Evaluating the Influence of Social Determinants of Health on Pre-term Births in regional NHS Trusts

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1. Introduction

Pre-term birth (PTB) is defined as any birth prior to 37 weeks of gestation. Extreme severity is 22- < 28 weeks, high severity is 28 - < 34 weeks and moderate severity is 34 - < 37 weeks. It's linked to poor physical and mental health in both mothers and babies, while straining the NHS work force and finances costing £3.4 billion per annum.

Social determinants of health (SDoHs) are non-medical factors that influence an individual's health, healthcare outcomes and well being. According to Keiger's eco-social theory of disease, SDoHs can influence a person's likelihood of receiving medical assistance, their lifestyle and their likelihood of being victim to healthcare provider bias. Addressing them improves patient outcomes.

This project looked at ethnicity and deprivation quintile as SDoHs adjusted for maternal age. **Women < 20 y/o and ≥ 45 y/o are more likely to have a PTB**, due to physical maturity, predisposition to more gestational illness and medical conception intervention (Figure 1). **Women from more deprived areas are more likely to have PTBs** due to poor health, lessened healthcare access and stress. **Women of colour (black Caribbean women) are more likely to have pre-term births due to predisposition to gestational illnesses**, antenatal disruptions and perceived or actual provider racial bias.

This project's **aim is to evaluate which SDoH has the greatest impact on PTB outcomes and develop a prescriptive profile of the most at-risk group** to give to a region's NHS trusts to be on the lookout for.

Figure 1 – infographic representation of graph showing the effect of MA on PTB

Figure 2 – infographic representation of graph showing the effect of DQ on PTB

2. Methods

PTB data extracts were analysed, via pivot tables which were translated into graphs of the PTB rates. **Confidence intervals were calculated** and added to the graphs to display reliability of datasets.

R-Studio was used to create maps according to former Clinical Commission Group (CCG) boundaries to spatialise actual vs expected PTB rates in the region

3. Key Findings

3.1. Isolated Analysis

Initially, individual analysis of each SDoH **follows the trend observed by literature for both deprivation quintile (DQ) and maternal age (MA).**
However, there's a deviation from the literature in ethnicity data, skewing more towards **white women and South Asian women having the highest PTB rate and black women being the least likely to have a PTB.** This deviation was determined to likely be due to the ethnic demographics of the analysed region.
The majority of PTBs were of moderate severity and medical indicated

3.3. Granular Analysis

When the SDoHs were observed more specifically, it was seen that **black mothers had a high severity PTB rate 142% higher than their white counter parts. (Figure 6)**

Furthermore, analysis of the birthing category showed that these **black mothers had a high severity spontaneous PTB rate 73.8% higher than a medically indicated.**

Analysis of these women's DQ yielded that women in a DQ 2 area were most at risk, closely followed by DQ3 and DQ5. And mothers in their 30s were more at risk for a high severity PTB.

3.4. Spatialised Analysis

The expected and actual data for the high severity PTB rate of each CCG were calculated via indirect standardisation. They were then spatialised and placed on a map of the region and **areas with a larger black population had an actual high severity PTB rate than much higher than the expected**. Areas of a greater white population that had this same trend were more deprived

3.2. Intersectional Analysis

The SDoHs were intersected, it was observed that when DQ and MA were observed together, **DQ didn't influence their PTB rate until about 25 y/o and lost its influence at 45 y/o, but the general trend surrounding MA remained relevant.** (Figure 3)

When ethnicity and MA were observed together, **MA only influenced the PTB of white and Asian mothers** (Figure 4). **A similar effect was observed when ethnicity and DQ were analysed together**. (Figure 5)

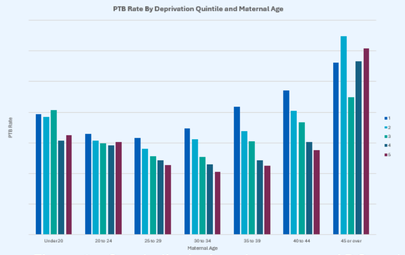

Figure 3 – Graph displaying observance of DQ and MA

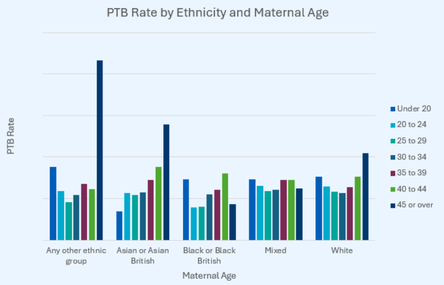

Figure 4 – Graph displaying observance of ethnicity and MA

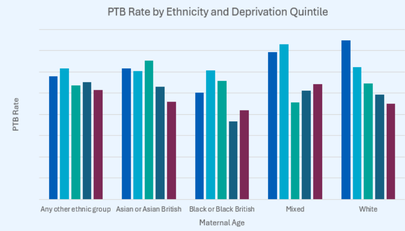

Figure 5– Graph displaying observance of ethnicity and DQ

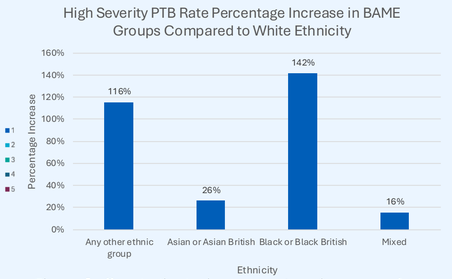

Figure 6– Graph displaying percentage increase of HS PTB rate in BAME groups compared to white counterparts.

4. Concluding Thoughts

From the analysis, it can be determined that **ethnicity seems to be the factor that determines whether women of colour have a PTB (especially of high severity), while for their white counterparts, deprivation seems to have the greatest bearing on their PTB outcomes**. Black mothers are at greater risk for many gestational illnesses *i.e.* eclampsia and this may be the causality for why they are more likely to have a high severity PTB, have a spontaneous PTB (which is linked to medical emergency) and have it while being the age category where they should likely be less likely for one. Further inquiry to see what can be done to mitigate this should be made, but this investigation suggests that healthcare **professionals should take a closer look at black mothers in their 30s with a higher risk for gestational illness as a profile for those most at risk.**

References

Esposito et al. (2022), *BMC Pregnancy and Childbirth;* Henderson et al. (2016), *BMJ Open;* House of Lords (2024), *House of Lords;* Kayode et al. (2024), *BMC Medicine;* Mayo Clinic (2024), *Mayo Clinic;* Saleemi (2021), *NHS England;* Society for Maternal-Fetal Medicine et al. (2024), *American Journal of Obstetrics and Gynecology;* Tommy's (2024), *Tommy's;* University of Bristol (2024), *University of Bristol;* World Health Organization (2019), *World Health Organization*