



A positive deviant approach to examining the impact of Covid-19 on ethnic inequalities in maternal and neonatal outcomes

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ABSTRACT

Objectives: During the COVID-19 pandemic, rapid and heterogeneous changes were made to maternity care. Identification of changes that may reduce maternal health inequalities is a national priority. The aim of this project was to use data collected about care and outcomes to identify NHS Trusts in the UK where inequalities in outcomes reduced during the pandemic and explore through interviews how the changes that occurred may have led to a reduction in inequalities.

Methods: A Women's Reference Group of public advisors guided the project. Analysis of Hospital Episode Statistics Admitted Patient Care data of 128 organisations in England identified "positive deviant" organisations that reduced inequalities, using maternal and perinatal composite adverse outcome indicators. Positive deviant organisations were identified for investigation, alongside comparators. Senior clinicians, heads of midwifery and representatives of women giving birth were interviewed. Reflexive thematic analysis was employed.

Results: The change in the inequality gap for the maternal indicator ranged from a reduction of -0.24 to an increase of 0.30 per 1000 births between the pre-pandemic and pandemic period. For the perinatal composite indicator, the change in inequality gap ranged from -0.47 to 0.67 per 1000 births. Nine Trusts were identified as positive deviants and 10 as comparators. We conducted 20 interviews from six positive deviant and four comparator organisations. Positive deviants reported that necessary shifts in roles led to productive and novel use of expert staff; comparators reported senior staff 'stepping in' where needed and no benefits of this. They reported proactivity and quick reactions, increased team working, and rapid implementation of new ideas. Comparators found constant changes overwhelming, and no increase in team working. No specific differences in care processes were identified.

Conclusions: Harnessing proactivity, flexibility, staffing resource, and increased team working proves vital in reducing health inequalities.

Introduction

Ethnic inequalities in maternal and perinatal outcomes in England have been widely reported [1,2]. In 2016–18, Black women were four times, Asian women two times, and women from mixed ethnicity two times more likely to die during pregnancy, birth and the postpartum period than White women [3]. Rates of stillbirth were approximately 40 % higher for babies of Black ethnicity and 60 % higher for babies of South Asian ethnicity than for babies of White ethnicity [2]. Moreover,

women from ethnic minority groups were disproportionately affected by COVID-19 infection [4,5].

Positive deviance studies seek to produce learning by examining individuals, teams, or organisations that show exceptionally good performance [6]. During the COVID-19 pandemic substantial shifts in provision and delivery of maternity care were identified [7]. In the UK National Health Service (NHS), these changes were often locally driven and there were important differences between individual hospital organisations (NHS Trusts) that have not been investigated. The aim of our

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mixed-methods study, the Covid Maternity Equalities Project (CMEP), was to use routinely collected healthcare data to identify positive deviant NHS Trusts where inequalities in outcomes reduced during the pandemic and explore through interviews how the changes that occurred in this time may have led to a reduction in inequalities.

Methods

The positive deviance approach has two steps: first, a quantitative component, where we identify NHS Trusts that demonstrated a reduction in inequalities in maternal and/or perinatal outcomes during the pandemic, and second, a qualitative component, where we interviewed senior staff in these Trusts and report contextual differences to understand potential contributors.

Patient and public involvement

A Women’s Reference Group of 23 women from diverse ethnic and socioeconomic backgrounds who gave birth between March 2020 and March 2021 was recruited from across England. This group supported development and execution of the project, in particular the selection of quantitative outcomes and co-designing the interview topic guide. Details of their involvement can be found in [Table 1](#).

Ethics approval and consent to participate

The UK National Health Service Health Research Authority (NHS HRA) reviewed the project under the UK Policy Framework for Health and Social Care Research. This Framework uses three criteria – use of randomisation, change to treatment or care, and generalisability – to ascertain the need for review by an ethics board. Since none of these criteria were met by this project, the NHS HRA identified it as Quality Improvement and ethical approval was not required. All methods were carried out in accordance with relevant guidelines and regulations in the Helsinki declaration, and local approvals were ascertained where necessary. Verbal informed consent was gained from all participants.

Identification of included Trusts

Dataset

Data was extracted from Hospital Episode Statistics Admitted Patient Care (HES APC). HES APC includes births that occur in NHS hospital Trusts [8]. A maternity episode was identified by the presence of information about the mode of birth in either the OPCS procedure codes (R17.1-R25.9) or the maternity tail of the HES record, or by the presence of the ICD-10 diagnosis code for live birth (Z37) [9]. For the baby, birth records were identified by the presence of any indication of birth, either in the [1] ICD diagnosis codes Z37-Z38, [2] age at the start of the episode of care, or [3] HES fields relating to episode type, method of admission, and level of neonatal care [10].

Definition of cohort

NHS Trusts were included in the study if they had records of more than 500 singleton births per annum in the period April 2018-March 2021 inclusive in HES. Maternal record exclusion criteria were: ICD-10 code of COVID-19 (U70.1-U70.2), congenital malformations (Q00-Q99), or recorded maternal age < 12 or > 55 years old. Episodes with an associated ICD-10 code of COVID-19 were excluded because we were interested in the indirect effect of COVID-19. Birth exclusion criteria were: ectopic pregnancy, miscarriage, termination, or recorded gestational age of under 24 completed weeks. [Figure S1](#) describes the record-level cohort derivation. [Table S1](#) shows the maternal and perinatal characteristics as recorded in HES and how they were codified.

Definition of time periods

The pandemic period was defined as all births occurring in March

Table 1
GRIPP2 Report on Involvement of the Women’s Reference Group.

AIM	To ensure the relevance and applicability of the C-MEP student design and outputs by consulting with a Women’s Reference Group (WRG) of a diverse group of women who gave birth in the first year of the Covid-19 pandemic.
METHODS	<p>We advertised for participants through the RCOG social media channels (facebook, twitter and Instagram), women’s network, and website, and advertisement through women’s organisations (Caribbean and African Health Network, 5x more, MVPs).</p> <p>292 women applied. We shortlisted aiming to maximise the diversity of ethnicities, ages, locations, and birth experiences.</p> <p>Twenty-three women were recruited. We met 5 times over the 18-month study period. Meetings ranged from 60 to 90 min, and were focused on the following:</p> <p>Introduction, project overview, women’s experiences of birth and care. Women’s views and experiences of inequality, choosing outcomes of importance for quantitative analysis Study update and group discussion with leader of Mothers For Mothers organisation Presentation and discussion of quantitative findings, co-creating qualitative interview topic guide. Presentation and discussion of qualitative findings, and plans for next steps.</p> <p>Seven members of the group also attended the project final event, with 3 presenting.</p>
STUDY RESULTS	<p>The WRG added critique and context to our research questions and project design, ensuring their relevance to women. Hearing their stories meant that the research team considered the issues arising in the quantitative and qualitative analysis in context. For example, the psychological impact of not having partners in present was highlighted, as well as individual stories of racism or discrimination.</p> <p>The WRG voted on women and baby birth outcomes that are available in HES data that ended up being included in the Composite Indicator for the quantitative component of the study. They also highlighted elements that were not captured, for example mental health, disability, or post-natal care.</p> <p>They also critiqued the findings, for example questioning the ethnicity categories and potential incongruities in the findings (specifically the increase in Caesareans but decrease in hospital stay).</p> <p>The WRG added questions to the topic guide, asking us to ask clinicians about why there were differences between trusts, what rationales teams were using to change the rules throughout the pandemic year, and to find out if trusts were aware of inequalities and biases before Covid. They also helped us create a timeline of events that happened from March 2020 to March 2021 to provide an aide memoir for the clinicians who were being interviewed.</p> <p>The key negative effect the WRG had was to highlight the limitations of our chosen methodology in providing answers to some of the women’s main</p>

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Table 1 (continued)

AIM	To ensure the relevance and applicability of the C-MEP student design and outputs by consulting with a Women's Reference Group (WRG) of a diverse group of women who gave birth in the first year of the Covid-19 pandemic.
	concerns, for example mental health and breastfeeding support, and also the poor quality of data specifically relating to ethnicity.
DISCUSSION AND CONCLUSIONS	We deliberately set out to position women as central to the project, with a view to taking a co-productive approach. This worked more equitably in the qualitative component than the quantitative. The constraints of the statistical processes and quality of HES data, and the limitations that brought, might have undermined the relationship with the WRG. However, through transparency, they understood the constraints and therefore did not end up disenfranchised. It was also more difficult than envisaged to involve the WRG in the qualitative analysis, largely due to the timelines.
REFLECTIONS / CRITICAL PERSPECTIVES	The WRG was a successful part of C-MEP, helping us design and influence outcomes as intended. The women gave positive feedback in terms of being listened to and feeling their contribution was valued. The women also found the opportunity to talk to other women who had similar, but different, experiences beneficial. Remote meetings via Teams worked well to include participants from all over the country. It allowed women to join the group easily while also caring for their babies, as well as when they returned to work as the project progressed. The women reported enjoying learning how to use the Miro board, which also provided a way to keep a shared visual record of everything that had been discussed. However, there is always added value in meeting face to face, which we recognised when we met those who could attend the in-person final event. A future project may benefit from a mix of approaches.

2020 to March 2021 inclusive. The pre pandemic period was defined as April 2018 to February 2020.

Choice of outcomes

We used maternal and perinatal composite indicators to rank NHS Trusts. Component outcomes were identified using literature review [11–16]. We selected only those that had been compared with evidence from published population-based epidemiological studies in England. [20] The final list of component outcomes was reviewed and approved by the Women's Reference Group. Table S2 shows the outcomes reviewed before inclusion in the final composite indicator. Outcomes were not weighted within indicators to enable transparency [17].

A full description of the codes that were used to identify each outcome is shown in Table S3. The composite indicators were constructed as binary outcomes identified by the presence of one or more component events.

Statistical analysis

We calculated the incidence rate of the maternal and perinatal composite indicators, and each component adverse outcome, in the pre-pandemic and pandemic period at a national level. We calculated these for the pre-pandemic and pandemic periods at a Trust level.

We ranked NHS Trusts according to the difference of the 'inequality gap' from the pre-pandemic to pandemic period, for both the maternal and perinatal composite indicators. The 'inequality gap' was defined as the difference in the number of adverse outcomes between mothers and babies with White ethnicity and those from any minority ethnic group

from the pre-pandemic to pandemic period. Ethnicity in this dataset is self-defined by individual patients, with NHS digital describing it as a combination of ancestry, identity, language, culture, physical appearance and religion. For each indicator, a measure of the change in inequality over time was calculated using the difference-in-differences (DiD) analysis. DiD is a statistical model that can be used to estimate the effect of a specific intervention (e.g. treatment, natural event, or health-care policy change) by comparing the changes in outcomes over time between a group that is affected by the intervention (treatment group) and a group that is not (control group) [18–20]. The DiD estimator measures the intervention effect by looking at the difference between the average outcome in the control and treatment groups, before and after the intervention [21]. The DiD is implemented by taking two differences between group means: 1) the first difference is the difference in the mean of the outcome variable between the two periods for each of the groups; 2) the second difference is the difference between the differences calculated for the two groups in the first stage [22]. In our study, we first calculated the change in the frequency of the composite indicator between the two periods, in records where the ethnicity was recorded as being (i) from a minority ethnic group and (ii) White. We then calculated the difference between these differences. Further details of this method are given in [Supplementary Text](#).

Trusts that had a reduction in the 'inequality gap', represented by a lower DiD result, that was statistically significant (95 % CI not including the null) between the pre-pandemic and pandemic periods for either of the maternal and perinatal composite indicators, or both, were identified as positive deviants (PD). We identified as potential comparators Trusts where there was no change in the 'inequality gap' between the pre-pandemic and pandemic periods.

All analyses were conducted using Stata 16 (StataCorp, College Station, TX).

Qualitative study

Recruitment

Senior obstetricians and midwives, and Maternity Voices Partnership (MVP) chairs, were approached. MVPs are local groups comprised of service users for each maternity unit in England. Contacts were acquired through clinical links, professional databases and word of mouth. An invitation email and information sheet were sent to all participants. If interest was expressed, a time for interview was set.

Interviews

Interviews took place over the videoconferencing software Microsoft Teams. Participants gave verbal consent at the start of the interview. An interview topic guide was created with the Women's Reference Group. Recordings were sent to a professional transcription company, and transcripts were anonymised and saved on a secure drive.

Analysis

We initially used reflexive thematic analysis techniques: line-by-line coding followed by grouping into categories according to meaning. Once these categories were established, a focused top-down approach was employed to extract key factors that had potential to affect ethnic inequalities.

Analysis was conducted using MaxQDA. The qualitative lead (JD) undertook the coding; 20 % were double-coded (RM). The qualitative team met weekly for discussion, reflection, and refinement of themes. These were then discussed with the wider team and the Women's Reference Group.

Results

Identification of Trusts

128 NHS Trusts had sufficient quality information to calculate the

difference in the inequality gap between the pre-pandemic and pandemic period for one or both maternal and perinatal composite indicators and were included in the study. Table 2 provides a description of the population in these trusts in the pre-pandemic and pandemic period. The change in the inequality gap for the maternal indicator ranged from a reduction of -0.24 (95 % CI -0.60 to 0.12) to an increase of 0.30 (95 % CI 0.10 to 0.51) per 1000 births between the pre-pandemic and pandemic period. For the perinatal composite indicator, the change in inequality gap ranged from -0.47 (95 % CI -0.97 to 0.02) to 0.67 (95 % CI 0.23 to 1.11) per 1000 births. Nine Trusts were identified as positive deviants based on the presence of a reduction in the inequality gap for either or both maternal or perinatal composite indicators (four maternal, three perinatal, and two both). Ten Trusts were identified as potential comparators.

(Table 3..)

Qualitative interviews

We interviewed 20 participants from 6 positive deviant (PD) and 4 comparator Trusts. Sampling was based on response. Ten (36 %) were senior obstetricians (7 PD; 3 comparators), eight (33 %) were senior midwives (6 PD, 2 comparators) and two (10 %) were MVP chairs (PDs). Interviews were on average 52 min (range: 30 to 119 min).

Key impactful changes

Staffing: Increased resources and productive use of expertise

Staff were off sick, isolating, and shielding, meaning that other staff were being given new roles to cover those who could not work. Despite these stressors, the positive deviant Trusts reported benefits. Shielding staff ran maternity hotlines, helped translate continuously guidance into Trust policy, and did other tasks to free up hospital-based staff. Many services paused; more staff were available to cover wards. For some Trusts, this meant freeing up senior clinicians.

Table 2
Maternal and neonatal characteristics by pandemic period.

Characteristic	Maternal		Characteristic	Perinatal	
	Pre-pandemic N (%)	Pandemic N (%)		Pre-pandemic N (%)	Pandemic N (%)
Maternal age			Birth weight (median (IQR))	3,370 (665)	3,380 (665)
<20	28,027 (2.9)	14,125 (2.5)	Gestational age		
20–35	722,026 (73.8)	416,315 (73.6)	<37	46,084 (6.6)	22,280 (5.8)
35–45	225,238 (23.0)	133,681 (23.6)	37–41	653,794 (93.2)	360,642 (94.1)
>45	3,070 (0.3)	1,776 (0.3)	>41	1,293 (0.2)	449 (0.1)
Gestational age			Ethnicity		
<37	53,137 (6.9)	25,874 (6.0)	White	592,324 (73.7)	307,471 (72.4)
37–41	722,616 (93.0)	404,353 (93.9)	Mixed	51,595 (6.4)	28,046 (6.6)
>41	847 (0.1)	247 (0.1)	Asian	96,675 (12.0)	55,974 (13.2)
Ethnicity			Black	39,653 (4.9)	21,042 (5.0)
White	753,335 (77.0)	394,615 (76.1)	Other	23,924 (3.0)	12,144 (2.8)
Mixed	20,135 (2.1)	11,162 (2.2)	Socioeconomic deprivation		
Asian	112,226 (11.5)	63,087 (12.2)	1 = least deprived	101,131 (15.2)	57,994 (15.3)
Black	47,191 (4.8)	25,120 (4.8)	2	104,857 (15.7)	60,969 (16.1)
Other	45,502 (4.6)	24,593 (4.7)	3	146,533 (22.0)	82,789 (21.8)
Obstetric history			4	147,912 (22.2)	84,092 (22.1)
Primiparous	473,137 (48.1)	294,876 (52.1)	5 = most deprived	165,903 (24.9)	93,483 (24.7)
Multiparous (no CS)*	395,087 (40.4)	207,064 (36.6)			
Multiparous (CS)**	112,166 (11.5)	63,960 (11.3)			
Socioeconomic deprivation					
1 = least deprived	143,319 (15.3)	85,460 (15.8)			
2	154,347 (16.4)	91,299 (16.9)			
3	206,084 (22.0)	118,036 (21.8)			
4	207,869 (22.1)	118,929 (22.0)			
5 = most deprived	227,462 (24.2)	127,274 (23.5)			

* without previous cesarean delivery.

** with previous cesarean deliver.

Table 3
Trusts' characteristics – positive deviants versus comparators.

Characteristic	Positive deviants N (%)	Comparators N (%)	All Trusts N (%)
Size (number of births)			
Small (<3000)	0 (0.0)	0 (0.0)	35 (27.3)
Medium (3000–5000)	3 (33.3)	7 (70.0)	57 (44.6)
Large (>5000)	6 (66.7)	4 (40.0)	36 (28.1)
Location			
Rural	0 (0.0)	0 (0.0)	16 (12.5)
Urban	9 (100.0)	10 (100.0)	112 (87.5)
Level of neonatal care			

“there was one very Senior Obstetrician whom we had taken off all other responsibilities and just asked him to look after antenatal patients.. all these patients were getting a really, really sensible management plans” (Clinical Director, PD Trust 2)

More senior staff also provided support and reassurance to teams.

“[management] worked long days to make sure there was a senior presence within midwifery every day of the week... it was more of a solidarity” (Head of Midwifery, PD Trust 4)

Where there were not more senior staff available, Trusts instead spoke of having other expertise to cover shortages.

“General sonography levels were getting to the critical level, actually the midwife sonography team or foetal medicine team could flex up” (Clinical Director, PD Trust 3)

Comparator Trusts, conversely, described no positive side effect of staff changes, senior staff instead would more passively “step in” (Clinical Director, Comp Trust 4) as a necessity.

However, even for PDs, these positive effects only lasted the first few months of the pandemic. The opening of other services, rise of Covid cases, introduction of testing and isolation rules, and staff burnout, meant that staffing later became a challenge for all.

“During [the second lockdown] it was different, our midwifery and MSW staffing were really heavily affected, whereas in the first wave it wasn't” (Head of Midwifery, PD Trust 5)

Proactive, multidisciplinary decision making

PDs reported an early appreciation of the severity of Covid-19 and responded with confidence and expertise.

“I'm lucky enough to work in an organisation where I do have experts who are advising regionally and nationally as well” (Clinical Director, PD Trust 6)

This proactivity was not reflected in the comparator interviews.

“It's changing so fast, we're going to reflect what the College says.” (Head of Midwifery, Comp Trust 2)

PDs also described an increase in team working and communication.

“The divisional team and the charity team we were meeting three times a day” (Clinical Director, PD Trust 2)

“It was one of the best times of excellent MDT working... none of this, 'I'm a doctor,' 'I'm a midwife'” (Head of Midwifery, PD Trust 1)

Comparators spoke instead of decisions being led by either midwives or obstetricians, with some reports of disagreements. Both PDs and comparators spoke of the removal of barriers to making changes to care and gave multiple examples of positive changes that have remained in place since, such as home blood pressure monitoring, postnatal contraception, hub and spoke models, and increased consultation with MVPs. They also spoke about improved communication with women, that was initiated by the move of many consultations to the telephone:

“Even though we were supposedly reducing certain things...I think you had more communication with the women” (Head of Midwifery, PD Trust 1)

Many Trusts set up (or increased the capacity) of maternity helplines, online question and answer sessions, or email addresses for women to contact midwives about their concerns. One positive deviant Trust pioneered a Covid Surveillance programme, where Covid positive women were contacted daily by midwives, and this was later adopted by other Trusts we interviewed. One clinician theorised that this increase and flexibility in communication would have had a positive effect on inequalities, reducing the “variance in care” (Senior Obstetrician, PD Trust 1).

Reflections on reducing inequalities

Interviewees reported that the factors listed above were likely to impact all women, regardless of ethnicity, but considered why and how a reduction in these inequalities was achieved in this period. Staff reported increased discourse about inequalities and their potential consequences.

“[a Black midwife] said if I'm pregnant now I'd be really, really scared because it's all over the news that you're five times more likely to die in childbirth, you're five times more likely to lose your baby and you're five times more likely to have Covid... so I said so right so what are we doing about this (Head of Midwifery, PD Trust 1)

There was a reflection that there were many reasons that women from ethnic minority groups have worse outcomes, including having English as a second language, being from more deprived areas, and being more likely to have more complex pregnancies. Staff hypothesised that, in applying Covid restrictions flexibly according to the need of individuals, these vulnerable groups may have received comparatively better, and more personalised, care.

“You're talking about our ethnic minority groups, that's how we sort of made sure that they were safe by still bringing them in and having interpreters” (Clinical Director, PD Trust 5)

“Lots of our women in our area who are from an ethnic group are also from some of our more deprived areas, so they were automatically in the [specialist] teams” (Clinical Director, Comparator Trust 4)

“We sent out a lot of information to our staff that these were very high-risk patients and that they had to be protected” (Clinical Director, PD Trust 5)

Discussion

We found that proactivity, team working, and flexibility in approach to staffing may have been responsible for improvements in care during the first COVID wave. That many women from ethnic minority groups may have more complex pregnancies and are more likely to be stratified as high risk may have resulted in them benefitting more from these modifications, leading to a reduction in inequalities.

We had originally hypothesised that there may be specific service changes associated with a reduction in inequalities, but these were not identified. This reflects a recent report on the complexities of inequalities and the fact that systemic change is needed rather than specific interventions [18]. Instead, PD Trusts described proactivity; they showed pride in their reaction to the challenge, the strength of their team, and expertise of their colleagues. In contrast, comparators spoke of anxiety around rapid changes, and staff working in separate groups. The importance of positive working relationships, technical competence supported by internal structures, and effective coordination has been previously highlighted as important factors in maintaining safe maternity units [19] and reducing health inequalities [18]. The characteristics of effective healthcare teams have also been described and include a clear purpose, suitable leadership, effective team members, self-knowledge, trust, commitment and flexibility [20]; these were all clearly described by positive deviant Trusts. This indicates how prescribed specific changes from central organisations may not be as effective as the promotion of effective team working within institutions.

We identified shifting staffing roles as important, a finding echoed by Read et al in their qualitative exploration of the impact of COVID-19 [21]. While some Trusts found that there was an increase in staffing for a short period, PD Trusts all reported a more subtle advantage: the ability to place more senior staff in specific roles with direct impact on women's clinical care, enabling better adaptation to both women and their teams. This further indicates the importance of flexibility in leadership of healthcare teams and the value of human factors in periods of crises [22].

Flexibility and proactivity allowed enhanced care to remain in place for women with high-risk pregnancies or who are from vulnerable backgrounds, and women who needed interpreters were still seen face to face. This demonstrates that staff were reacting to concerns that remote consultations can lead to inequitable care, a finding also established in other recent research [18,23]. Staff reported that, in their Trusts, women from ethnic minorities were more likely to fall into these vulnerable groups. Thus, the service changes made to enable enhanced care to women with higher risk pregnancies may have been more likely to improve outcomes for women from ethnic minority groups, leading to the observed reduction in the inequality gap. This highlights the importance of improving care pathways for vulnerable women in maternity care [24].

A primary strength of this study is our positive deviance approach that has been previously employed in maternity care to capture contextual contributors to good outcomes [6]. We have been able to generate new hypotheses about how inequalities in maternal and perinatal outcomes may be reduced. A further strength is the involvement of our Women's Reference Group in all stages of the study, ensuring that the study remained grounded in the experience of women of different

ethnic groups who had given birth during the pandemic. The most important limitation is in the choice of the composite outcomes used to rank units, as the aggregation of outcomes in this way could have masked changes in the less common (but more serious) outcomes such as stillbirth. Furthermore, the units selected as PDs were predominantly large teaching hospitals based in cities, which may reflect differences in the statistical power of this study to detect change in units with higher and lower proportions of women from ethnic minority groups. However, these units may also be more likely to have more accumulated expertise and greater built-in team resilience which acted as a cushion mechanism when rapid changes imposed.

To conclude, we found that, during the initial year of the COVID-19 pandemic, some NHS Trusts were able to reduce ethnic inequalities in maternal and perinatal outcomes. These Trusts reported better team-working, more proactivity, more ownership over changes to services, and more flexibility in the use of staffing and other resources than comparator Trusts. Our findings suggest that these characteristics are important to drive improvement in care for women from ethnic minority groups in a time of great service change. We recommend that initiatives to reduce inequalities in maternal and perinatal outcomes for ethnic minority women prioritise interventions to strengthen clinical team-working and initiative in innovation and flexibility in individual maternity units, to enable improvements in care to benefit ethnic minority women. More work is needed to determine how this can be promoted and fostered.

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CRediT authorship contribution statement

Jemima Dooley: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Jen Jardine:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Buthaina Ibrahim:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Rohan Mongru:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation. **Farrah Pradhan:** Supervision, Resources, Project administration, Methodology. **Daniel Wolstenholme:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Erik Lenguerrand:** Writing – review & editing, Supervision, Methodology, Funding acquisition, Formal analysis, Data curation. **Tim Draycott:** Writing – review & editing, Supervision, Methodology, Funding acquisition. **Faye Bruce:** Writing – review & editing, Methodology, Funding acquisition. **Stamatina Iliodromiti:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.srhc.2024.100971>.

References

- Jardine J, Walker K, Gurol-Urganci I, Webster K, Muller P, Hawdon J, et al. Adverse pregnancy outcomes attributable to socioeconomic and ethnic inequalities in England: a national cohort study. *Lancet* 2021;398(10314):1905–12.
- Kenyon S, MBRACE team. MBRACE-UK Perinatal Mortality Surveillance Report, UK Perinatal Deaths for Births from January to December 2014. Department of Health Sciences: University of Leicester; 2016.
- Knight M, Bunch K, Tuffnell D, Banerjee A, Cox P, Cross-Sudworth F, et al. Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity. Oxford; 2021.
- Allotey J, Stallings E, Bonet M. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. *Br Med J* 2020.
- Knight M, Bunch K, Vousden N, Morris E, Simpson N, Gale C, et al. Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: national population based cohort study. *Br Med J* 2020;m2107:369.
- Liberati EG, Tarrant C, Willars J, Draycott T, Winter C, Chew S, et al. How to be a very safe maternity unit: an ethnographic study. *Soc Sci Med* 2019;223:64–72.
- Jardine J, Relf S, Magee LA, von Dadelszen P, Morris E, Ross-Davie M, et al. Maternity services in the UK during the coronavirus disease 2019 pandemic: a national survey of modifications to standard care. *BJOG* 2021;128(5):880–9.
- Herbert A, Wijlaars L, Zylbersztejn Aea. Data resource profile: hospital episode statistics admitted patient care (HES APC). *Int J Epidemiol* 2017;46:1093.
- Knight HE, Cromwell DA, Gurol-Urganci I, Harron K, van der Meulen JH, Smith GCS. Perinatal mortality associated with induction of labour versus expectant management in nulliparous women aged 35 years or over: An English national cohort study. *PLoS Med* 2017;14(11):e1002425.
- Murray J, Saxena S, Modi N, Majeed A, Aylin P, Bottle A, et al. Quality of routine hospital birth records and the feasibility of their use for creating birth cohorts. *J Public Health (Oxf)* 2013;35(2):298–307.
- Herman D, Lor KY, Qadree A, Horn D, D'Souza R. Composite adverse outcomes in obstetric studies: a systematic review. *BMC Pregnancy Childbirth* 2021;21(1):107.
- Knight HE, Oddie SJ, Harron KL, Aughey HK, van der Meulen JH, Gurol-Urganci I, et al. Establishing a composite neonatal adverse outcome indicator using English hospital administrative data. *Arch Dis Child Fetal Neonatal Ed* 2019;104(5):F502–9.
- Nair M, Kurinczuk JJ, Knight M. Establishing a national maternal morbidity outcome indicator in England: a population-based study using routine hospital data. *PLoS One* 2016;11(4):e0153370.
- Sandall J, Murrells T, Dodwell M, Gibson R, Bewley S, Coxon K, et al. The efficient use of the maternity workforce and the implications for safety and quality in maternity care: a population-based, cross-sectional study Health Services and Delivery Research. Southampton (UK)2014.
- Lain SJ, Algert CS, Nassar N, Bowen JR, Roberts CL. Incidence of severe adverse neonatal outcomes: use of a composite indicator in a population cohort. *Matern Child Health J* 2012;16(3):600–8.
- Roberts CL, Cameron CA, Bell JC, Algert CS, Morris JM. Measuring maternal morbidity in routinely collected health data: development and validation of a maternal morbidity outcome indicator. *Med Care* 2008;786–94.
- Barclay M, Dixon-Woods M, Lyratzopoulos G. The problem with composite indicators. *BMJ Qual Saf* 2019;28(4):338–44.
- Wadhawan M, Nguyen VZ, Linden B, Barry C, Abiola A. Summary report: digital apps and reducing ethnic health inequalities. NHS Race and Health Observatory 2023.
- Liberati EG, Tarrant C, Willars J, Draycott T, Winter C, Kuberska K, et al. Seven features of safety in maternity units: a framework based on multisite ethnography and stakeholder consultation. *BMJ Qual Saf* 2021;30(6):444–56.
- Stewart GL, Barrick MR. Team structure and performance: Assessing the mediating role of intrateam process and the moderating role of task type. *Acad Manag J* 2000; 43(2):135–48.
- Neal S, Stone L, Moncrieff G, Matthews Z, Kingdon C, Topilidou A, et al. Assessing safe and personalised maternity and neonatal care through a pandemic: a case study of outcomes and experiences in two Trusts in England using the ASPIRE COVID-19 framework. *BMC Health Serv Res* 2022.
- Royal College of Midwives. Making Maternity Services Safer: Solution Three. London, UK: Royal College of Midwives; 2021.
- Hinton L, Dakin FH, Kuberska K, Boydell N, Willars J, Draycott T, et al. Quality framework for remote antenatal care: qualitative study with women, healthcare professionals and system-level stakeholders. *BMJ Qual Saf* 2022.
- Heys S, Downe S, Thomson G. 'I know my place': a meta-ethnographic synthesis of disadvantaged and vulnerable women's negative experiences of maternity care in high-income countries. *Midwifery* 2021;103:103123.