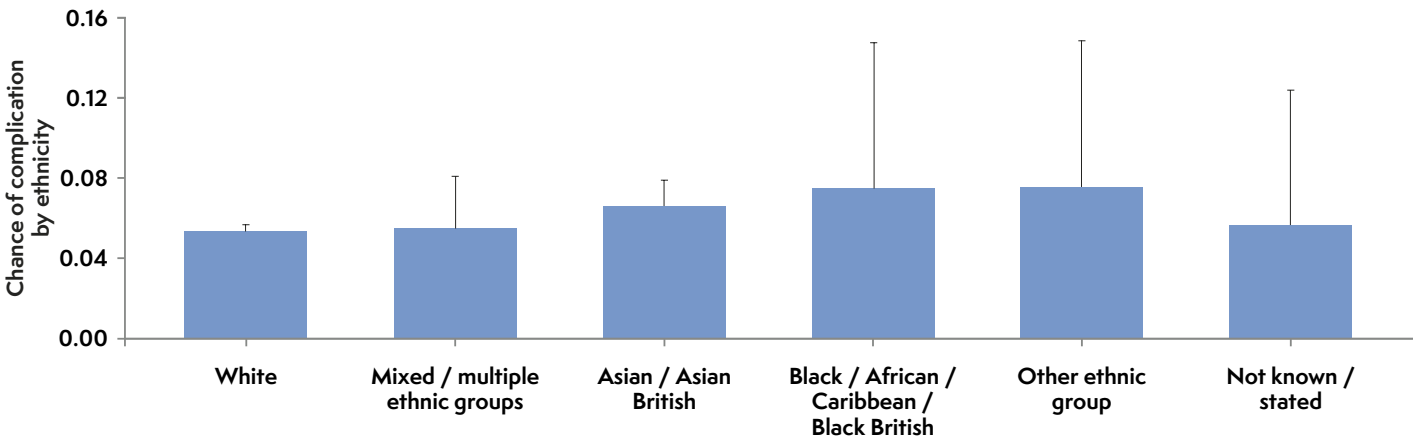


Figure 30.2 Proportion of patients having a complication reported in the Activity Survey by ethnicity (with 95% confidence intervals)



Perioperative cardiac arrests and ethnicity

There were 881 cases of perioperative cardiac arrest reported over the one-year period. The ethnicity of patients who had a cardiac arrest is compared with all patients having anaesthesia care based on the results of the Activity Survey in Table 30.2.

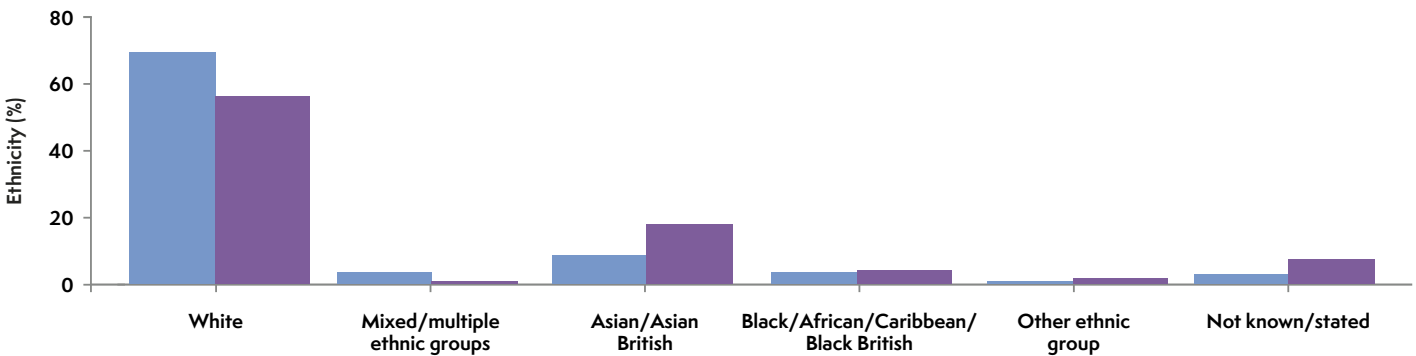
Compared with the 727 White patients who had a cardiac arrest, the 98 non-White patients were younger. There were 104 children (0–18 years) who had a cardiac arrest reported to NAP7. When compared with the 3,429 child cases having anaesthesia care reported in the NAP7 Activity Survey, children having a perioperative cardiac arrest were more often of non-White ethnicity (Figure 30.3).

Children of Asian and Asian British ethnicity accounted for 20% of perioperative cardiac arrests in children but only 6.6% of children in the Activity Survey. This signal was not replicated in the adult population (5.2% of cardiac arrests and 7% of activity). In paediatric cardiac surgery 18% of cardiac arrests occurred in Asian or British Asian children who accounted for 9.7% of surgical activity. Again, this signal was not present in adult cardiac surgery cases (8% of cases and 8% of activity).

Table 30.2 Ethnicity data of NAP7 registry cases and Activity Survey cases

Ethnicity	All cases, n = 881	Activity Survey, n = 24,172
White	727 (83%)	20,700 (86%)
Mixed/multiple ethnic groups	3 (0.3%)	365 (1.5%)
Asian/Asian British	68 (7.7%)	1,692 (7.0%)
Black/African/Caribbean /Black British	22 (2.5%)	788 (3.3%)
Other ethnic group	5 (0.6%)	185 (0.8%)
Not known/stated	56 (6.4%)	442 (1.8%)

Figure 30.3 Ethnicity among children (0-18 years old) in the NAP7 Activity Survey and who had a cardiac arrest reported to NAP7. Activity Survey ■, Case registry ■.



The distribution of ethnicities among obstetric patients who had a cardiac arrest differed from both obstetric patients in the Activity Survey (Table 30.3) and the rest of the cohort of cardiac arrests reported to NAP7 (Table 30.4).

In cardiology patients captured by the NAP7 Activity Survey (those undergoing cardiac catheter laboratory interventions with involvement of an anaesthetist) 88% of patients were White and 3.7% Asian, whereas among the 54 having cardiac arrests 74% (*n* = 40) were White and 17% (*n* = 9) were Asian.

Among patients with airway and respiratory related cardiac arrests 16% of cases reported to NAP7 were in patients of Asian ethnicity compared with 7% of the Activity Survey population, and 24% were of non-White ethnicity compared with 12% of the Activity Survey population.

Perioperative cardiac arrest outcomes were similar in White and non-White ethnic groups (Table 30.5). A more detailed breakdown is provided in Table 30.6.

The NAP7 panel did not identify any specific issues based on patient ethnicity in reviews of the perioperative cardiac arrest cases and there were no differences among patient groups in the numbers being judged to have received good, good and poor or poor care. Overall care was rated as good in 52% of White patients and 57% of non-White patients. Overall care was rated as poor in 2.2% of White patients and 1% of non-White patients. The causes of perioperative cardiac arrest were similar for White and non-White patients.

Discussion

We have reported these findings as there is a need for all healthcare staff to understand ethnicity and healthcare inequalities. We have observed differences in the incidence of perioperative cardiac by ethnicity in children, obstetric patients and patients undergoing cardiology procedures. In all these settings, patients of non-White ethnicity were overrepresented.

The number of cases of cardiac arrest for specific ethnic groups are small and our findings need to be interpreted with caution. In addition, we have relied on anaesthetists to provide ethnicity data on the patients they have cared for. Ethnicity is determined

Table 30.3 Ethnicity of NAP7 obstetric cardiac arrest cases and Activity Survey obstetric cases

Ethnicity	Obstetric cardiac arrest, <i>n</i> = 28	Obstetric Activity Survey, <i>n</i> = 3,176
White	15 (54%)	2,424 (76%)
Mixed/multiple ethnic groups	0 (0%)	55 (1.7%)
Asian/Asian British	4 (14%)	437 (14%)
Black/African/Caribbean/Black British	6 (21%)	166 (5.2%)
Other ethnic group	0 (0%)	42 (1.3%)
Not known/stated	3 (11%)	52 (1.7%)

Table 30.4 Ethnicity of obstetric cardiac arrests reported to NAP7 and all non-obstetric cardiac arrests

Ethnicity	Obstetric cardiac arrest, <i>n</i> = 28	Non-obstetric cardiac arrests, <i>n</i> = 853
Black/African/Caribbean/Black British	6 (21%)	16 (1.9%)
Asian/Asian British	4 (14%)	64 (7.5%)
Other ethnic group	0 (0%)	5 (0.6%)
Mixed/multiple ethnic groups	0 (0%)	3 (0.4%)
White	15 (54%)	712 (83%)
Not known/stated	3 (11%)	53 (6.2%)

Table 30.5 Perioperative cardiac arrest outcomes for patients of White and non-White ethnicity in cases reported to NAP7. ROSC, return of spontaneous circulation.

Ethnicity	White, <i>n</i> = 727	Non-White, <i>n</i> = 98
Survived, ROSC > 20 minutes	539 (74%)	81 (83%)
Alive at discharge	291 (40%)	45 (46%)
Still in hospital	120 (17%)	19 (19%)

Table 30.6 Perioperative cardiac arrest outcomes by ethnicity in cases reported to NAP7. ROSC, return of spontaneous circulation.

Age (years)	Initial event		Hospital outcome		
	Survived (ROSC > 20 min)	Died	Alive	Died	N/A – still admitted
White	539 (75%)	182 (25%)	316 (43%)	291 (40%)	120 (17%)
Mixed/multiple ethnic groups	3 (100%)	0 (0%)	2 (67%)	0 (0%)	1 (33%)
Asian/Asian British	55 (82%)	12 (18%)	30 (44%)	25 (37%)	13 (19%)
Black/African/Caribbean/Black British	20 (91%)	2 (9.1%)	12 (55%)	6 (27%)	4 (18%)
Other ethnic group	3 (60%)	2 (40%)	1 (20%)	3 (60%)	1 (20%)
Not known/stated	45 (80%)	11 (20%)	23 (41%)	23 (41%)	10 (18%)

by how a person identifies themselves and it is uncertain how the reporting anaesthetists obtained these data. Studies suggest that GP and hospital ethnicity data tend to be less reliable for non-White patients (especially for those in 'Mixed', 'Other' groups) and 'Traveller' groups – these biases and inaccuracies have been attributed to data infrastructure challenges, human and institutional challenges (ONS 2023c). The Activity Survey data ([Chapter 12 Serious complications survey](#)), which provide us with an estimate of overall UK anaesthetic activity, show that the ethnicity and age demographic of the anaesthetic population is similar to the general population (see Appendix 30.2 for the relative proportions of the whole population by reported ethnicity within each age group). This includes the finding that non-White ethnic group patients tended to be younger (ONS 2021).

The Activity Survey data provide us with the proportion of patients who have a complication during anaesthesia care by ethnicity (Figure 30.2) and the differences are not statistically significant. We have not undertaken a multivariable analysis to correct for comorbidity and did not collect data on other confounders (eg socioeconomic status).

Three areas were notable for variation in distributions by ethnicity among patients who had a cardiac arrest compared with anaesthetic activity. The nature of our analysis means that we cannot determine whether variations are due to ethnicity itself or due to other factors which might co-vary with ethnicity (eg socioeconomic deprivation, access to healthcare, obesity and other comorbidities).

Children who had a cardiac arrest were disproportionately of Asian and Asian British ethnicity (20% of cardiac arrests, 6.6% of overall activity) and this included children undergoing cardiac surgery (19% vs 9%). A similar observation was noted in patients undergoing interventional cardiology care under the care of an anaesthetist.

In obstetrics, Black patients accounted for 28% of cardiac arrests but only 6.1% of the obstetric population receiving anaesthesia care. This latter observation is consistent with US data that reported an excess of cardiac arrests in obstetric patients of Black ethnicity (Guglielminotti 2021).

We did not note any major issues around recognition of deterioration or hypoxaemia in patients of non-White ethnicity but this would have been difficult to identify with our methodology. It is therefore notable that patients of non-White, especially Asian ethnicity were disproportionately represented in cardiac arrests due to airway and breathing causes (see [Chapter 21 Airway and respiratory](#)).

For perioperative cardiac arrest patients, the NAP7 panel judgement about the quality of care provided was similar for both White and non-White patients.

Our data add a small amount of new information to the very limited information available about perioperative care disparities based on ethnicity. Further detailed studies that include measurement of potential confounders are required to improve our understanding of health inequalities in perioperative care. Where inequalities are found, resolving them should be a priority.

Recommendations

Research recommendations

- Potential inequality in perioperative care is an area that requires further detailed study and the areas highlighted in NAP7, particularly perioperative cardiac arrest in non-White children (especially Asian children) and Black obstetric patients, merit further study.
- Whether racial inequality in monitoring has an impact on recognition of clinical deterioration and occurrence of perioperative cardiac arrests merits further study.

References

- Bamber 2023: Bamber JH, Goldacre R, Lucas DN *et al* A national cohort study to investigate the association between ethnicity and the provision of care in obstetric anaesthesia in England between 2011 and 2021. *Anaesthesia* 2023; 78: 820–9.
- Brown 2019: Brown TP, Booth S, Hawkes CA *et al* Characteristics of neighbourhoods with high incidence of out-of-hospital cardiac arrest and low bystander cardiopulmonary resuscitation rates in England. *Eur Heart J Qual Care Clin Outcomes* 2019; 5: 51–62.
- Cecil 1988: Cecil WT, Thorpe KJ, Fibuch EE, Tuohy GF. A clinical evaluation of the accuracy of the Nellcor N-100 and Ohmeda 3700 pulse oximeters. *J Clin Monit* 1988; 4: 31–6.
- Chan 2009: Chan PS, Nichol G, Krumholz HM *et al* Racial differences in survival after in-hospital cardiac arrest. *JAMA* 2009; 302: 1195–201.
- Feiner 2007: Feiner JR, Severinghaus JW, Bickler PE. Dark skin decreases the accuracy of pulse oximeters at low oxygen saturation: the effects of oximeter probe type and gender. *Anesth Analg* 2007; 105: S18–23.
- Guglielminotti 2021: Guglielminotti J, Wong CA, Friedman AM, Li G. Racial and ethnic disparities in death associated with severe maternal morbidity in the United States: failure to rescue. *Obstet Gynecol* 2021; 137: 791–800.
- Lee 2023: Lee W, Martins MS, George RB, Fernandez A. Racial and ethnic disparities in obstetric anesthesia: a scoping review. *Can J Anaesth* 2023; 70: 1035–46.
- Ly 2023: Ly DP, Blegen MB, Gibbons MM *et al* Inequities in surgical outcomes by race and sex in the United States: retrospective cohort study. *BMJ* 2023; 380: e073290.
- MBRRACE-UK 2022: Knight M, Bunch K, Patel R *et al*, eds. Saving Lives, Improving Mothers' Care Core Report: Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2018–20. Oxford: National Perinatal Epidemiology Unit; 2022. https://www.npeu.ox.ac.uk/assets/downloads/mbrrace-uk/reports/maternal-report-2022/MBRRACE-UK_Maternal_CORE_Report_2022_v10.pdf (accessed 4 June 2023).
- Norton 2022: Norton HL. Variation in pulse oximetry readings: melanin, not ethnicity, is the appropriate variable to use when investigating bias. *Anaesthesia* 2022; 77: 354–55.
- NHS RHO 2023: NHS Race and Health Observatory. <https://www.nhsrho.org> (accessed 4 June 2023).
- ONS 2021: Office for National Statistics. 2021. Ethnic group, England and Wales: Census 2021. <https://www.ons.gov.uk/peoplepopulationandcommunity/culturalidentity/ethnicity/bulletins/ethnicgroupenglandandwales/census2021> (accessed 4 June 2023).
- ONS 2023a: Office for National Statistics. Ethnic group, national identity and religion. Measuring equality: A guide for the collection and classification of ethnic group, national identity and religion data in the UK. 2023. <https://www.ons.gov.uk/methodology/classificationsandstandards/measuringequality/ethnicgroupnationalidentityandreligion> (accessed 4 June 2023).
- ONS 2023b: Office for National Statistics. Updating ethnic and religious contrasts in deaths involving the coronavirus (COVID-19), England: 24 January 2020 to 23 November 2022. Estimates of COVID-19 mortality rates by ethnic group and religion using linked data from the Office for National Statistics' Public Health Data Asset. <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/articles/updatingethniccontrastsindeathsinvolvingthecoronaviruscovid19englandandwales/24january2020to23november2022> (accessed 4 June 2023).
- ONS 2023c: Office for National Statistics. 2023. Understanding consistency of ethnicity data recorded in health-related administrative datasets in England: 2011 to 2021. Comparisons showing differences in the recording of ethnicity data between health administrative data sources and the 2011 Census. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthinequalities/articles/understandingconsistencyofethnicitydatarecordedinhealthrelatedadministrativedatasetsinengland2011to2021/2023-01-16> (accessed 4 June 2023).
- Reinier 2019: Reinier K, Rusinaru C, Chugh SS. Race, ethnicity, and the risk of sudden death. *Trends Cardiovasc Med* 2019; 29: 120–6.
- Sjoding 2020: Sjoding MW, Dickson RP, Iwashyna TJ *et al* racial bias in pulse oximetry measurement. *N Engl J Med* 2020; 383: 2477–8.
- Sogbodor 2023: Sogbodor AL, Razavi C, Williams K *et al* Ethnicity and Risk of Complications after Emergency Surgery for Paediatric Appendicitis: Observational Cohort Study of 2799 Children in the UK National Health Service. *Anaesthesia* 2023; in press.
- UK Gov 2021: List of ethnic groups. <https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups> (accessed 4 June 2023).
- Wiles 2022: Wiles MD, El-Nayal A, Elton A *et al* The effect of patient ethnicity on the accuracy of peripheral pulse oximetry in patients with COVID-19 pneumonitis: a single-centre, retrospective analysis. *Anaesthesia* 2022; 77: 143–52.
- Women and Equalities Committee 2023: Black Maternal Health. Third Report of Session 2022–23: Report, together with formal minutes relating to the report. HC 94. London: House of Commons; 2023. <https://publications.parliament.uk/pa/cm5803/cmselect/cmwomeq/94/report.html> (accessed 4 June 2023).

Appendix 30.1 Ethnic groups

Information from: List of ethnic groups. <https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups> (accessed 4 June 2023).

Asian or Asian British:

- Indian.
- Pakistani.
- Bangladeshi.
- Chinese.
- Any other Asian background.

Black, Black British, Caribbean or African:

- Caribbean.
- African.
- Any other Black, Black British, or Caribbean background.

Mixed or multiple ethnic groups:

- White and Black Caribbean.
- White and Black African.
- White and Asian.
- Any other mixed or multiple ethnic background.

White:

- English, Welsh, Scottish, Northern Irish or British.
- Irish.
- Gypsy or Irish Traveller.
- Roma.
- Any other White background.

Other ethnic group:

- Arab.
- Any other ethnic group.

Appendix 30.2 Relative proportions of the population by reported ethnicity within each age group, based on UK Census 2021 for England and Wales

<https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/demographics/age-groups/latest>
(accessed 8 July 2023)

Appendix 30.2 Relative proportions of the population by reported ethnicity within each age group, based on UK Census 2021 for England and Wales. White ■, Mixed ■, Asian ■, Black ■, Other ■.

