Health outcomes and economic burden of ethnic inequalities in maternal and neonatal outcomes in England

Authors: Svetlana Ratushnyak, Helen Campbell, Oliver Rivero-Arias and Ramon Luengo-Fernandez

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For enquiries contact: Professor Oliver Rivero-Arias (oliver.rivero@npeu.ox.ac.uk) or Associate Professor Ramon Luengo-Fernandez (ramon.luengo-fernandez@npeu.ox.ac.uk)

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Synopsis

Background

Ethnic inequalities in maternal and neonatal outcomes remain a major public health concern in England. Black and Asian women experience higher rates of severe maternal morbidity, maternal mortality, preterm birth, stillbirth, and neonatal mortality than White women. However, the economic consequences of these inequalities for the NHS and wider society are poorly understood.

Aim

To estimate the annual healthcare costs and productivity losses associated with ethnic inequalities in maternal and neonatal outcomes in England.

Methods

A cohort-based economic model was developed for all women in England reaching 24 weeks' gestation over a 12-month period. Women were stratified into White, Asian, Black, Mixed, and Other ethnic groups. Maternal pathways included antenatal, delivery, and postpartum care up to 42 days after birth, while neonatal pathways included outcomes and healthcare use up to 27 days after birth. Event probabilities and relative risks by ethnicity were estimated using national administrative datasets (primarily 2024–25 data), and published literature. Healthcare unit costs were derived from NHS reference costs and national guidance. Productivity losses associated with premature maternal and neonatal deaths were estimated using a human capital approach.

Findings

The model included 515,220 maternities. Black and Asian women experienced substantially higher rates of pregnancy complications, emergency caesarean section, hypertensive disorders, diabetes in pregnancy, severe haemorrhage, and maternal infections compared with White women. Babies born to Black women experienced the highest risks of stillbirth, very preterm birth, neonatal intensive care admission, and neonatal mortality. Overall, maternal and neonatal ethnic inequalities resulted in substantial excess healthcare and productivity losses in England, with total additional costs estimated at approximately £352 million annually. The largest share of these additional costs was observed among Asian populations (£174.9 million) followed by Black populations (£128.9 million). Neonatal inequalities accounted for approximately two thirds of the total economic burden.

Conclusions

Maternal and neonatal ethnic inequalities impose substantial healthcare and societal costs in England. Reducing these inequalities could improve health outcomes while also reducing the associated economic burden.

Limitations

The study likely underestimates the true burden as it excluded long-term consequences and wider societal costs such as unpaid care, social care, or educational impacts.

Introduction

Black women in the UK are more than twice as likely to die during or shortly after childbirth compared to white women [1], and this persists even after accounting for socioeconomic deprivation. Women from minority ethnic groups are also more likely to experience severe maternal morbidity – serious complications that can pose a risk to life during pregnancy, childbirth, or the postpartum period – compared to white women [2]. Ethnic inequalities also significantly impact neonatal outcomes and care, contributing to stillbirths, preterm births, and foetal growth restriction [3,4].

Addressing ethnic inequalities in maternal and neonatal health has been identified as a national priority in several key policy documents, including the NHS Long Term Plan and the Core20PLUS5 strategy [5,6]. To date, there has been little comprehensive research on the long-term economic burden that maternal and neonatal health inequalities impose on the NHS. Where cost-related research exists, it often lacks ethnic stratification or focuses narrowly on single outcomes or services.

These inequalities require urgent, systemic mitigation, particularly as the proportion of births to non-UK-born mothers continues to rise each year. In 2023, 31.8% of live births in England and Wales were to non-UK-born mothers – an increase from 30.3% in 2022 [7]. However, the societal implications of these inequalities, in terms of increased care costs or reduced health outcomes, remain poorly understood. While existing research highlights promising interventions such as caseload midwifery, vitamin D supplementation, culturally adapted cognitive behavioural therapy, midwifery-led care models, and health advocacy programmes, the cost-effectiveness of these approaches is underexplored [8]. System-level responses, such as improved multidisciplinary collaboration and proactive resource reallocation [9], also lack robust economic evaluation.

The overall aim of this work is to produce a cohort-based model to quantify the economic costs of maternal and neonatal health inequalities, including associated health care costs, and productivity losses due to maternal or infant death in England.

Methods

The starting cohort for the model was all pregnant women in England reaching 24 weeks' gestation over a 12-month period, stratified into the following ethnic groups: White, Asian, Black, Other, and Mixed. The model included healthcare costs of events along the maternal care pathway, with women followed from 24 weeks of pregnancy through to 42 days postpartum. The neonatal care pathway was also modelled for liveborn babies out to 27 days after birth, with follow-up extended beyond this point only for infants whose neonatal unit admission continued beyond 27 days. Figure 1 shows the structure of the model and the events included along the care pathways.

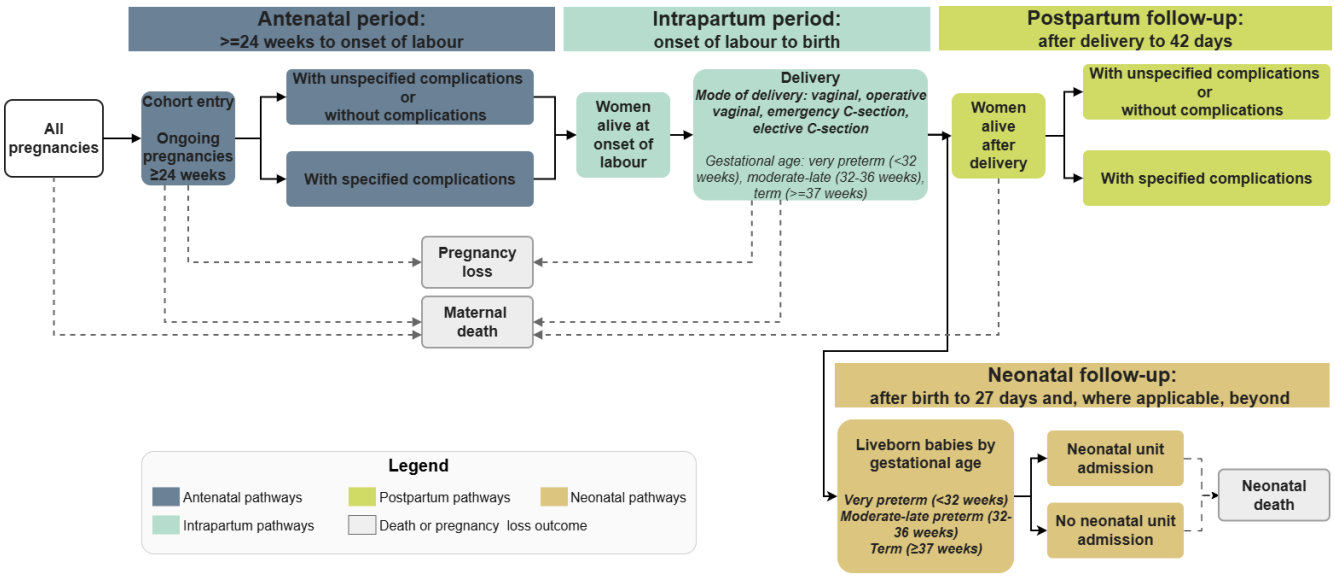

Figure 1. Model structure.

Events were first modelled using data for White women and their babies, who served as the reference case. Maternal event probabilities included key pregnancy complications (for example gestational hypertension, pre-eclampsia, and diabetes), maternal death, pregnancy loss, timing of birth (very pre-term, moderate to late pre-term, and term), delivery type (vaginal, instrumental, elective and emergency caesarean) and post-delivery events. Neonatal events modelled were neonatal unit admissions and mortality (both dependent upon timing of birth).

Probabilities for pathway events were estimated primarily using administrative data for England (including NHS maternity statistics [10], MBRRACE-UK maternal and perinatal mortality surveillance [1,11], ONS birth data [12], the National Maternity and Perinatal Audit report [13], National Pregnancy in Diabetes Audit) [14] and published studies [15]. Using these sources, relative risks were also estimated for each modelled event by maternal ethnic group, again with White women used as the reference group. These relative risks were then applied to the corresponding reference-case event probabilities to estimate event probabilities, and subsequently expected numbers of events, for each minority ethnic group.

Healthcare resource use associated with events in the model (for example the ongoing management of pregnancy complications) was informed by clinical guidelines [16–25] and published studies [26–30], and unit costs were taken from the National Schedule of NHS Costs [31], Unit Costs of Health and Social Care [32], and the NHS Drug Tariff [33].

The model was run separately for all maternities in each ethnic group, and the proportion of modelled events was reported. Maternity was defined as a woman who gives birth to one or more liveborn or stillborn babies at 24 completed weeks of gestation or more, or who experiences an antenatal maternal death, irrespective of gestational age. Ethnic groups were defined according to the ethnicity groupings available in the data sources, including NHS maternity statistics and MBRRACE-UK surveillance data [1,10,11,13]. These were based on 2001 Census categories, with Chinese grouped under Other rather than Asian[34].

Maternal healthcare costs were grouped into antenatal, delivery, and postpartum periods, and mean healthcare costs per maternity were reported for each period and each ethnic group. Additional maternal healthcare costs in each ethnical group were calculated as the difference in mean healthcare costs relative to the White women reference group and then scaled to the annual maternity population in each ethnic group to estimate total additional NHS maternal care costs.

Neonatal healthcare costs were grouped by gestational age, and mean neonatal costs per maternity were reported for neonates born to women in each ethnic group across very preterm (<32 weeks), moderate to late preterm (32 to <37 weeks), and term (>37 weeks) births. Additional neonatal healthcare costs were calculated as the difference in mean neonatal healthcare costs relative to neonates born to White women and then scaled to the annual newborn population in each ethnic group to estimate total additional NHS neonatal care costs.

For women and babies who die prematurely, the opportunity to contribute to society over their remaining lifetime is lost. We used the human capital approach to measure and value lost productivity due to premature mortality [35]. Productivity losses from premature death were estimated by calculating the sum of the age-specific products of the following:

- number of maternal and neonatal deaths by ethnicity [1,11,12];
- number of remaining work years at the time of death [36,37];
- annual gross earnings [38]; and
- economic activity and unemployment rates in the population (aged 15–79) [37].

Working years left at the time of death were estimated as the number of years up to age 79. Although the typical retirement age ranges between 65 and 67 years [36], there are a significant number of individuals working up to age 79 [37]. Therefore, the number of working years left at the time of death was adjusted by the likelihood of individuals in each age group (5-year age bands from 15 to 79 years old) being economically active and employed [37]. Each working year lost was valued using mean annual earnings (female for mothers, and average for babies) [38]. Future earnings lost were discounted to present values using a 3.5% annual rate [39].

The overall economic burden of ethnic inequalities was then estimated by summing additional maternal and neonatal healthcare costs and productivity losses for each minority ethnic group.

Results

Population characteristics

515,220 maternities were modelled (we excluded 27,015 maternities with missing ethnicity data). White women accounted for two thirds of maternities (n=346,637, 67%), followed by Asian women (n=92,198, 18%), Black women (n=37,380, 7%), women of Other ethnicities (n=23,996, 5%), and Mixed ethnicity women (n=15,009, 3%).

Maternal outcomes

Compared with White women, important differences in pregnancy and postpartum complications were observed across ethnic groups (Table S1). Black women experienced significantly higher risks of pre-existing hypertension (RR 2.81, 95% CI 2.58–3.05), pre-eclampsia/eclampsia (RR 1.50, 95% CI 1.43–1.57), maternal infectious diseases (RR 2.69, 95% CI 2.51–2.87), and massive postpartum haemorrhage (RR 1.41, 95% CI 1.33–1.49). Asian women had markedly increased risks of diabetes mellitus in pregnancy (RR 2.15, 95% CI 2.12–2.18), puerperal sepsis (RR 2.93, 95% CI 2.72–3.16), and antepartum haemorrhage (RR 1.23, 95% CI 1.19–1.27). Mixed and Other ethnic groups also experienced elevated risks for several infectious and haemorrhagic complications, although generally to a lesser extent.

Rates of emergency caesarean delivery were substantially higher among Black (33%) and Asian women (31%) compared with White women (22%), with spontaneous vaginal delivery less common in minority ethnic groups. Preterm delivery was more frequent among Black women (7%) compared with White women (6%).

Maternal healthcare costs

Within the antenatal period, healthcare costs increased with the need to manage pregnancy complications. For example, pre-existing hypertension and diabetes during pregnancy added an estimated £2,914 and £2,091 per maternity respectively, to routine antenatal care costs of £1,216.

Delivery costs also increased with more complex modes of delivery and with the presence of maternal complications. For example, emergency caesarean section represented the most expensive delivery mode with costs ranging from £8,093 in uncomplicated pregnancies to £10,775 in pregnancies complicated by massive postpartum haemorrhage. In contrast, spontaneous vaginal delivery was associated with the lowest delivery costs, ranging from £3,462 to £5,618.

During the postpartum period, the highest additional costs were associated with massive postpartum haemorrhage (£6,905) and puerperal sepsis (£3,844), reflecting the need for intensive monitoring, treatment, and potential hospital readmissions. Other complications generated comparatively smaller additional postpartum costs, ranging from £45 to £173 per maternity.

Attaching these costs to the rates of pregnancy and postpartum complications and the modes of delivery for each ethnic group, generated the estimated mean healthcare costs per maternity shown in Figure 2.

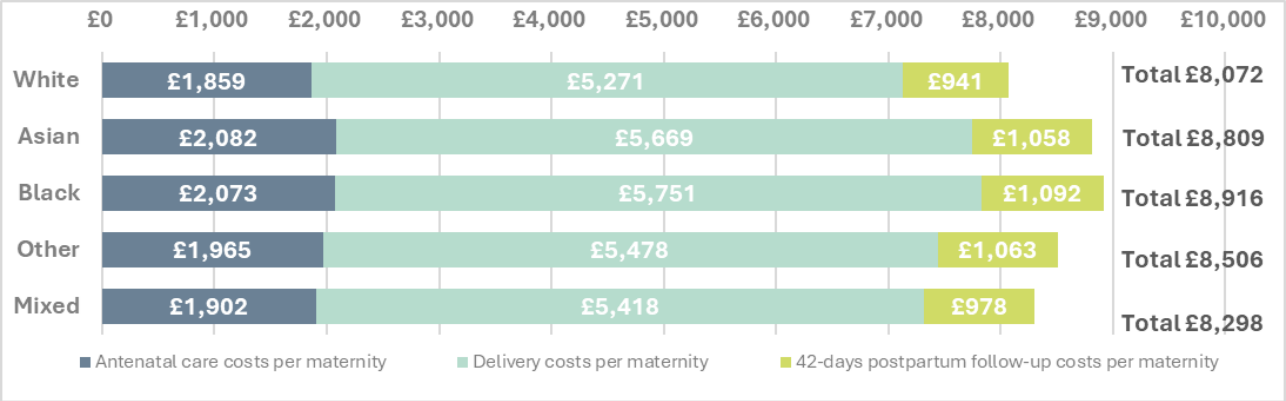

Figure 2. Mean maternal healthcare costs by period of care and maternal ethnic group.

Across all ethnic groups, delivery-related costs represented the largest component of maternal healthcare costs, followed by antenatal and postpartum follow-up costs up to 42 days after delivery.

The largest contributors to the additional maternal costs seen for women in minority ethnic groups when compared to White women, were emergency caesarean deliveries, diabetes in pregnancy, hypertensive disorders, severe haemorrhage, and puerperal infections (Table S1). The impact is seen through an increased need for health care and thus costs during antenatal, intrapartum, and postpartum periods.

Table 1 presents the additional maternal healthcare costs per maternity for each minority ethnic group relative to White women.

Table 1. Additional maternal healthcare costs per maternity for each minority ethnic group relative to White women.

Pregnancy phase	Asian	Black	Other	Mixed
Antenatal care	£222	£214	£105	£43
Delivery	£398	£480	£207	£147
Postpartum care	£116	£150	£122	£36
Total additional maternal healthcare	**£737**	**£844**	**£434**	**£226**

Excess maternal healthcare costs per maternity were highest for Black women (£844 greater than White women), followed by Asian women (£737 greater than White women).

Table 2 scales these additional maternal healthcare costs per maternity for each minority ethnic group to the national population level.

Table 2. Additional NHS maternal care costs for each minority ethnic group scaled to the annual maternity population level (£000).

	Asian (n=92,198)	Black (n=37,380)	Other (n=23,996)	Mixed (n=15,009)
Antenatal care	£20,506	£8,003	£2,529	£638
Delivery	£36,695	£17,941	£4,969	£2,210
Postpartum care	£10,740	£5,621	£2,918	£547
Total additional NHS maternal care	**£67,942**	**£31,565**	**£10,416**	**£3,396**

Compared to White women, the estimated additional costs of managing pregnancy in Asian women was approximately £67.9 million annually. For Black women the estimated additional cost was £31.6 million. The larger costs for Asian women reflect the larger size of this ethnic group within the population.

Delivery-related costs were the largest contributor to excess maternal NHS costs across all ethnic minority groups, accounting for approximately £36.7 million among Asian women and £17.9 million among Black women annually.

Maternal productivity losses

Premature maternal mortality contributed to the productivity loss estimates, although the absolute numbers were small. Relative to White women, the risk of maternal death was highest among Black women, followed by Asian and Mixed women, while women in the Other ethnic group experienced lower risk.

Figure 3 shows lifetime productivity losses associated with premature maternal mortality. On account of the numbers being small and to standardise the comparison across the ethnic groups, these are reported per 1,000 maternities.

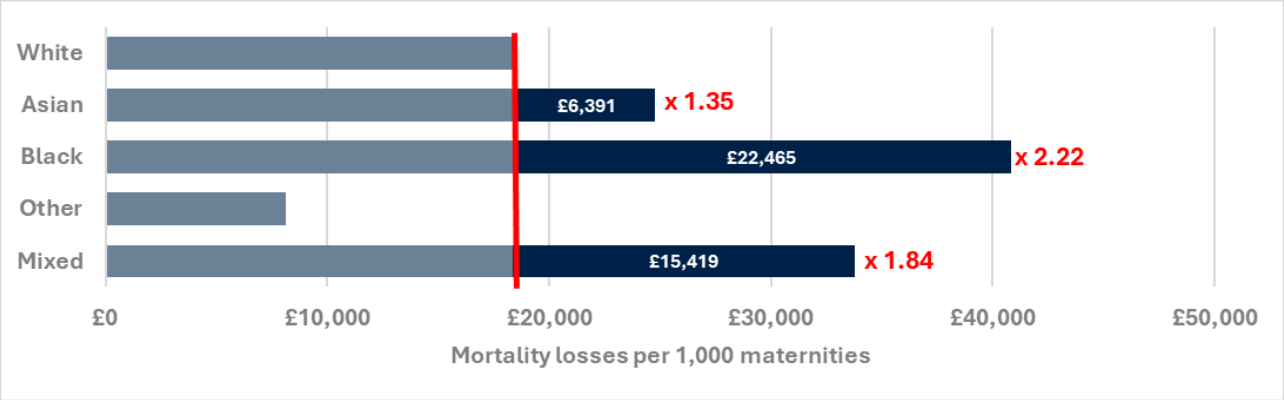

Figure 3. Lifetime productivity losses per 1,000 maternities associated with premature maternal mortality in each ethnic group.

Productivity losses associated with premature maternal mortality were small compared with direct NHS healthcare costs. However, important inequalities were observed across ethnic groups.

Black women experienced the highest productivity losses, with losses more than twice those observed among White women (2.22 times higher). Mixed ethnicity women also experienced substantially higher productivity losses (1.84 times higher), while Asian women experienced moderately increased losses (1.35 times higher) compared to White women.

In contrast, women from Other ethnic groups experienced lower productivity losses relative to the White reference population within the model.

Total additional maternal costs

Table 3 shows total additional NHS maternal care costs and productivity losses for each ethnic group relative to White women, scaled to the national population level.

Table 3. Population-level total additional maternal costs and productivity losses relative to White women (£000s).

	Asian (n=92,198)	Black (n=37,380)	Other (n=23,996)	Mixed (n=15,009)
Additional NHS maternal care costs	£67,942	£31,565	£10,416	£3,396
Additional productivity losses	£589	£840	-£246	£231
Total additional maternal costs	**£68,531**	**£32,405**	**£10,169**	**£3,627**

Overall, maternal ethnic inequalities were associated with substantial excess healthcare costs in England, largely driven by higher rates of severe maternal morbidity, emergency intrapartum care, and maternal mortality among Black and Asian women.

Neonatal outcomes

Ethnic inequalities were also observed in neonatal outcomes by maternal ethnicity (Table S2).

Black babies experienced the greatest inequalities across neonatal outcomes. Compared with White babies, Black babies had more than double the risk of stillbirth (RR 2.06, 95% CI 1.80–2.36) and were 72% more likely to be born very preterm (<32 weeks gestation) (RR 1.72, 95% CI 1.59–1.85). Asian babies also experienced elevated risks of stillbirth (RR 1.56, 95% CI 1.40–1.73) and very preterm birth (RR 1.11, 95% CI 1.04–1.19).

No substantial differences were observed in moderate-late preterm birth between Asian, Black, and White babies. However, babies from Other ethnic groups experienced slightly lower risks of moderate-late preterm birth (RR 0.91, 95% CI 0.88–0.95).

Among moderate-late preterm babies, neonatal unit admission rates were lower across all minority ethnic groups compared with White babies. In contrast, among term babies, neonatal unit admission rates were slightly higher among Asian (RR 1.08, 95% CI 1.05–1.11) and Black babies (RR 1.12, 95% CI 1.08–1.17), and lower among babies from Other ethnic groups (RR 0.94, 95% CI 0.90–0.97).

Neonatal mortality was also substantially higher among Black and Asian babies compared with White babies, demonstrating persistent ethnic inequalities in survival during the neonatal period.

Overall, these findings demonstrate substantial ethnic inequalities in neonatal outcomes, particularly among Black and Asian populations, with disproportionately higher risks of stillbirth, very preterm birth, and neonatal mortality.

Neonatal healthcare costs

Figure 4 shows the neonatal healthcare costs per maternity by gestational age and maternal ethnic group.

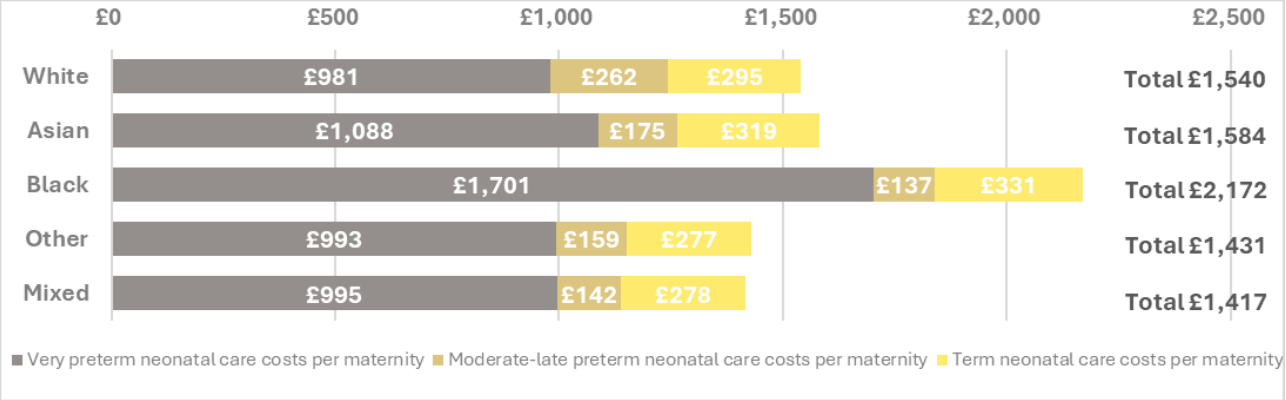

Figure 4. Neonatal healthcare costs by gestational age and maternal ethnic group.

Across all ethnic groups, very preterm births (<32 weeks gestation) represented the largest contributor to neonatal healthcare costs on account of many of these babies requiring costly neonatal intensive care over prolonged periods. Neonatal costs associated with moderate-late preterm and term births were substantially lower.

Table 4 presents the additional healthcare neonatal care costs per maternity by maternal ethnic group relative to White women

Table 4. Additional neonatal healthcare costs per maternity relative to White women

	Asian	Black	Other	Mixed
Very preterm (<32 weeks)	£107	£720	£11	£14
Moderate-late preterm (32 to <37 weeks)	-£87	-£125	-£103	-£120
Term (>37 weeks)	£24	£36	-£18	-£17
Total neonatal healthcare	**£44**	**£632**	**-£109**	**-£124**

Babies born to Black women incurred the highest excess neonatal healthcare costs per maternity (£632 above those born to White women), largely as a consequence of the substantially higher rates

of very preterm birth and neonatal critical care admissions they experienced. Babies born to Asian women incurred more modest additional neonatal NHS costs (£44 per maternity).

In contrast, lower neonatal health care costs were estimated among babies born to Other and Mixed ethnic groups relative to babies born to White women. These lower costs reflected lower neonatal unit admission rates and lower moderate-late preterm neonatal care utilisation within the model.

Table 5 presents the additional neonatal healthcare costs in England scaled to the annual newborn population relative to newborn in White women

Table 5. Additional neonatal care costs scaled to the annual newborn population relative to newborns in White women (£000s)

	Asian (92,671)	**Black** (37,846)	**Other** (24,227)	**Mixed** (15,191)
Very preterm (<32 weeks)	£9,839	£26,899	£271	£207
Moderate-late preterm (32 to <37 weeks)	-£8,028	-£4,687	-£2,467	-£1,808
Term (>37 weeks)	£2,175	£1,353	-£435	-£262
Total NHS neonatal care	**£4,055**	**£23,619**	**-£2,624**	**-£1,856**

Note: The number of babies in each ethnic group was estimated using multiple data sources and reflects babies born to mothers in each ethnic group.

Babies born to Black women had the highest additional neonatal NHS costs, with an estimated excess annual cost of approximately £23.6 million relative to babies born to White women. Babies born to Asian women generated approximately £4.1 million in additional neonatal NHS costs annually.

Neonatal productivity losses

Figure 5 shows productivity losses again per 1,000 maternities associated with stillbirths and neonatal mortality.

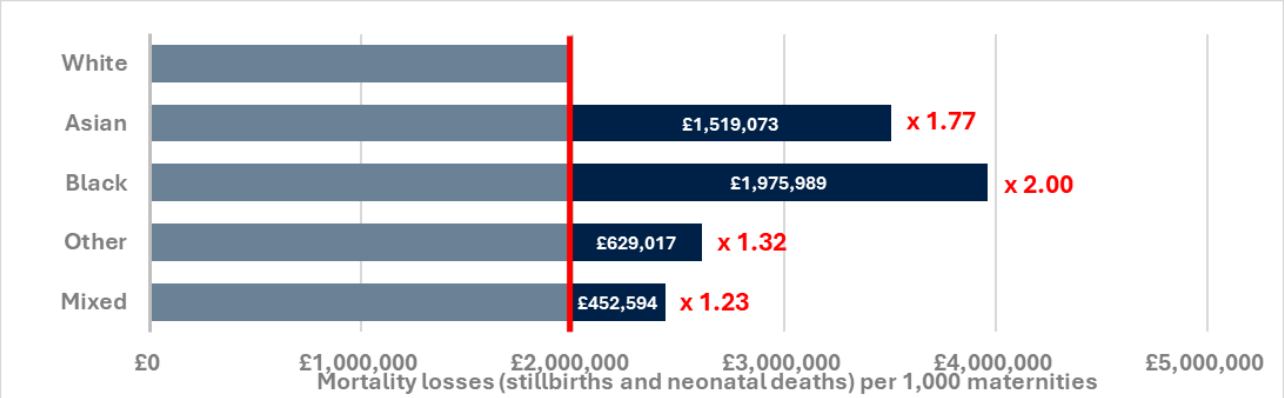

Figure 5. Lifetime productivity losses per 1,000 maternities associated with stillbirth and neonatal mortality in each ethnic group.

Productivity losses associated with stillbirth and neonatal mortality were substantially higher than those associated with maternal mortality. Babies born to Black women experienced the highest productivity losses, with losses approximately twice those observed among babies born to White women. Babies born to Asian women also experienced substantially elevated productivity losses, estimated to be approximately 1.77 times higher than for babies born to White women.

Babies born to women in the Other and Mixed ethnic groups also experienced higher productivity losses compared with babies born to White women, although the magnitude of the inequality was smaller.

Table 6 shows additional total neonatal healthcare costs and productivity losses for each maternal ethnic group relative to neonates born to White women, scaled to the population level for England.

Table 6. Population-level additional neonatal healthcare costs and productivity losses relative to neonates born to White women (£000s).

	Asian (92,671)	Black (37,846)	Other (24,227)	Mixed (15,191)
Additional neonatal healthcare costs	£4,055	£23,619	-£2,624	-£1,856
Additional productivity losses	£102,304	£72,924	£20,700	£17,936
Total additional neonatal costs	**£106,359**	**£96,543**	**£18,076**	**£16,080**

Note: The number of babies in each ethnic group was estimated using multiple data sources and reflects babies born to mothers in each ethnic group.

Productivity losses represented the largest component of the additional neonatal costs in all ethnic groups, substantially exceeding direct neonatal healthcare costs. Overall, substantial additional healthcare costs and productivity losses were observed for babies born to Black and Asian women on account of their higher rates of stillbirth, very preterm birth, and neonatal mortality.

Overall economic burden of maternal and neonatal ethnic inequalities

Table 7 shows total additional total for each maternal ethnic group relative to White women, scaled to the population level for England.

Table 7. Population-level overall additional costs relative to White women (£000s).

	Asian	Black	Other	Mixed	Across all ethnic groups
Total additional maternal costs	£68,531	£32,405	£10,169	£3,627	**£114,732**
Total additional neonatal costs	£106,359	£96,543	£18,076	£16,080	**£237,058**
Total additional total costs	**£174,890**	**£128,948**	**£28,245**	**£19,707**	**£351,790**

Overall, maternal and neonatal ethnic inequalities result in substantial excess healthcare and productivity losses in England, with total additional costs estimated at approximately £352 million annually.

The largest share of these additional costs was observed among Asian populations (£174.9 million), followed by Black populations (£128.9 million), followed by lower additional overall costs among Other (£28.2 million) and Mixed ethnicity groups (£19.7 million). Although the total cost among Black women was 26.3% lower than among Asian women, this is notable given that the Black population was about 40% smaller, indicating a higher cost per maternity and a greater individual burden in Black ethnical minority group. The higher total costs among Asian populations are likely to reflect, in part, the larger population size within this group.

Discussion

The total cost of maternal and neonatal inequalities in England is considerable and is estimated to be at approximately £352 million annually. Two thirds, £237 million, of this total cost was due to inequalities in neonatal health, driven by high rates of neonatal deaths (4.93 and 3.96 deaths per 1,000 live births in babies from black and Asian mothers, vs. 2.05 in whites) and stillbirths (6.8 and 5.1 stillbirths per 1,000 births in babies from Black and Asian mothers, vs. 3.3 in whites) in babies born to mothers from ethnic minorities [15].

Per 1,000 maternities, all ethnic groups except other ethnic group experienced higher mortality losses than whites, for both stillbirths and neonatal deaths, as well as maternal deaths. For black and mixed ethnicity groups, when compared to whites, inequalities were most marked for maternal mortality losses than for stillbirths and neonatal deaths.

Mothers from ethnic minorities had substantially higher rates of co-morbidities and complications[40], especially black women. Routinely collected NHS data [10] shows that black mothers had higher rates of pre-eclampsia, existing hypertension, infections, sepsis and diabetes than white mothers. These

high rates of complications also explained the relatively higher NHS care costs mothers from minority ethnic backgrounds incurred. In 2024/25, the proportion of white mothers undergoing emergency Caesarean section was 22%, for black mothers this was 33%, with considerably higher rates also observed in mothers from other ethnic backgrounds [10]. With a cost of between £8,000 and £11,000 per emergency Caesarean section, these were a main driver of the costs of inequality, especially if they are compared to the cost of a spontaneous delivery (ranging between £3,000 and £6,000 per delivery) [31].

Although the costs of inequalities in neonatal NHS care were smaller in magnitude than for maternity care, the annual cost of these inequalities was approximately £23 million. These costs were driven by higher rates of very preterm birth (<32 weeks) in babies from black and Asian mothers [13], which resulted in neonatal intensive care admissions. Paradoxically, although neonatal deaths and stillbirths were higher in babies from mothers from mixed and other ethnicities than those from white mothers [11], their NHS care costs were lower, in part due to lower rates of intensive care admission.
Although our study was based on large aggregate datasets of all maternities in England, reporting comorbidities, complications and outcomes by ethnicity, our study had limitations. When costing the additional costs of complications/comorbidities in routine NHS pregnancy and delivery care, we assumed that the cost of these, including delivery method, would be the same regardless of ethnicity. Given that evidence suggests that complications, such as pre-eclampsia and gestational diabetes, tend to be more severe in women from ethnic minorities [41,42], we believe our results are likely to be an underestimate of the true costs of inequalities. The time horizon of our study is also likely to result in our costs being an underestimate. Maternal and neonatal complications during pregnancy and delivery are likely to result in longer-term physical and mental health consequences likely to increase costs not captured in our analysis [43–47]. Finally, our analysis only included NHS care costs and those associated with productivity losses. As a result, we did not include the costs associated with unpaid care from relatives and friends, productivity losses associated with non-return to work after maternal leave, and those associated with the educational and social care systems. It is also important to note that wider determinants of health are likely to play an even greater role in shaping these inequalities and warrant further urgent investigation.

In conclusion, substantial ethnic inequalities persist across maternal and neonatal outcomes in England, with important consequences for both families and the wider health system. The findings of this study demonstrate that these inequalities are associated with considerable NHS care costs and productivity losses, particularly among black and Asian mothers and their babies. Reducing these disparities through improvements in prevention, maternity care, and neonatal outcomes has the potential not only to improve equity and population health, but also to reduce the significant economic burden associated with maternal and neonatal inequalities.

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APPENDIX

Table S1 Relative risks of maternal complications by ethnic group compared with White women

Complication	White	Asian	Black	Mixed	Other
Pre-existing hypertension*	1	1.20 [1.10 to 1.30]	**2.81 [2.58 to 3.05]**	1.26 [1.06 to 1.51]	1.15 [0.99 to 1.34]
Gestational hypertension*	1	0.69 [0.66 to 0.71]	0.93 [0.88 to 0.98]	0.78 [0.71 to 0.85]	**0.58 [0.54 to 0.63]**
Unspecified hypertension**	1	0.83 [0.78 to 0.88]	1.20 [1.11 to 1.29]	0.89 [0.78 to 1.01]	0.85 [0.76 to 0.94]
Pre-eclampsia/Eclampsia	1	0.92 [0.88 to 0.95]	**1.50 [1.43 to 1.57]**	0.95 [0.87 to 1.04]	0.82 [0.76 to 0.88]
Diabetes mellitus in pregnancy	1	**2.15 [2.12 to 2.18]**	1.56 [1.52 to 1.60]	1.27 [1.22 to 1.33]	1.66 [1.61 to 1.70]
Antepartum haemorrhage	1	1.23 [1.19 to 1.27]	1.10 [1.05 to 1.16]	1.09 [1.01 to 1.18]	1.26 [1.19 to 1.34]
Maternal infectious diseases (infectious diseases classifiable elsewhere)	1	0.98 [0.92 to 1.06]	**2.69 [2.51 to 2.87]**	1.24 [1.08 to 1.43]	1.48 [1.34 to 1.64]
Postpartum haemorrhage (massive ≥1,5L)	1	0.94 [0.90 to 0.98]	1.41 [1.33 to 1.49]	1.05 [0.95 to 1.15]	1.26 [1.17 to 1.35]
Puerperal sepsis	1	**2.93 [2.72 to 3.16]**	2.14 [1.91 to 2.41]	1.36 [1.10 to 1.68]	2.10 [1.82 to 2.41]
Other puerperal infections	1	1.58 [1.50 to 1.67]	1.39 [1.28 to 1.50]	1.09 [0.95 to 1.24]	1.49 [1.36 to 1.64]

Note: White women were the reference group. Relative risks estimated using NHS maternity statistics 2024/25 [10].

**Excluding pre-eclampsia*

***combined with gestational hypertension for the analysis*

Table S2 Relative risks for neonatal outcomes by ethnic group compared with White women

	White	Asian	Black	Other	Mixed
Stillbirths	1	1.56 [1.40 to 1.73]	2.06 [1.80 to 2.36]	1.22* [1.03 to 1.44]	1.22* [1.03 to 1.44]
Live births, gestational age					
Very preterm (<32 weeks)	1	1.11 [1.04 to 1.19]	1.72 [1.59 to 1.85]	1.01* [0.92 to 1.12]	1.01* [0.92 to 1.12]
Moderate-late preterm (32–36 weeks)	1	1.00 [0.97 to 1.03]	0.99 [0.95 to 1.03]	0.91* [0.88 to 0.95]	0.918 [0.88 to 0.95]
Neonatal admission by gestational age**					
Moderate–late preterm (32–36 weeks)	1	0.86 [0.82 to 0.90]	0.89 [0.84 to 0.96]	0.86* [0.81 to 0.92]	0.86* [0.81 to 0.92]
Term (≥37 weeks)	1	1.08 [1.05 to 1.11]	1.12 [1.08 to 1.17]	0.94* [0.90 to 0.97]	0.94* [0.90 to 0.97]
Neonatal mortality	1	1.79 [1.58 to 2.04]	1.60 [1.32 to 1.94]	1.05 [0.79 to 1.39]	1.16 [0.83 to 1.62]

Note: White ethnicity was used as the reference group, with White baby ethnicity used as a proxy for births to White mothers [12]. Relative risks were estimated from NHS maternity statistics [10], the National Maternity and Perinatal Audit[13], and linked cohort study [15], and were applied within gestational age categories.

**Other and Mixed ethnic groups were reported together in the Ethnic and Socio-economic Inequalities in NHS Maternity and Perinatal Care for Women and their Babies report [13].*