



Department
of Health &
Social Care

Sex ratios at Birth in Great Britain, 2013-17

A report on sex ratios at birth in Great Britain

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Executive Summary

Aim

This report provides statistics on the analysis of male to female birth ratios in Great Britain using the most recent data for the period 2013-17.

The purpose of these Official Statistics is to update and inform the public and Parliament on whether or not there is evidence for sex selective abortions happening at scale within specific communities in Great Britain. Data are sourced from birth registration data in England, Wales and Scotland. This analysis does not use data on abortions, as sex of the fetus at termination is not available, however some indicative data is presented on abortions in Appendix A.

This analysis uses a generally accepted birth sex ratio upper limit of 107 (see paragraph 1.16) i.e. we are looking for birth ratios with significantly more than 107 boys born for every 100 girls within a community. Where the ratio of boys to girls for a particular country or ethnicity is significantly greater than 107 (after adjusting for multiple testing and the order of birth of the child) this may indicate that people in this community have been involved in sex selective abortions. A lower sex birth ratio limit is not used, as we are not investigating if there are many more girls born than boys born in Great Britain.

Key findings from 2013 to 2017 data

This report presents statistics on the analysis of male to female birth ratios in Great Britain for the period 2013 to 2017:

- This analysis of birth sex ratios finds no evidence for sex selective abortions occurring in Great Britain over the period 2013 to 2017.
- There were 3.7 million births registered in Great Britain in this period with a ratio of boys to girls of 105.4, which is below the accepted upper limit of 107. (See Table 1; Results)
- Latest analyses by **country of origin of mother** for overall birth ratios, and by birth order, shows no ratio was found to be significantly higher than a boy to girl birth ratio of 107. (See Table 2 in accompanying spreadsheets).
- Analysis of sex birth ratios by **ethnicity of the child** for both overall birth ratio, and birth ratios by birth order, found no ratio to be significantly higher than 107. (See Table 3 in accompanying spreadsheets).

1. Background

- 1.1 The Department of Health and Social Care made a [commitment to publish sex birth ratio](#) analysis annually, in line with the recommendation of the Council of Europe Parliamentary Assembly that member states should collect the sex ratio at birth, monitor its development and take prompt action to tackle possible imbalances' and 'encourage research on sex ratios at birth among specific communities'. If more boys than girls are being born than is expected, this could imply some pregnancies are being terminated with an abortion due to the sex of the fetus. This process is known as a sex selective abortion. However, a number of factors can influence the sex of a child including maternal and paternal age, coital rates, number of children and sex of previous children.

The legal context

- 1.2 Concern has been raised in some countries about the occurrence of sex selective abortions^{1, 2}.
- 1.3 Sex is not itself a lawful ground for abortion in England, Wales and Scotland (Abortion Act 1967). Department of Health and Social Care guidance, in May 2014, states that abortion on the grounds of sex alone is illegal.
- 1.4 However, under the Abortion Act, it is lawful to abort a fetus where two registered medical practitioners (RMPs) (i.e. doctors) are of the opinion, formed in good faith, "that there is a substantial risk that if the child were born it would suffer from such physical or mental abnormalities as to be seriously handicapped." There are some serious conditions which are known to be related to a person's sex.
- 1.5 In early 2015 the Serious Crime Act contained a requirement that the Secretary of State should arrange for an assessment to be made, within six months of Royal Assent, of the evidence for sex-related abortions occurring. A report was subsequently laid before Parliament in August 2015, which contained the [assessment of evidence of terminations of pregnancy being undertaken on the grounds of the sex of the fetus](#), and a statement and explanation of why the Secretary of State for Health considered a formal plan under sub-section (3) (a) of the clause was not required.

¹ Hesketh, T., & Xing, Z. W. (2006). Abnormal sex ratios in human populations: causes and consequences. *Proceedings of the National Academy of Sciences*, 103(36), 13271-13275.

² Chahnazarian, A. (1988). Determinants of the sex ratio at birth: Review of recent literature. *Social biology*, 35(3-4), 214-235.

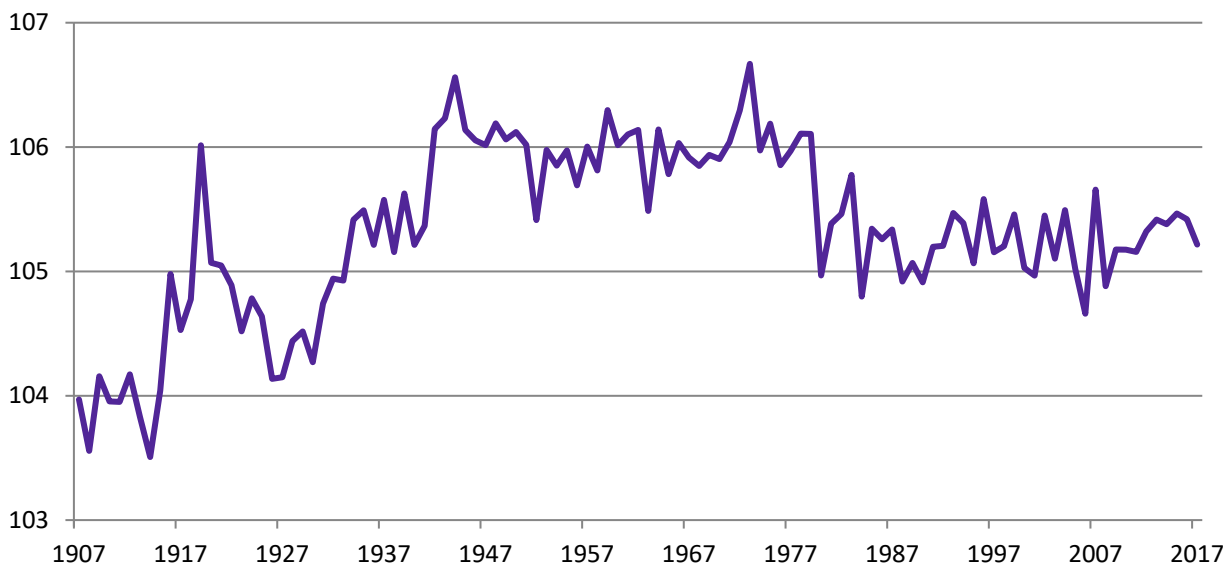
Identifying the Sex of a Fetus with Technology

- 1.6 Antenatal sexing of the fetus is not a routine part of antenatal care. Scans are undertaken to support the clinical care of the mother and unborn baby such as: the number of foetuses, the age of the fetus, and screening for fetal anomalies. It is usually only possible to identify the sex of a baby at the second ultrasound scan, which takes place at around 18-21 weeks gestation. Disclosing the sex of a fetus is a local decision, adhering to local policies, and should be based on clinical judgment about the certainty of the assessment and the individual circumstances of each case.
- 1.7 Ultrasound Imaging can be used to accurately determine the sex of a fetus where gestational age is over 12 weeks and certain other factors are present. However, where these factors are not present, and gestation is less than 11 weeks and 4 days, it is not possible to accurately identify the sex of a fetus using ultrasound imaging.
- 1.8 The introduction of new and emerging technologies (such as Non-Invasive Prenatal Testing which is currently available in private clinics and on the internet) provide further context from which the monitoring of birth ratios needs to be considered. Further details on NIPT are available in the [August 2015 report on the evidence for sex selective abortions](#). Plans are underway to make the NIPT test available on the NHS. The UK National Screening Committee made a recommendation to use NIPT, a contingent test in the NHS Fetal Anomaly Screening Programme only for Trisomy 13, 18 and 20 and not for any other genetic marker, including sex. (A trisomy is a disorder characterised by an additional chromosome).
- 1.9 The majority of abortions take place in the first trimester of pregnancy (91% up to 12 weeks; 58% up to 7 weeks gestation), whilst NHS antenatal sexing of a fetus typically takes place much later in the pregnancy, usually between 18-21 weeks gestation. The majority of abortions are therefore taking place nearly two months before most women could have been told the sex of the fetus in the antenatal screening pathway. It is acknowledged though that some people may seek information on sex using other methods such as tests available on the internet or in private clinics. However, data is not available on the extent to which other methods of sex determination may be being used. See Appendix A for further information on abortions by gestation and ethnicity.

Trends in Birth Sex Ratios

1.10 Within large populations, we can expect the birth ratio to vary, due to external factors³ including wars and economic crises. Figure 1 shows the fluctuation within England, Wales and Scotland since 1907. The chart shows that the birth ratio has never been above 107 over that period. The minimum ratio was 103.5 in 1914 and the maximum ratio was 106.7 in 1973. The male to female birth ratio has been consistently around 105 since 1980.

Figure 1: Live male births per 100 live female births, England, Wales and Scotland



Source: Office for National Statistics and National Records of Scotland.

1.11 The issue of sex ratios of new born babies is the subject of numerous academic articles, where there is a range of evidence. A 2011 World Health Organisation report stated a biologically normal sex ratio at birth ranges from 102 to 106 male births, per 100 female births⁴ Although other studies have stated that 105 or lower is a more “normal” ratio of boys to girls⁵. Evidence suggests that a number of factors can influence the sex of a child, including maternal and paternal age, coital

³ Helle, S., Helama, S., & Lertola, K. (2009). Evolutionary ecology of human birth sex ratio under the compound influence of climate change, famine, economic crises and wars. *Journal of Animal Ecology*, 78(6), 1226-1233.

⁴ World Health Organization. (2011). Preventing gender-biased sex selection: an interagency statement-OHCHR, UNFPA, UNICEF, UN Women and WHO.

⁵ Hesketh, T., & Xing, Z. W. (2006). Abnormal sex ratios in human populations: causes and consequences. *Proceedings of the National Academy of Sciences*, 103(36), 13271-13275.

rates, number of children and sex of previous children⁶. It is important to note that the interaction between factors that could influence the sex of the child has not been controlled for, or taken into account in this analysis.

- 1.12 For this publication a birth ratio upper limit of 107 boys to 100 girls is used as a threshold for comparisons. This is based on a review of available literature^{5, 7} advice from academic experts and on examination of data on birth ratios in more developed countries.
- 1.13 Birth ratios for selected countries based on UN data for 2010-2015 are shown in Figure 4 of the results section and are compared with Great Britain data for 2013-2017 based on the mother's country of birth.

Calculations and statistical tests used

- 1.14 The birth ratios were calculated for each ethnicity and country of birth by dividing the number of male births by the number of female births and multiplying this value up by 100 to achieve a ratio of the number of boys born per 100 girls. Ratios are examined for all births and by birth order (so whether a child is first born, second born, third born or more).
- 1.15 The aim of this analysis is to investigate if any of the birth ratios considered are statistically significantly higher than 107, i.e. if any group or community has statistically significantly more than 107 boys born for every 100 girls.
- 1.16 Birth ratios above the 107 threshold do occur, but could be due to chance, rather than due to a real difference. Statistical significance testing is carried out to determine whether any differences observed between the birth ratios and the 107 threshold are likely to be "real" or whether they are consistent with chance fluctuations.
- 1.17 This publication uses a number of techniques to test whether ratios over 107 are statistically significant. The first stage of the process is to calculate the probability ('p values') that the differences observed could arise by chance as opposed to there being a real difference. We have used the common acceptable level of 5% significance level in this analysis, which means that a statistically significant result

⁶ Jacobsen, R., Møller, H., & Mouritsen, A. (1999). Natural variation in the human sex ratio. *Human reproduction*, 14(12), 3120-3125.

⁷ Chahnazarian, A. (1988). Determinants of the sex ratio at birth: Review of recent literature. *Social biology*, 35(3-4), 214-235.

is found for any p values less than 0.05 (5%) – in other words, such a result would occur rarely by chance alone.

- 1.18 However, this methodology presents some difficulties when there are many tests. For example, the ‘country of mother’s origin’ analysis involved testing the significance level for 171 countries and five birth orders, equivalent to 855 statistical tests. (815 tests were carried out as 40 countries in the unknown birth order category had no data available). With so many tests, it would be expected that some results appear statistically significant due to chance alone. For example, at the 5% significance level used here, you would expect on average, even when there was no real difference from a ratio of 107, that 1 in 20 results would be found to be significant. When applying this across these country of birth tests there is a high chance of a “false positive” result, and inferring evidence about sex selective abortions incorrectly.
- 1.19 In order to address this issue, known as the ‘multiple testing problem’, a statistical technique called the Benjamini-Hochberg procedure was applied using the p values already calculated as part of our method to assess statistical significance. In addition to this procedure, the Storey technique is also used to estimate false positive discovery rate as a form of sensitivity analysis. The application of these techniques is discussed in detail in the technical guidance.

Limitations of the analysis

- 1.20 Using birth registration data to calculate birth ratios is an indirect method for investigating evidence for sex selective abortions.
- 1.21 The relatively small number of births within many of the groups in this analysis are such that large differences between birth ratios and the expected upper limit of 107 would need to be observed for the ratio to be identified as statistically significantly higher than the expected upper limit of 107. Therefore, evidence would only be identified through this means if sex selection were taking place on a significant scale.
- 1.22 Any differences in the birth ratios seen could be due to a number of factors, not just sex selective abortions. There is evidence that paternal and maternal age, coital rates and the number and sex of previous children can influence the sex of a child.

2. Results

Coverage of this analysis

2.1 This report presents statistics on the analysis of male to female birth ratios in Great Britain for the period 2013-2017.

2.2 Birth ratios are examined for:

- All mothers for 2013-2017 for Great Britain
- The country of birth of the mother of the baby born for 2013-2017 for Great Britain
- Ethnicity of child for 2013-2017 for England and Wales

2.3 In each case, the analysis looks at:

- Overall sex birth ratios
- Birth ratios by birth order (that is for first born children, second born children etc).

All Births

2.4 In the period 2013-2017, there were 3.7 million live births in Great Britain and an overall ratio of boys to girls of 105.4 which is below the upper limit of 107. (Analysis covered countries where the total number of births for 2013-17 was 100 or more to ensure adequate sample sizes, so excluding some countries).

2.5 The sex birth ratio across the different birth orders did not vary significantly (see Table 1 below). The sex birth ratio among the 1.5 million first born children was 105.6, among the 1.3 million second born children was 105.3 and among the third born or more children was 105.2.

Table 1: Sex birth ratios by birth order, Great Britain, 2013-2017

Birth order	Number of births	Birth ratio
All births	3,739,474	105.4
1st born	1,501,068	105.6
2nd born	1,327,233	105.3
3rd born or more	895,488	105.2
Unknown	15,685	105.4

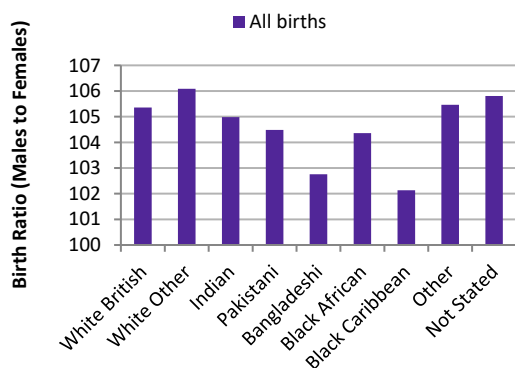
(Unknown birth order represents those babies whose birth order was unknown).

Births by Ethnicity of Child

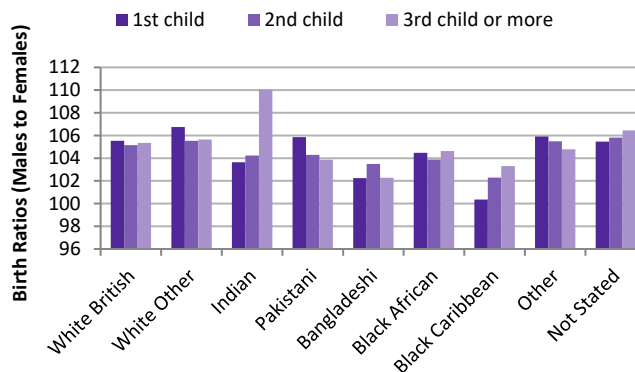
- 2.6 Data on ethnicity of the child is not available for Scotland and therefore this component of the analysis is limited to England and Wales.
- 2.7 There were 3.5 million births included in the analysis of birth ratios by ethnicity of the child and birth order, for England and Wales. The majority of births in England and Wales were for children in the White British ethnic group (62%).
- 2.8 An analysis of birth sex ratios by the ethnicity of the child for England and Wales both for overall birth ratio and by birth order, showed no ratio to be significantly higher than 107. (See Table 3 in accompanying spreadsheets).
- 2.9 Although some birth ratios were higher than 107, such as third born or later babies of Indian ethnicity, following the statistical testing, no ethnicity and birth order were found to be statistically significant.

Figure 2: Birth ratios by ethnicity: England and Wales, 2013-2017

a) All births



b) 1st, 2nd and 3rd child or more



2.10 When interpreting the birth ratios (Table 3), it is important to keep in mind that this analysis covers 9 ethnic groups for 5 categories of birth order (all, first born, second born, third born or later, and unknown birth order). We would therefore expect to see high birth ratios for some groups simply as a result of random variation and small sample sizes.

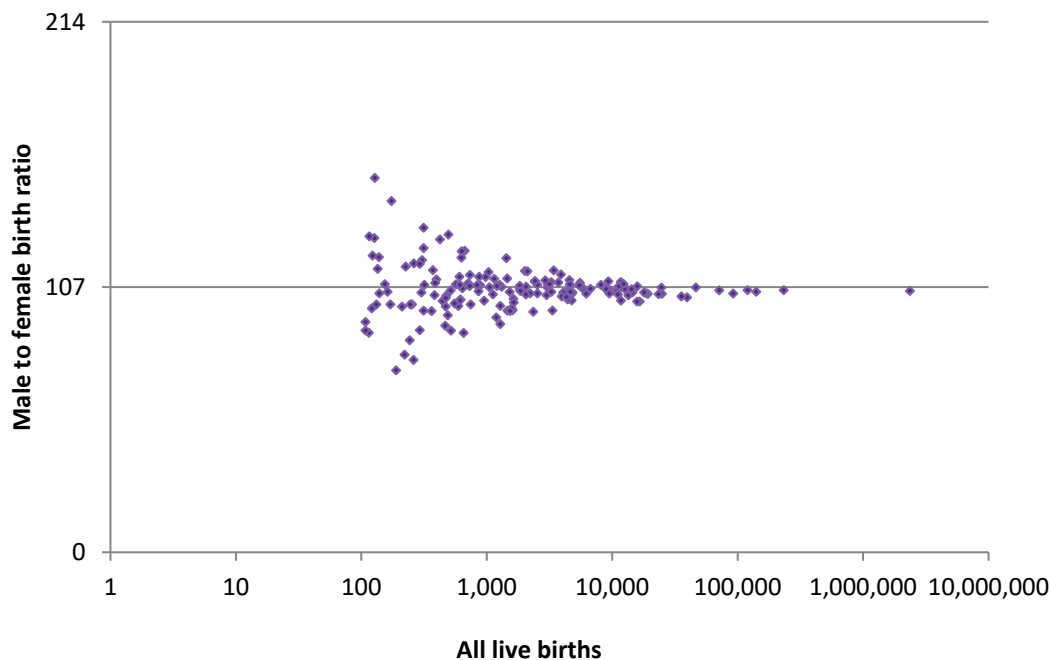
Births by mother's country of origin

2.11 The majority of births in Great Britain were to mothers born in England, Wales and Scotland (73%). This analysis focuses on the mother's country of origin for the 27% (representing 1,011,209 births) of babies born to mothers from countries outside of England, Wales or Scotland.

2.12 The analysis of birth sex ratios by the mother's country of origin for Great Britain for the overall birth sex ratio and by birth order, showed no ratio to be significantly higher than 107. Table 2 (in accompanying spreadsheets) shows the sex birth ratios for all of the countries included in the analysis. To ensure adequate sample size, countries with a total of 100 or more births were included in the analysis.

2.13 When interpreting the birth ratios in Table 2, it is important to keep in mind that this analysis covers 171 country of origin groups for 5 categories of birth order (all, 1st born, 2nd born, 3rd born or later, and unknown birth order). We would therefore expect to see high birth sex ratios for some groups simply as a result of random variation and small sample sizes. To illustrate, during 2013-2017 for women born in Eswatini (ex- Swaziland), there were 60 babies who were the first born with a sex birth ratio of 172.7 whilst 62 babies were the second born with a sex birth ratio of 82.4. This wide variation exists, particularly where sample sizes are smaller (see Figure 3 below).

Figure 3: Plot of Male to Female birth ratio by country of origin of the mother: All births, Great Britain, 2013-2017



2.14 The greater variation in countries with lower numbers of live births is shown in Figure 3 in relation to the unadjusted birth ratios, and compared to the 107 boys to 100 girls ratio used as the threshold for comparisons. Over half the countries (57 per cent) are below the 107 ratio threshold, with most of those that are higher having low sample sizes, for example Guatemala and Antigua & Barbuda where the ratio is 120 and 127 boys to 100 girls respectively. Similar variation is seen below the 107 line, with El Salvador where there were 89 boys born for every 100 girls. As noted above, when testing using the Benjamini-Hochberg technique, there were no countries found to be significantly higher than the 107 ratio.

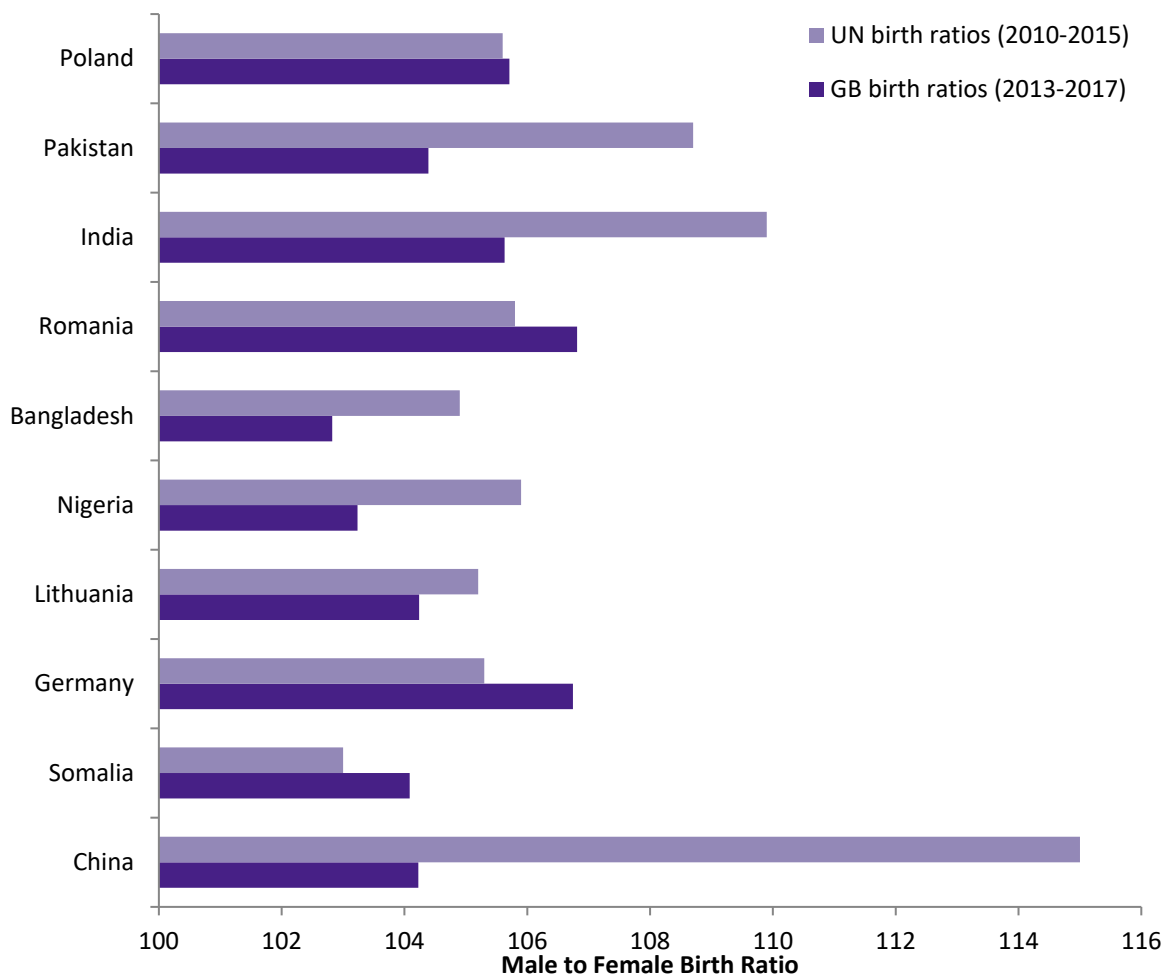
Comparison of GB country of birth with international data

2.15 Figure 4 shows a comparison between birth sex ratios in Great Britain by mother's country of birth compared to UN birth ratios within those countries. This is presented for the Top 10 countries for live births in Great Britain, excluding those mothers that were born in Great Britain. Although the selection of years used in this chart is different, this data still provides a useful basis for comparison.

2.16 The comparison of birth sex ratios in Great Britain with UN sex ratios for the countries shown in figure 4, shows that where the mother's country of origin is European (Poland, Romania, Germany and Lithuania) the birth ratio within Britain is similar to the birth ratio within the country of origin. Birth ratios for these countries are around 104 to 106 boys to 100 girls.

2.17 Figure 4 also shows that for countries where the mother’s country of origin is outside Europe, the birth ratios within Great Britain are generally lower than the ratio in the country of origin. This is particularly marked for China, where the UN data shows a birth ratio of 115 boys born per 100 girls within China, compared to a ratio of 104 for births in Great Britain by Chinese-born mothers. Similarly, for Pakistan the birth ratio is 109 in the country of origin compared to 104 in Great Britain and in India the ratio is 110 compared to 106 in Great Britain. However, Somalia does not follow this trend, showing male to female birth ratio for Somalia-born mothers in GB slightly higher at 104 when compared to 103 for births to women living in Somalia.

Figure 4: Live male births per 100 live female births, comparison of Great Britain against UN data for Top 10 births registered by mother's country of origin, various years



Abortions by Gestation and Ethnicity

2.18 To supplement the sex birth ratio analysis, further analysis has been done to investigate the relationship between gestation (and thus when sex can be identified) and abortion rates, by ethnic group of the woman. See Annex A.

Conclusion

2.19 Following extensive statistical testing, this analysis of sex birth ratios finds **no evidence** for sex selective abortions occurring in Great Britain over the period 2013-2017.

Appendix A: Abortions by Gestation and Ethnicity

Data on the sex of the fetus at an abortion is not available, which is why birth registrations data are used in this analysis. We can however analyse abortions data by ethnicity of the mother and gestation to provide wider context around the birth sex ratio analysis. Any evidence for unusual sex birth ratios might imply sex selective abortions were taking place in the population.

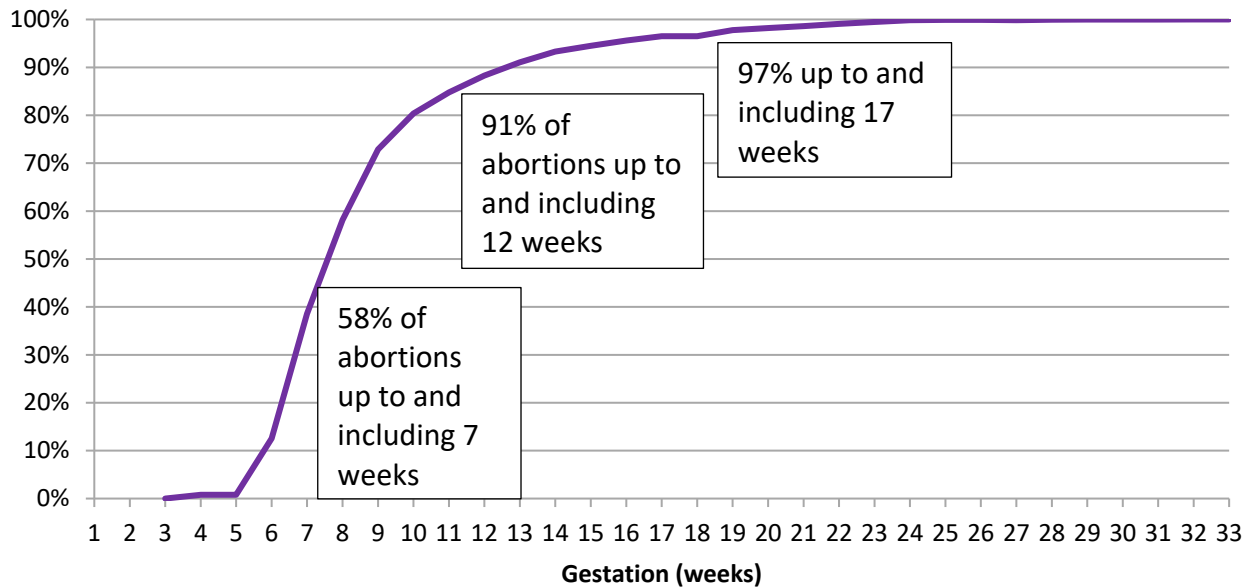
This section adds some additional context on abortions by gestation and ethnicity from the annual abortion statistics publication: [Abortion statistics for England and Wales: 2018 - GOV.UK](#)

This covers residents of England and Wales in 2018.

All abortions, by gestation

The total number of abortions for residents of England and Wales in 2018 was 200,608. This was an increase of 4% from 2017, and the highest number recorded. The majority of abortions took place in the early stages of pregnancy: 91% up to and including 12 weeks; 58% up to and including 7 weeks gestation), whilst NHS antenatal sexing of a fetus typically takes place much later in the pregnancy at 18-21 weeks gestation. The majority of abortions are therefore taking place nearly two months before most women could have been told the sex of the fetus in the antenatal screening pathway. It is acknowledged though that some people may seek information on sex using other methods such as tests available on the internet or in private clinics. However, data is not available on the extent to which other methods of sex determination may be being used.

Chart 1: Proportion of abortions by gestation week, England and Wales, 2018

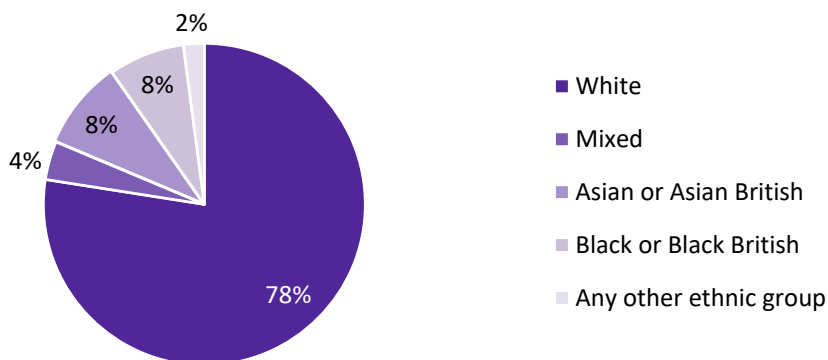


All abortions by ethnic group

Ethnicity was recorded on 97% of the forms received for 2018. Of all ethnicities recorded, 78% were reported as White, 8% as Asian or Asian British and 8% as Black or Black British.

Chart 2: Abortion statistics split by ethnic group, England and Wales, 2018

2018 Abortion Statistics - Abortions by Ethnicity, England & Wales



All abortions, by gestation and ethnic group

There are variations between the gestation period of an abortion when comparing different ethnicities. The proportion of abortions before 17 weeks range from 95 to 97 per cent depending on the ethnic group of the woman. For abortions carried out before 12 weeks the range between different ethnic groups is from 86 to 91 per cent, with a wider range for abortions carried out before 7 weeks from 36 to 45 per cent depending on the ethnic group of the woman.

Table 1: Abortions by gestation period and ethnic group, residents of England and Wales, 2018

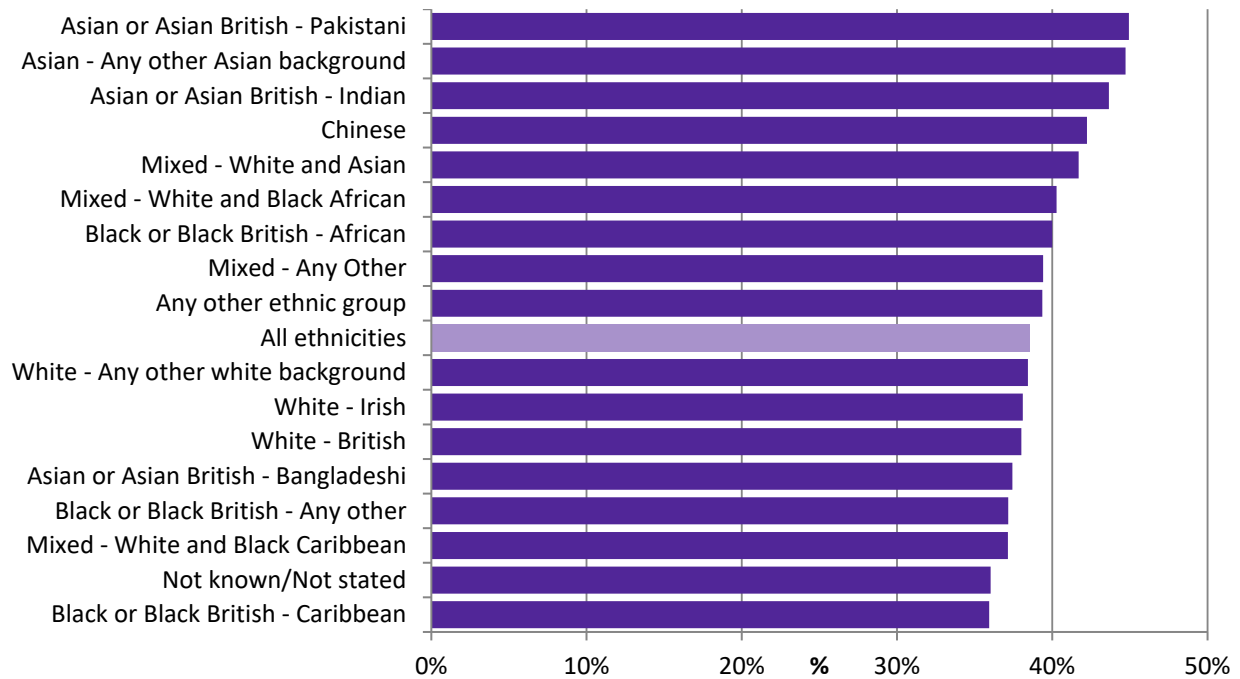
Ethnic group	Total Number of abortions	Less than 7 weeks gestation	7-11 weeks gestation	12-16 weeks gestation	17-21 weeks gestation	22 weeks and over gestation
All ethnicities	200,608	39%	50%	8%	3%	1%
White- British	132,628	38%	50%	8%	2%	1%
White-Irish	1,286	38%	48%	10%	3%	1%
White-Other	18,540	38%	49%	9%	3%	1%
Mixed-White and Black Caribbean	3,231	37%	50%	9%	3%	1%
Mixed-White and Asian	1,060	42%	49%	7%	2%	1%
Mixed-White and Black African	1,080	40%	46%	10%	3%	1%
Mixed-Other	2,299	39%	49%	8%	3%	1%
Asian-Indian	6,102	44%	46%	6%	3%	1%
Asian-Pakistani	4,431	45%	43%	7%	4%	1%
Asian-Bangladeshi	1,651	37%	51%	7%	3%	1%
Asian-Other	4,300	45%	46%	6%	2%	1%
Black or Black British-African	9,097	40%	49%	8%	3%	1%
Black or Black British Caribbean	4,191	36%	51%	9%	3%	1%

Ethnic group	Total Number of abortions	Less than 7 weeks gestation	7-11 weeks gestation	12-16 weeks gestation	17-21 weeks gestation	22 weeks and over gestation
Black or Black British-Other	1,402	37%	50%	9%	3%	1%
Chinese	1,423	42%	48%	6%	2%	1%
Any other ethnic group	2,846	39%	50%	8%	3%	1%
Not known/not stated	5,041	36%	53%	9%	2%	1%

For abortions under 7 weeks, 'Asian or Asian British – Pakistani' women and any other Asian ethnicity apart from Indian and Bangladeshi have the highest proportion (45 per cent), with Asian or Asian British -Indian (44 per cent) and Chinese and Mixed-White and Asian (42 per cent) also having a high proportion of women having abortions under 7 weeks.

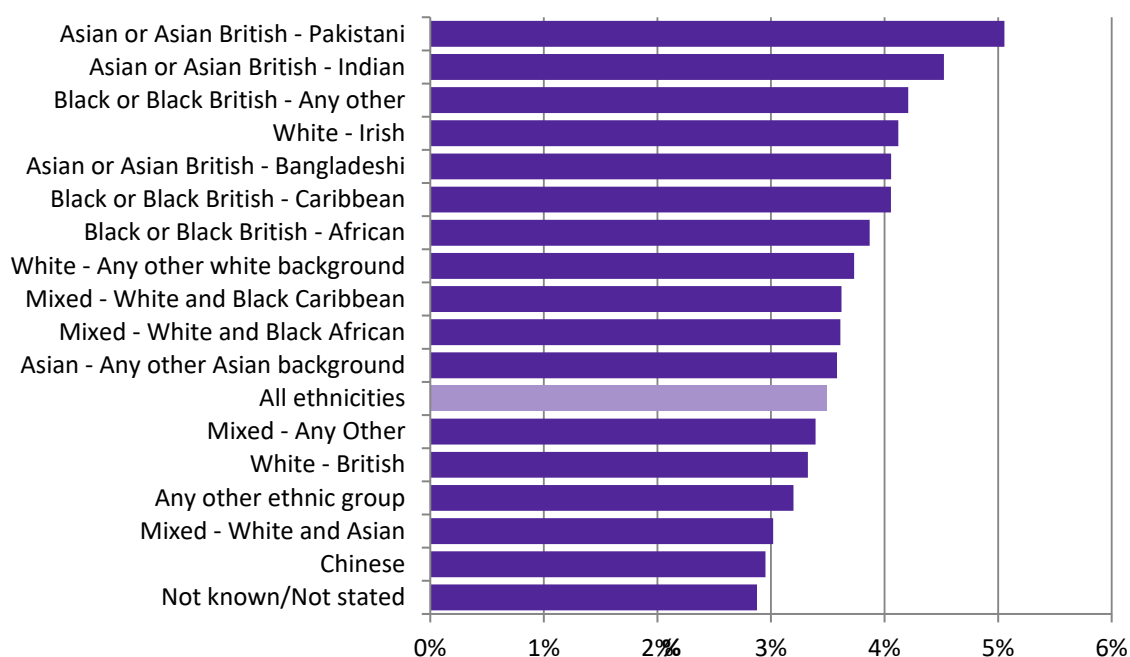
Ethnic groups with the lowest proportion having an abortion under 7 weeks gestation were: 'Black or Black British – Caribbean' and women whose ethnicity is either unknown or not stated (both 36 per cent) and Mixed-White and Black Caribbean, Asian or Asian British-Bangladeshi and Black or Black British-any other (37 per cent).

Chart 3: Abortions by gestation and ethnic group: proportion under 7 weeks gestation



Abortions over 17 weeks account for 3 per cent of all abortions. There is a variation across ethnicities for this gestation with women of 'Asian or Asian British Pakistani ethnicity having over 5 per cent of abortions over 17 weeks as a proportion of the total abortions for this ethnicity. See chart 4 below.

Chart 4: Abortions by gestation and ethnic group: proportion over 17 weeks gestation



Repeat abortions and ethnic group

Of all women who had an abortion in 2018, 39 per cent had already had one or more previous abortions. Again, amongst women who have had a previous abortion, there was variation across ethnic groups.

47% of Black or Black British women having abortions in 2018 had previously had at least one abortion, compared with 33% of Chinese or other ethnic group.

Table 2: Percentage of women who had one, two and three or more previous abortions, by ethnic group, England and Wales, 2018

Ethnic group	No previous abortions	1 previous abortion	2 previous abortions	3 or more previous abortions	Total
All ethnicities	61%	28%	8%	3%	100%
White	61%	28%	8%	3%	100%
Mixed	54%	30%	11%	5%	100%
Asian	65%	25%	7%	2%	100%

Sex Ratios at Birth in Great Britain, 2013-2017

Ethnic group	No previous abortions	1 previous abortion	2 previous abortions	3 or more previous abortions	Total
Black	53%	31%	11%	5%	100%
Chinese or other	67%	24%	7%	3%	100%
Not known/not stated	65%	25%	7%	3%	100%

Further Information

Enquiries

Enquiries about the data or requests for further information should be addressed to:

Birth Ratio Statistics
Department of Health and Social Care
39 Victoria Street
Westminster
London
SW1H 0EU

e-mail: birthratios@dhsc.gov.uk

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Links

This bulletin for birth ratio analysis for 2013-2017, and previous reports, can be found on GOV.UK:

<https://www.gov.uk/government/collections/gender-birth-ratios-for-the-uk>

Related links

See abortion statistics, 2018:

<https://www.gov.uk/government/statistics/abortion-statistics-for-england-and-wales-2018>

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