

Joint contribution of socioeconomic circumstances and ethnic group to variations in birth outcomes in England and Wales

Charles Opondo, Ron Gray, Jennifer Hollowell, Yangmei Li, Jennifer J Kurinczuk, Maria A Quigley

NIHR Policy Research Unit in Maternal Health and Care, National Perinatal Epidemiology Unit, Nuffield Department of Population Health, University of Oxford, Old Road Campus, Headington, Oxford OX3 7LF

Introduction

The rates of adverse birth outcomes have declined steadily over the last several decades all over the world. However, stark disparities in birth outcomes persist across ethnic groups and socioeconomic strata. This study sought to describe the variation in risks of adverse birth outcomes across ethnic groups and levels of socioeconomic circumstances, and to explore the role of socioeconomic circumstances in explaining ethnic variations in birth outcomes.

Methods

Data

This was a retrospective cohort study of all singleton live births at gestational age of 22 weeks or more in England and Wales. The Office for National Statistics provided us with linked data relating to births that occurred between 1 January 2006 and 31 December 2012. Data on 4,744,666 infants were available in the linked data set, but after excluding infants with outlier or missing birthweights and gestational ages, 4,634,932 infants were included in the study.



Outcome and exposure variables

Outcomes of interest were: neonatal death, defined as a death from any cause occurring within the first 28 days of life; infant death, defined as a death from any cause occurring before the first birthday; and preterm birth, defined as a birth occurring before 37 completed weeks of gestation. The main explanatory variable was ethnic group of the infant as recorded in the NHS Numbers for Babies (NN4B) notification system, based on the list of ethnic categories used in the 2001 Census in England and Wales. Socioeconomic circumstances were considered a potential mediator of the association between ethnicity and birth outcomes.

Analysis

The analysis was conducted in two steps:

- slope index of inequality (SII) and the relative index of inequality (RII) were estimated to describe the differences in birth outcomes across index of multiple deprivation (IMD);
- structural equation modelling (SEM) was used to test indirect effects through IMD in the effect of ethnicity on birth outcomes.

Acknowledgements

We thank Bliss, the Race Equality Foundation, Sands, and the Lullaby Trust for their helpful involvement in the Patient and Public Involvement (PPI) consultation for this project. We also thank Alison MacFarlane, Hiranthi Jayaweera and Nirupa Dattani for their input during the planning and writing up of this study.

This poster reports on an independent study which was funded by the NIHR Policy Research Programme in the Department of Health and Social Care, England (grant 108/0001). The views expressed are not necessarily those of the Department.

Results

Cohort characteristics

Ethnic group of infant, n (%)		IMD decile, n (%)	
White British	3,009,231 (64.9)	1 (most deprived)	662,767 (14.3)
White (other)	340,526 (7.4)	2	598,259 (12.9)
Indian	132,651 (2.9)	3	541,795 (11.7)
Pakistani	180,269 (3.9)	4	489,932 (10.6)
Bangladeshi	62,948 (1.4)	5	439,270 (9.5)
Black Caribbean	47,505 (1.0)	6	422,908 (9.1)
Black African	154,076 (3.3)	7	388,665 (8.4)
Mixed or other ethnic group	419,970 (9.1)	8	382,585 (8.3)
Ethnic group not stated	287,756 (6.2)	9	366,851 (7.9)
		10 (least deprived)	341,900 (7.4)
Sex of infant, n (%)		Year of birth, n (%)	
Male	2,377,766 (51.3)	2006	631,705 (13.6)
Female	2,257,166 (48.7)	2007	646,902 (14.0)
		2008	663,918 (14.3)
Mother's age in years, mean (SD)	29.0 (6.0)	2009	659,807 (14.2)
Mother's country of birth*, n (%)		2010	671,265 (14.5)
UK	3,507,324 (75.7)	2011	675,075 (14.6)
Not UK	1,127,465 (24.3)	2012	686,260 (14.8)
Neonatal mortality, n (per 1,000)	9,638 (2.1)		
Infant mortality, n (per 1,000)	15,001 (3.2)	Preterm birth (<37 weeks), n (%)	258,515 (5.6)
*Excludes 143 infants whose mother's country of birth is unclear or not stated			
IMD, Index of Multiple Deprivation			

Table 1: Characteristics of the 4,634,932 infants born in England and Wales between 2006 and 2012

Variation in birth outcomes across IMD and ethnic groups

	Neonatal mortality	Infant mortality	Preterm birth
Index of inequality across IMD			
Slope index	1.48 (1.35 – 1.60)	2.66 (2.50 – 2.82)	2.15 (2.10 – 2.21)
Relative index	2.05 (1.92 – 2.18)	2.29 (2.17 – 2.41)	1.47 (1.46 – 1.49)
Proportion of total variance:			
within ethnic group (crude)	2.7%	3.1%	0.7%
explained by IMD (crude)	30.1%	34.0%	28.2%
explained by IMD (adjusted*)	25.8%	27.3%	35.1%
*adjusting for mother's age, mother's country of birth, registration type, year of birth and sex of child			

Table 2: Slope and relative indices of inequality (bootstrap 95% confidence intervals), and amount of variation in birth outcomes across ethnic groups explained by IMD

Indirect effects of ethnic group on birth outcomes

	Neonatal mortality	Infant mortality	Preterm birth
White British	[comparison group]	[comparison group]	[comparison group]
White (other)	–	-20.1% (-35.9 to -4.4)	-8.8% (-9.5 to -8.0)
Indian	14.7% (8.5 to 20.1)	21.0% (10.4 to 31.6)	29.7% (19.9 to 39.4)
Pakistani	14.0% (11.3 to 16.7)	13.9% (12.2 to 15.6)	–
Bangladeshi	–	40.0% (24.4 to 55.2)	–
Black Caribbean	13.4% (10.5 to 16.3)	16.8% (13.0 to 20.7)	19.3% (17.0 to 21.5)
Black African	18.6% (14.1 to 23.1)	22.6% (18.5 to 27.0)	78.2% (64.2 to 92.2)
Mixed or other	–	–	–
Not stated	1.6% (0.8 to 2.3)	2.5% (0.6 to 4.4)	–
Indirect effects are differences relative to the comparison group; they were not calculated in groups and outcomes where there was no evidence of an unadjusted effect of ethnicity on socioeconomic circumstances or of an adjusted effect of socioeconomic circumstances on birth outcome			

Table 3: Relative indirect effect of ethnic group on birth outcomes, with 95% confidence intervals

Conclusions

Further reductions in adverse birth outcomes in England and Wales could be facilitated by interventions that reduce overall social inequality as this appears to be an important driver of variation in outcomes across ethnic groups. Such interventions must broaden their focus beyond health outcomes alone, and must aim to improve the totality of life circumstances among groups who experience the poorest outcomes.

Citation

Opondo C, Gray R, Hollowell J, Li Y, Kurinczuk JJ, Quigley MA. (2019) Joint contribution of socioeconomic circumstances and ethnic group to variations in preterm birth, neonatal mortality and infant mortality in England and Wales: a population-based retrospective cohort study using routine data from 2006 to 2012. BMJ Open 9(7):e028227. doi:10.1136/bmjopen-2018-028227

