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Title

Ethnic inequities in 6-8 week baby check coverage in England 2006-2021: a cohort study using the Clinical Practice Research Datalink

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Abstract

Background: Inequities in the coverage of 6-8 week maternal checks, health visitor reviews and infant vaccinations have been reported in England. Ethnic inequities in 6-8 week baby checks have not been studied nationally.

Aim: To examine the effect of maternal ethnicity on 6-8 week baby check coverage in England 2006-2021.

Design and Setting: Cohort study using electronic health records.

Methods: We calculated baby check coverage in 16 ethnic groups, by year and region, and risk ratios using modified Poisson regression. We calculated coverage and timing of baby checks in relation to maternal checks and infant vaccinations by ethnic group.

Results: Ethnic inequities in 6-8 week baby check coverage in England varied by year and region. Coverage increased 2006-07 to 2015-16, then stabilised to 80-90% for most groups. Coverage was lowest for Bangladeshi and Pakistani groups 2006-07 to 2011-12. In the West Midlands, coverage was lowest at 59% for four groups: Bangladeshi, Caribbean, African, and Any other Black, African or Caribbean background. In the North West, coverage was lowest for Bangladeshi (65%) and Pakistani (69%) groups. These patterns remained after adjusting for other factors, and persisted over time. Coverage was highest in those whose mothers received a maternal check and those who received at least one dose of 8 week infant vaccinations.

Conclusions: Coordinated action at the level of integrated commissioning boards, primary care networks and GP practices is required to better understand the reasons behind these inequities and redress the persistent disparities in 6-8 week baby check coverage.

Keywords

Ethnicity, 6-8 week baby check, 6-8 week maternal postpartum check, infant vaccination, primary health care, preventive care

How this fits in

A number of preventive care services for infants and mothers are scheduled in the 6-8 week period after birth. While ethnic inequities have been reported in the coverage of 6-8 week maternal checks, health visitor reviews and infant vaccinations in England, little is known about whether 6-8 week baby checks are similarly affected. This study examined the relationship between ethnicity and 6-8 week baby checks, using electronic health record data from 2006-2021. We found that ethnic inequities varied by year and region, with persistent inequities particularly affecting the Bangladeshi and Caribbean groups in the West Midlands and the Bangladeshi group in the North West in recent years. Across all ethnic groups, baby check coverage was highest for those who also received their 8 week vaccinations and whose mothers received a 6-8 week maternal check.

Introduction

Various preventive care services are provided in England for mothers and babies 6-8 weeks after birth. These include the 6-8 week baby check for physical examination (1), the 6-8 week maternal check for postnatal physical and mental health concerns (2), the 6-8 week health visitor review for breastfeeding, sleep and support at home (3), and the first infant vaccinations at 8 weeks.

GP practices, health visiting services, midwifery and other community health services aim to provide coordinated care for mothers and babies. However, in practice, there are local variations in commissioning and delivery as well as changes to funding and clinical guidance over time (2, 4). As a result, gaps and overlaps have been reported, leading to confusion for both service providers and parents during the postnatal period (5, 6).

Evidence of inequities in coverage by ethnicity have also emerged. Routine statistics showed that the odds of receiving a 6-8 week health visitor review was highest for 'White' infants compared to all other aggregated ethnic groups in 2018/19 and 2019/20, and the reverse was true for 'Black' infants (7). This was consistent across most regions. Lack of, and delays in, the coverage of 6-8 week maternal checks are also patterned by ethnicity, deprivation, maternal age and preterm birth (8, 9). Additionally, stark ethnic inequities have been identified in childhood vaccinations across England (10, 11). While a study in London found preliminary evidence for ethnic inequities in 6-8 week baby checks during the first year of the COVID-19 pandemic (12), ethnic inequities in baby checks provided by GPs are yet to be examined at a national level.

We examined the effect of maternal ethnicity on infants receiving their 6-8 week baby checks at a GP practice in England between 2006 and 2021. We used mother-baby linked electronic health records (EHRs) from GP and hospital data to estimate the percentage of infants born to mothers in each ethnic group receiving a 6-8 week baby check and how this varied by year and region. A secondary analysis described the relationship between coverage and timing of 6-8 week baby checks, 6-8 week maternal checks and 8 week infant vaccinations by ethnic group.

Methods

Study design

This observational cohort study used individual-level data spanning the financial years 2006-07 through 2020-21.

Data sources

We used data from the Clinical Practice Research Datalink (CPRD) Aurum primary care database May 2022, which included the CPRD Mother-Baby Link to link mother and baby records, and the CPRD Pregnancy Register to obtain pregnancy and birth related data. We derived ethnicity from CPRD data linked to Hospital Episode Statistics (HES) Admitted Patient Care (APC) data. We obtained other sociodemographic variables from linked Office for National Statistics (ONS) Index of Multiple Deprivation (IMD) and Rural-Urban Classification (RUC) data.

Study cohort

Children born after 1 January 2006 linked to their mothers using the CPRD Aurum Mother-Baby Link were the population eligible for this study. Follow-up began at birth and ended at the earliest of: de-registration from their GP practice, end of study period (31 March 2021), or death. Baby checks occurring at any time between 4-12 weeks after birth were identified to allow some leeway for CPRD's estimation of birth dates. Hence, we excluded children whose follow-up ended before 12 weeks of age. For the main analysis, we also restricted the eligible population to only those who were registered by 12 months of age (Figure 1). Some additional exclusions were applied due to small numbers in categorical variables or missing data. Before applying these exclusions, we explored whether data were missing completely at random by comparing those with missing and non-missing data by ethnic group and study outcomes.

Figure 1. Study cohort inclusions and exclusions

*Number of children excluded are not mutually exclusive.

Deriving study variables

We identified 6-8 week baby check and maternal check codes using code lists, expanding on previously published sources (8, 13, 14). Multiple codes recorded on the same date were de-duplicated. Further data cleaning is detailed in Box S1.

We chose maternal ethnicity as the explanatory factor of interest since maternal/parental ethnicity has a greater bearing on preventive care for babies than babies' ethnicity (15). We firstly identified ethnicity records in CPRD using an adapted code list from previously published sources (16-18). Where individuals had missing records or ethnicity coded as 'unknown' or 'not stated' in CPRD, we used their HES APC episode-level ethnicity data. Where individuals had multiple ethnicity records, we used an algorithm to identify a single most plausible ethnic category (19, 20). We used the ONS England and Wales Census disaggregated ethnicity classification system, with the exception of the Gypsy and Irish Traveller, Arab and Roma ethnic groups as group sizes were too small for analyses and the representativeness of these ethnic groups in EHRs was a concern (see Box S1 for further information). We therefore included 16 ethnic groups and an 'Unknown' group.

Other study variables derived from the linked dataset included are detailed in Figure 2 and Box S1.

Statistical analysis

We report coverage by ethnic group (the percentage of children born to mothers in each ethnic group that received a 6-8 week baby check) overall, stratified by year, and stratified by region. If a region contained ethnic group(s) with <5 children who had not received a baby check, we excluded this entire region from analyses involving regional stratification. We then stratified by both year and region to describe trends over time, and excluded ethnic groups within each region and year that had <5 children who had not received a baby check.

Using risk ratios from modified Poisson modelling with robust standard errors, we calculated the average (total) effect of maternal ethnicity on receiving a baby check. As there was effect modification by region (likelihood ratio test $p < 0.001$), we reported risk ratios stratified by region, comparing each ethnic group to the English, Welsh, Scottish, Northern Irish or British group (hereon referred to as the White British group) in that same region. While exploration of effect modification by both region and year was initially planned, ethnic group sizes were too small to proceed.

We constructed a directed acyclic graph (DAG) informed by the existing evidence to guide statistical modelling (Figure 2) (21-29). We ran two models: one without variable adjustment, and one with multivariable adjustment for all measured sociodemographic and maternal/birth related factors.

To address our secondary research question, we described the percentage of children in each ethnic group that received a baby check stratified by whether their mothers received a maternal check, and whether they received at least one dose of an 8-week infant vaccination. We calculated the proportion of children who received their baby check on the same day as an infant vaccination and/or their mother's maternal check.

We conducted sensitivity analyses by replicating the above on a cohort of children registered by 4 weeks of age to determine whether delayed retrospective coding of 6-8 week baby checks by GP practices affected the findings.

Further methodological detail is included in Box S1 and published in a related study (11).

Figure 2. Directed acyclic graph (DAG) for the effect of maternal ethnicity on 6-8 week baby checks in England

Results

Cohort characteristics

Of the 1,339,494 eligible children, 1,283,165 (96%) were included in the main analysis, and 747,967 (56%) in sensitivity analysis. Maternal ethnicity was largely representative of the general population of women of child-bearing age (15-49 years) and infants at the time of 2011 Census (Table 1) (30), as were most other sociodemographic, maternal and birth factors (Table S1). There was a slightly lower proportion of children born preterm in our study cohort. North East, East Midlands and Yorkshire and The Humber were excluded from analyses involving regional stratification due to small group sizes. There were no notable differences in patterns of missing data between ethnic groups or between those who did and did not receive baby checks.

Table 1. Distribution of ethnicity in the study cohort compared to the general population of England

	Reference population %	**Main analysis n (%)****	**Sensitivity analysis n (%)****
		N = 1,283,165	N = 747,967
Maternal ethnicity*			
English, Welsh, Scottish, Northern Irish or British	74.8	877,583 (68.4)	525,349 (70.2)
Irish	0.8	6,757 (0.5)	3,784 (0.5)
Any other White background	6.9	118,485 (9.2)	69,537 (9.3)
Indian	3.1	41,418 (3.2)	22,726 (3)
Pakistani	2.4	39,020 (3)	21,351 (2.9)
Bangladeshi	0.9	17,411 (1.4)	10,359 (1.4)
Chinese	1.1	9,904 (0.8)	5,202 (0.7)
Any other Asian background	2.1	31,833 (2.5)	17,364 (2.3)
Caribbean	1.3	12,964 (1)	5,904 (0.8)
African	2.5	53,582 (4.2)	26,391 (3.5)
Any other Black, African or Caribbean background	0.6	8,410 (0.7)	4,074 (0.5)
White and Black Caribbean	0.8	8,433 (0.7)	4,237 (0.6)
White and Black African	0.3	4,952 (0.4)	2,505 (0.3)
White and Asian	0.6	4,171 (0.3)	2,337 (0.3)
Any other Mixed or multiple ethnic background	0.6	8,493 (0.7)	4,503 (0.6)
Any other ethnic group	0.7	25,860 (2)	14,110 (1.9)
Unknown	N/A	13,889 (1.1)	8,234 (1.1)

Denominator is number of children

* Reference population: Women aged 15-49 years in England at the time of the 2011 Census

** Main analysis = registered with a CPRD GP practice by 12 months of age; Sensitivity analysis = registered with a CPRD GP practice by 4 weeks of age.

6-8 week baby checks by maternal ethnicity, year and region

The effect of ethnicity varied over time and by region. Coverage increased between 2006-07 and 2015-16, then stabilised between approximately 80% and 90% across the rest of the study period for most ethnic groups (Figure S1, Table S2).

However, between 2006-07 and 2010-11, a much lower proportion of children born to mothers of Bangladeshi (e.g. 52% compared with 68% in the White British group in 2006-07) and Pakistani (e.g. 56% in 2006-07) ethnicity received the baby check. This gap between Pakistani and Bangladeshi groups and other ethnic groups was even greater in the sensitivity analysis (Figure S2, Table S3).

By region, lower coverage and greater disparities between ethnic groups were observed in the West Midlands and the North West (Figure S3, Table S4). In the West Midlands, baby check coverage was the lowest for four ethnic groups where only 59% of babies received the check: Bangladeshi, Caribbean, African and Any other Black, African or Caribbean background, (RR 0.74, 95%CIs ranging from 0.7-0.8 compared to White British; Figure 3, Figure S3, Table S4, Table S6). In contrast, coverage was 80% in the White British group. In the North West, baby check coverage was lowest for the Bangladeshi (65%, RR 0.83, 95%CI 0.8-0.86 compared to White British) and Pakistani ethnic groups (69%, RR 0.88, 95%CI 0.85-0.9). Coverage was 79% in the White British group. These patterns were similar in sensitivity analysis (Figure S2, Table S3, Figure S4, Table S5, Figure S5, Table S7) and remained consistent after adjusting for sociodemographic, maternal and birth factors (Figure S6, Table S8, Figure S7, Table S9).

In the West Midlands and North West, ethnic inequities persisted over time (Figure 4, Table S10). For example, the Bangladeshi and Caribbean groups still had lower coverage than White British in the West Midlands in 2020-21 (71.2% coverage, 95%CI 62.4-79.9% for Bangladeshi and 70.8%, 95%CI 58-83.7% for Caribbean groups compared with 89.3%, 95%CI 88.4-90.1% for the White British group). In the North West, coverage in the Bangladeshi group improved in the mid-2010's then declined again in recent years (e.g. 68.4% coverage, 95%CI 60.5-76.3% in 2020-21 compared with 87.8%, 95%CI 87-88.6% in the White British group).

Figure 3. Average (total) effect of maternal ethnicity on 6-8 week baby checks, accounting for effect modification by region (comparing each ethnic group with the White British reference group in the same region)

Figure 4. 6-8 week baby check by maternal ethnic group, region and year of vaccination

Data points for ethnic groups within each region and year with <5 children who had not received a baby check have been removed.

6-8 week baby checks, maternal checks and infant vaccination

6-8 week maternal check coverage was lower than baby checks, between 58 and 68% across ethnic groups. Pakistani (58%) and Any other Black, African or Caribbean background (60%) had the lowest maternal check coverage (Table S11, S12).

Baby check coverage was lower for those whose mothers did not receive a maternal check, particularly for the Caribbean group. Baby check coverage was also lower in those who did not receive at least 1 dose of an infant vaccination, particularly for the Pakistani group (Figure 5, Figure S8). Across all ethnic groups, the gap in baby check coverage was wider between children who did and did not receive infant vaccination than between children whose mothers did and did not receive maternal checks.

Of babies receiving a 6-8 week check, approximately three-quarters received at least one other service on the same day (Figure S9, S10). This was consistent across ethnic groups, with slight differences in the proportion of each ethnic group receiving different combinations of services on the same day. For example, the Pakistani group had the lowest proportion of babies and mothers receiving their 6-8 week checks on the same day (24% compared with 35% in the White British group). Bangladeshi and Any other White Background had the lowest proportion of babies receiving their baby check on the same day as infant vaccination (25%), though this was similar to that of the White British group (26%).

Figure 5. 6-8 week baby check coverage by ethnic group, stratified by receipt of maternal checks and infant vaccination

Discussion

Summary

Ethnic inequities in 6-8 week baby check coverage in England has varied across time and by region. Overall, a lower proportion of babies born to mothers of Bangladeshi and Pakistani ethnicity received a 6-8 week baby check than other ethnic groups between 2006-07 and 2010-11 (e.g. 52% and 56% compared with 68% in the White British group in 2006-07). In the West Midlands, coverage was lowest for four ethnic groups: Bangladeshi, Caribbean, African and Any other Black, African or Caribbean background (59% compared with 80% for White British). In the North West, this was the case for Bangladeshi and Pakistani ethnic groups (65% and 69% compared with 79% for White British). These patterns remained consistent after adjusting for sociodemographic factors and maternal and birth factors, and persisted over time, particularly for the Bangladeshi and Caribbean groups in the West Midlands and the Bangladeshi group in the North West.

Three-quarters of babies who received a 6-8 week check also received an infant vaccination and/or maternal check (for their mother) on the same day. Babies in all ethnic groups were less likely to receive a check if their mothers did not have a maternal check, or if they did not receive at least 1 dose of an infant vaccination. This affected some ethnic groups slightly more than others.

Strengths and limitations

This is the first study to use EHRs to examine ethnic inequities in 6-8 week baby check coverage across England. Given the large size of the CPRD Aurum and linkage of mother and baby records, we were able to examine maternal ethnicity at a disaggregated level to provide more granular findings than previous studies (31). Examining maternal ethnicity also has greater potential to inform public health action as parental ethnicity has a greater bearing on infants' preventive care utilisation than the ethnicity of the infant itself (15).

Baby check coverage is not monitored nationally, so it is difficult to determine whether overall trends (e.g. increase in prevalence) is an artifact of improved clinical coding or improved coverage. Future studies of 6-8 week checks should also consider study designs that better represent regions like North East, East Midlands and Yorkshire and The Humber, as well as Arab, Roma, and Gypsy and Irish Traveller ethnic groups.

Comparison with existing literature

The scarce existing evidence on 6-8 week preventive care services used aggregated ethnic groups, so it is difficult make comparisons to the current study. Babies from 'Black' ethnic groups are least likely to receive health visitor checks (7), and during the pandemic, lower baby check coverage was found for the 'Black Other' group compared to 'White British/Irish' in London (12); this was also the case in our study for baby checks in the West Midlands.

Implications for research and practice

While the inclusion of 6-8 week baby checks and maternal checks as essential services in the NHS England General Medical Services contract in 2020/21 is a welcome change to boost coverage overall (4, 32, 33), funding for GPs alone is unlikely to redress the persistent ethnic inequities in coverage. Given regional disparities and the lack of evidence on why some ethnic groups are more affected by inequities in preventive care checks, localised action is required to better understand and redress the modifiable factors that drive these inequities.

For example, there may be a lack of clarity for parents on the purpose of each of the various preventive care services during this 6-8 week period (5, 6), particularly when information about services may have been provided in ways that were not responsive to language, cultural, religious and gender preferences, health literacy levels and digital access (15). Providing such information at an inopportune time during this stressful early infancy period also makes it challenging for parents to make informed decisions (11), and may lead to parents seeking information and reassurance outside of the NHS. These factors could have so been compounded by GP access barriers and mistrust of health services affecting some ethnic groups more than others (34), including factors that affect trust and decision-making from pregnancy through to early childhood, such as the increased risk of infant mortality in babies born to Caribbean, African, Pakistani and Bangladeshi mothers which has been documented nationally and specifically in the West Midlands (35). Better understanding of these complex, interwoven and context-specific factors will help to ensure co-production of effective strategies to boost coverage for specific minority ethnic communities, including the tailoring of programmes that have been

successfully implemented in other services and settings, such as providing information through trusted community leaders and co-locating services in community spaces (36).

Additionally, given findings that baby check coverage is higher in those who received another preventive care service, local health services need a better understanding of whether and why different models of service delivery (e.g. joint appointments, longer appointments) could act as a facilitator or barrier for preventive care access in some ethnic groups. The effectiveness of the disparate commissioning and service delivery arrangements across the country for these preventive care checks could be evaluated, and integrated commissioning boards and primary care networks could support GP, health visitor and midwifery services to review how the various perinatal services are offered to families in their locality, whether the purpose of these appointments are clearly communicated for families from diverse language, cultural and religious backgrounds (15), whether gaps still remain in meeting infants' health needs and addressing parents' concerns at the 6-8 week time point, and what can be done within their specific contexts to ensure equity of access and coverage.

Finally, the paucity of evidence and lack of comparability between studies and routine statistical reports calls for a unified approach to using ethnicity classification systems in research and monitoring, as well as standardised methods for coding preventive care checks in primary care.

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Ethical approval

This study (protocol number 21_000716) was approved through the Clinical Practice Research Datalink (CPRD) Research Data Governance process. All data used in this study were provided by the CPRD, and cannot be shared with other researchers. Researchers must seek approval from CPRD to access this data for the purposes of their own research. This study is based in part on data from the CPRD obtained under licence from the UK Medicines and Healthcare products Regulatory Agency. The data is provided by patients and collected by the NHS as part of their care and support. The interpretation and conclusions contained in this study are those of the authors alone. Linked data were also provided by the Office for National Statistics (ONS). ONS and Hospital Episode Statistics (HES) data © (2021) were re-used with the permission of The Health & Social Care Information Centre. All rights reserved.

Competing interests

We declare no competing interests.

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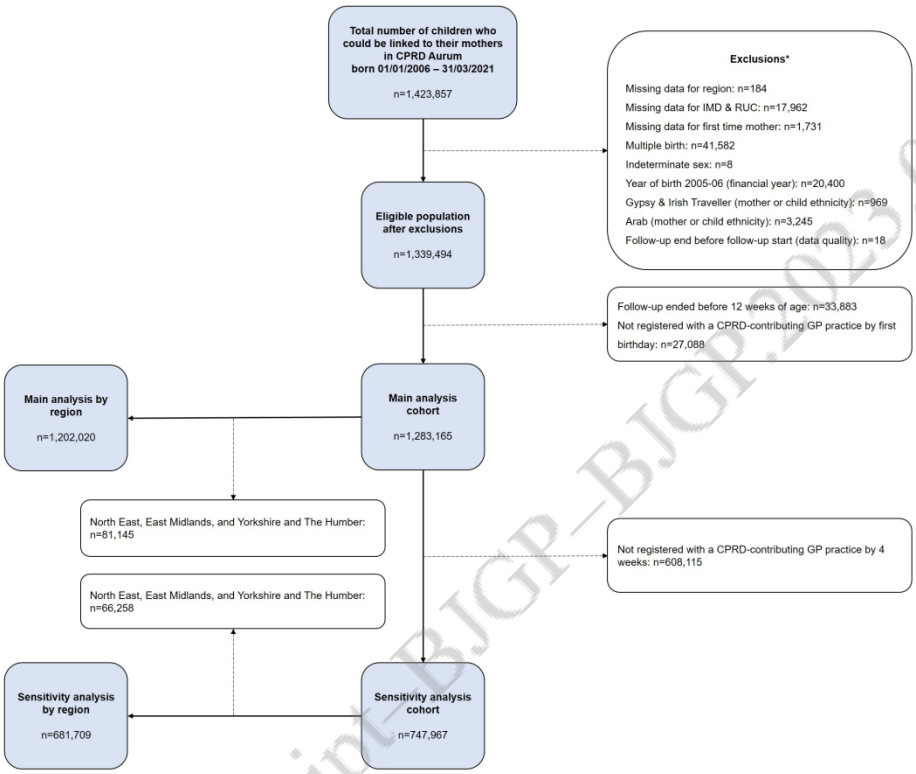

Figure 1. Study cohort inclusions and exclusions

402x336mm (150 x 150 DPI)

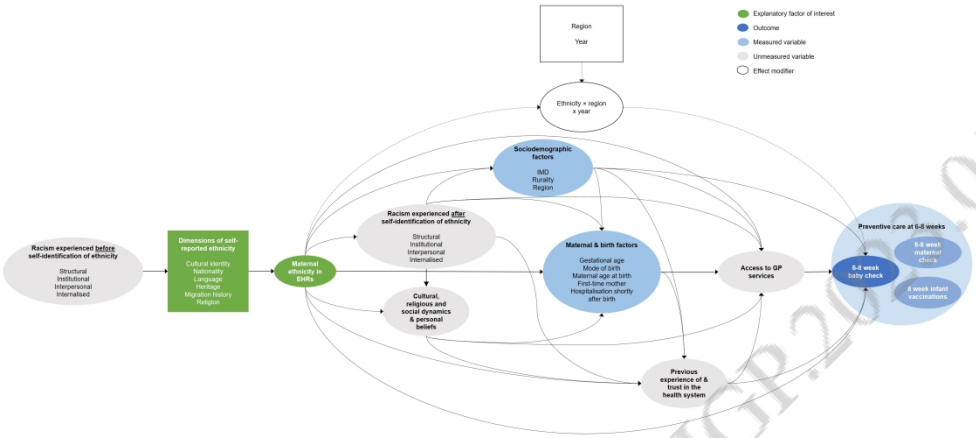

Figure 2. Directed acyclic graph (DAG) for the effect of maternal ethnicity on 6-8 week baby checks in England

717x357mm (150 x 150 DPI)

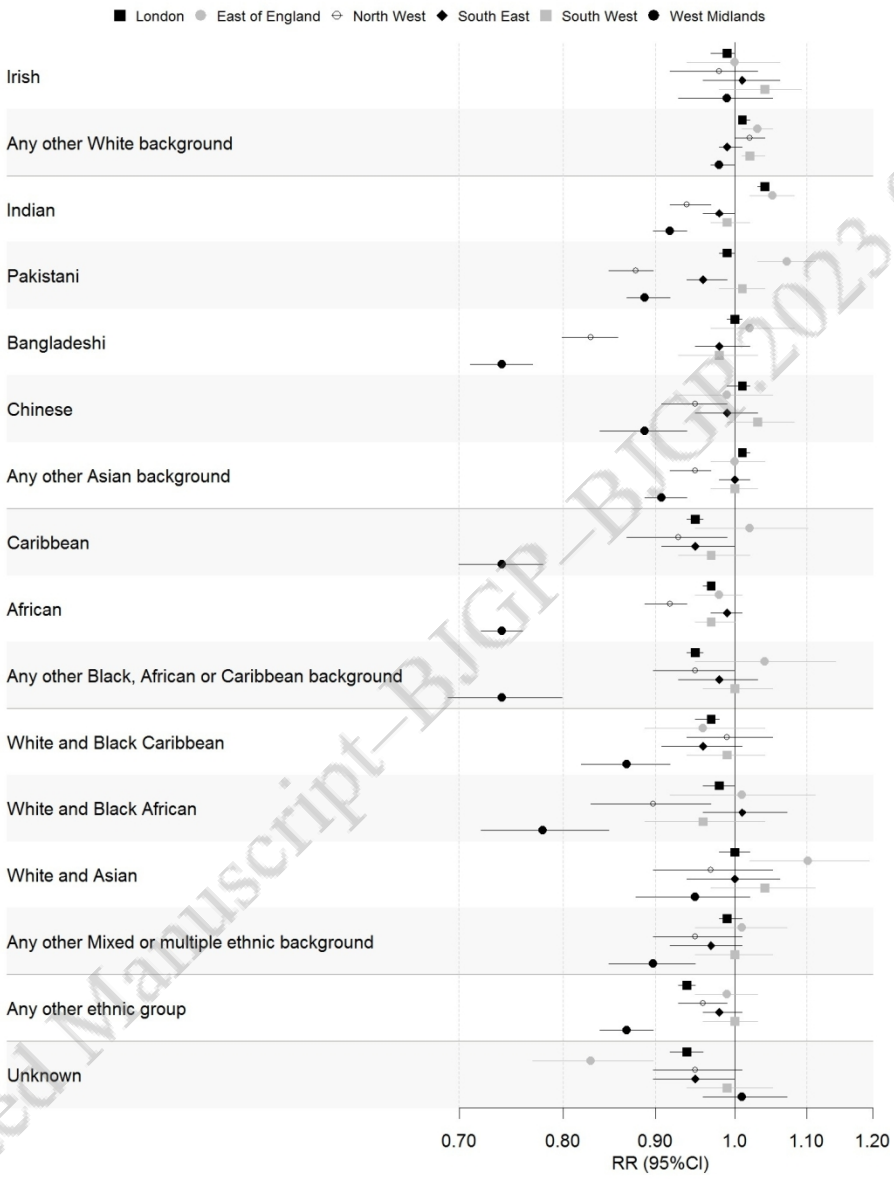

Figure 3. Average (total) effect of maternal ethnicity on 6-8 week baby checks, accounting for effect modification by region (comparing each ethnic group with the White British reference group in the same region)

396x529mm (96 x 96 DPI)

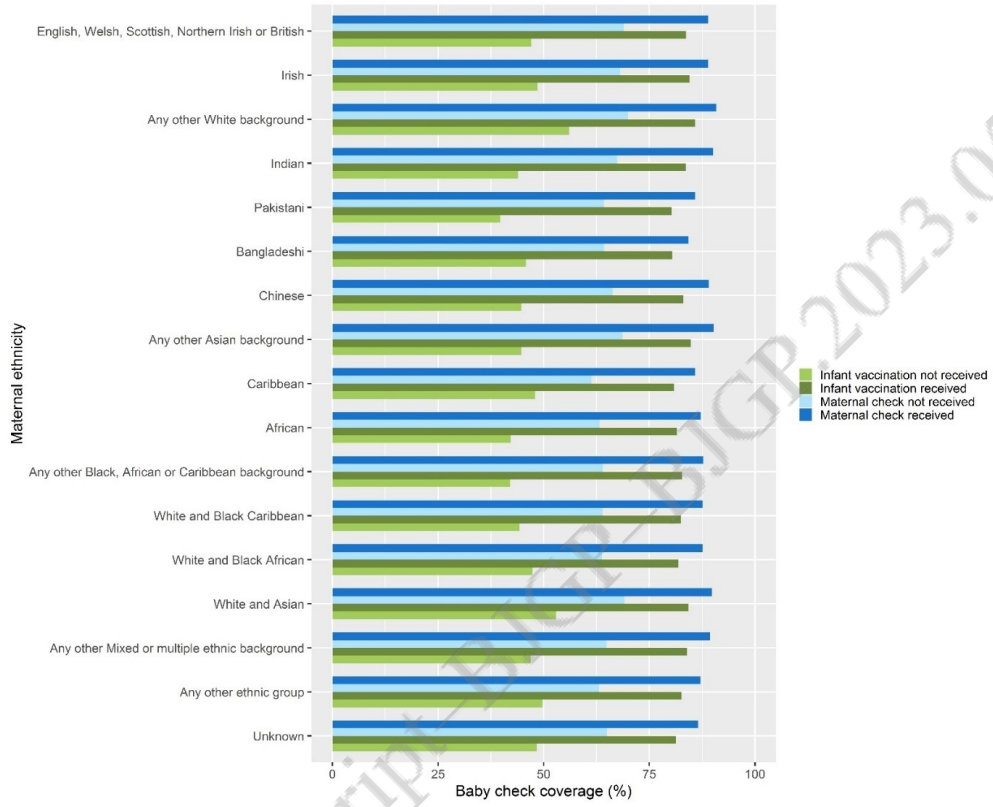

Figure 5. 6-8 week baby check coverage by ethnic group, stratified by receipt of maternal checks and infant vaccination

159x132mm (220 x 220 DPI)