

Exploring the relationship between socio-economic disadvantage and severe maternal morbidity in England, using an exploratory factor analysis (EFA)

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Introduction

In England it has been shown that deprivation is a risk factor for both maternal mortality and severe maternal morbidity(SMM) [1, 2]. In the current literature, deprivation has been measured using a composite measure, the Index of Multiple Deprivation (IMD) and it is currently unclear which aspects of this measure are driving any increased risk in an adverse maternal health outcome. It has also been shown that women from a minoritised ethnic group have a greater risk of both maternal mortality and SMM and are more likely to live in deprived areas [2, 3]. It is also unknown which aspects of deprivation are most associated with ethnicity and how these aspects may modify the risk of SMM between different ethnic groups.

Objectives

- To perform a factor analysis (EFA) to explore the relationship between the different aspects of deprivation and how theses aspects are associated with SMM.
- To explore whether the association between these aspects of deprivation and SMM are consistent across different ethnic groups

Methods

Study design: Population based cohort study
Database: Hospital episode Statistics Admitted Patient Care (HES APC)
Population: Every woman who gave birth from 1st January 2013 to 23rd March 2023, in hospital, in England
Exposure: The composite IMD and new factors from the EFA
Outcome: Composite SMM defined using the modified English Maternal Morbidity Outcome Indicator (EMMOI)
Statistics: Exploratory factor analysis (EFA) and multilevel Poisson regression modelling

Results

4,040,106 births in England 2013-2023 SMM rate **1.77%**

Factor 1: Traditional socioeconomic status(SES) included income, employment and education

Factor 2: Urban deprivation included air pollution , road traffic accidents, household overcrowding, homelessness, English language proficiency, geographical barriers (reversed ranking)

Risk of SMM (95% CI) exploratory factor analysis

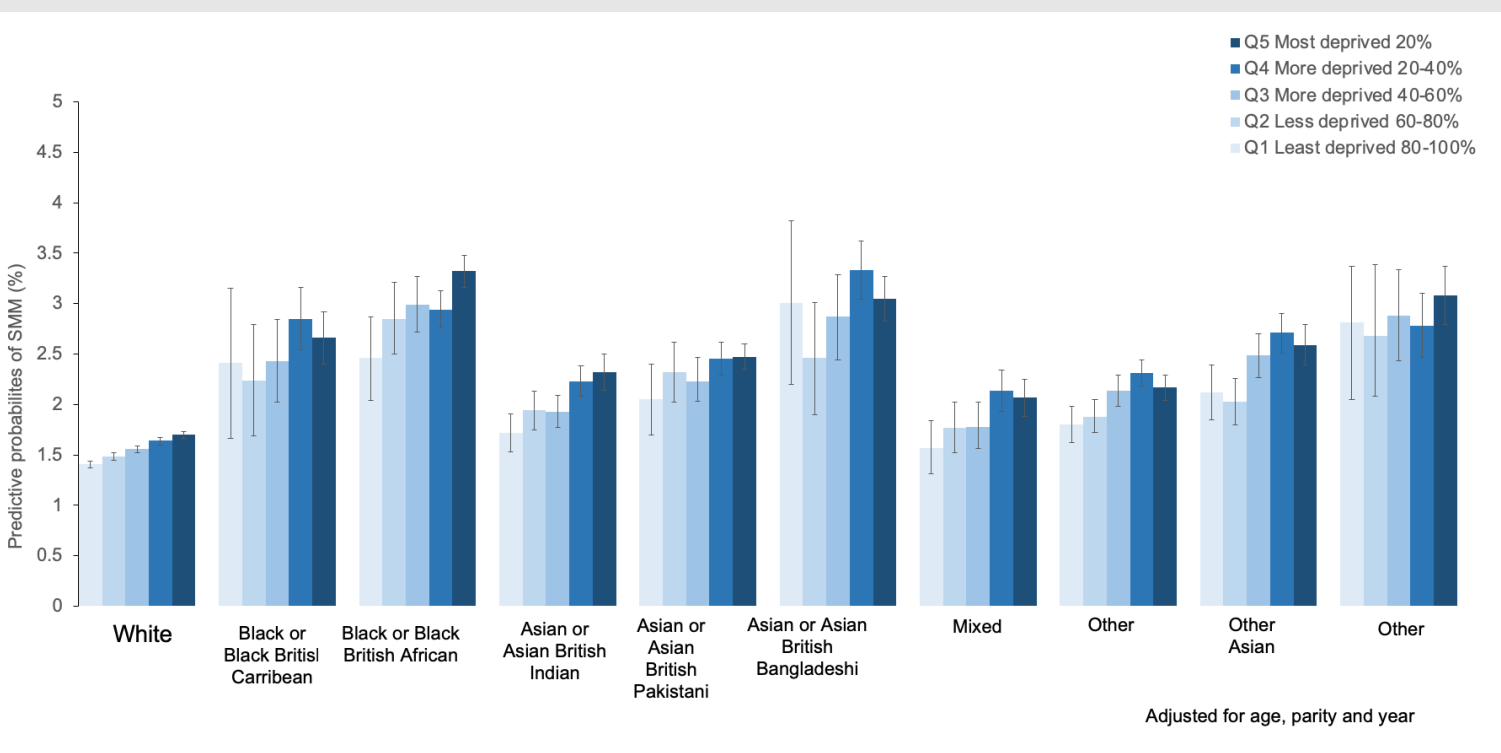
Risk of SMM (95% CI) Composite IMD

Composite IMD		
	Total	Incidence SMM (%)
Deprivation quintile		
1 (Least deprived)	580,065	8.79(1.1-52)
2	650,469	10.56(1.62)
3	737,849	12.82(1.74)
4	869,377	16.29(1.87)
5 (Most deprived)	1001406	18.95(1.89)

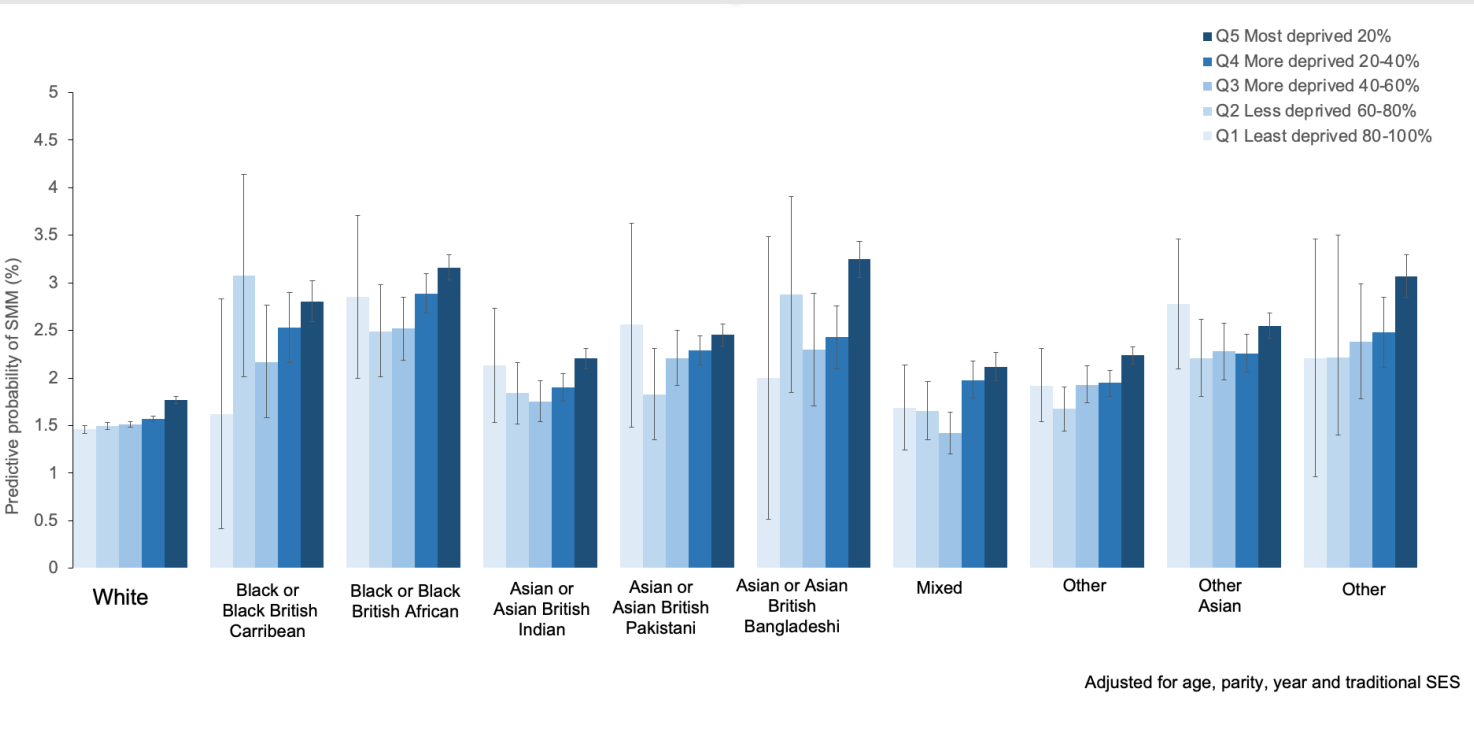
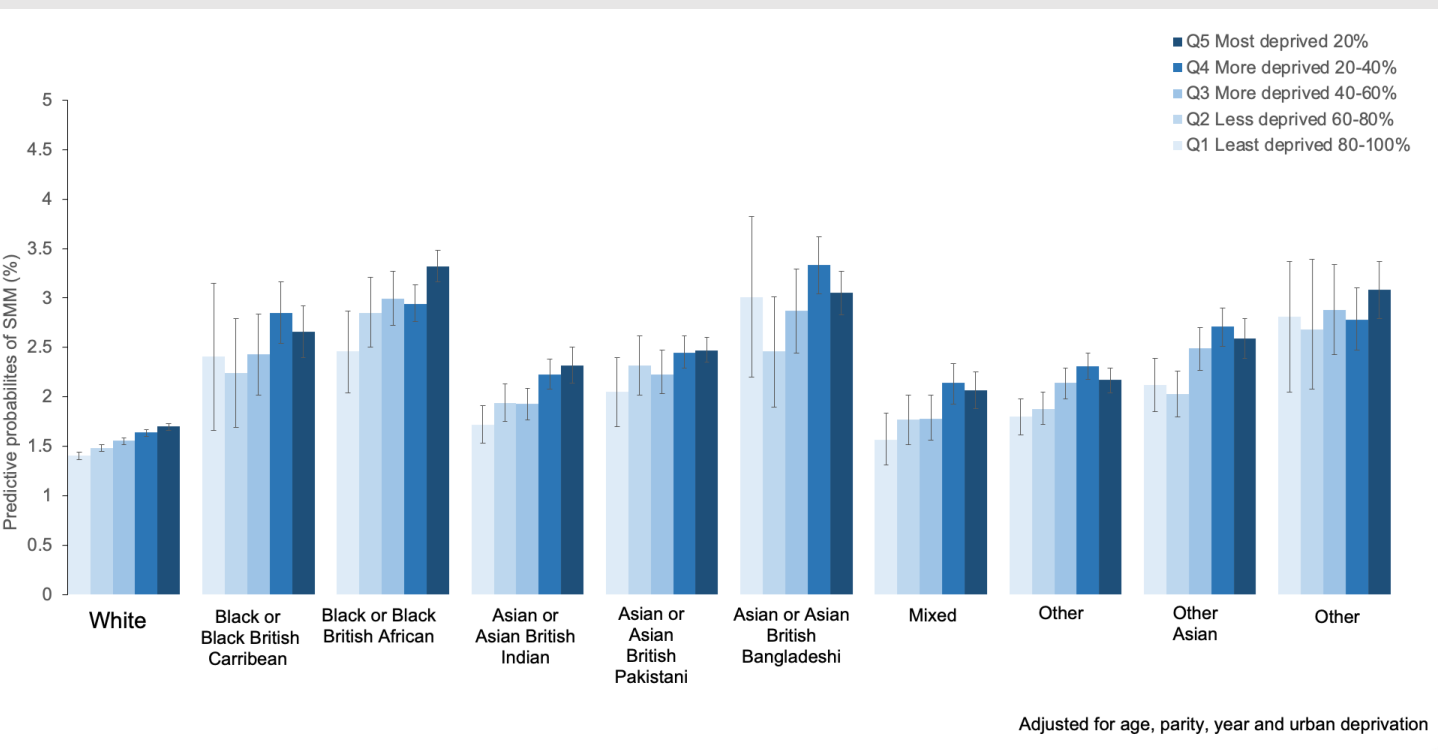
Traditional SES		
	Total	Incidence SMM (%)
Deprivation quintile		
1 (Least deprived)	467,020	7.70(1.62)
2	725,081	12.62(1.71)
3	838,144	15.52(1.82)
4	906,446	17.55(1.86)
5 (Most deprived)	1011997	18.00(1.75)

Urban deprivation		
	Total	Incidence SMM (%)
Deprivation quintile		
1 (Least deprived)	426,171	6.46(1.49)
2	677,218	10.49(1.53)
3	786,176	12.51(1.56)
4	945,153	16.57(1.72)
5 (Most deprived)	1129970	25.36(1.22)

Adjusted predictive margins (95% CI) of SMM in each ethnic group and composite IMD deprivation quintiles



Adjusted predictive margins (95% CI) of SMM in each ethnic group and exploratory factor analysis deprivation quintiles



Discussion

- Across the whole study population, both Traditional Socio-economic Status (SES) and Urban Deprivation are associated with SMM, although the greatest risk is seen in the areas with the highest amount of Urban Deprivation, even after adjusting for area-level Traditional SES.
- Being from a minoritised ethnicity is a greater risk factor than living in a deprived area, and deprivation does not have a pronounced dose response relationship in minoritised ethnic groups.

Strengths and limitations

- Large population-based study representative of 98% of English births and routinely collected data therefore limiting selection or reporting bias
- Socio-economic disadvantage only reported at neighbourhood level therefore risk of misclassification if used as a proxy for individual disadvantage

Conclusion

More research is needed exploring the individual versus neighbourhood effects of disadvantage in order to ascertain which resources should be targeted to reduce SMM

References

1. Felker, A. and Knight, M. (2024), MBRRACE-UK update: Key messages from the UK and Ireland Confidential Enquiries into Maternal Death and Morbidity 2023. Obstet Gynecol, 26: 27-31.
2. Geddes-Barton D, Ramakrishnan R, Knight M, Goldacre R. Associations between neighbourhood deprivation, ethnicity and maternal health outcomes in England: a nationwide cohort study using routinely collected healthcare data. J Epidemiol Community Health. 2024 Jun 4.
3. Vousden N, Bunch K, Kenyon S, Kurinczuk JJ, Knight M. Impact of maternal risk factors on ethnic disparities in maternal mortality: a national population-based cohort study. The Lancet Regional Health–Europe. 2024 May 1;40.