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Using linked data and family studies to understand multigenerational causes of low birthweight among Australian Aboriginal infants

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Introduction

Low birthweight is common among Aboriginal infants. Birthweight is correlated across generations due to the transmission of genetic and environmental factors. Another cause may be fetal programming, where a fetus' response to a hostile environment leads to poor adult health and, in turn, a poor uterine environment for her offspring.

Objectives and Approach

Identifying a causal relationship between maternal birthweight and offspring birthweight is difficult. However, we can gain insights by approaching the question from several different angles, including family studies involving both parents and cousins who share maternal grandparents. Family studies using linked data are possible with data from Western Australia (WA), the only Australian state with a database of family relationships.

We used linked birth, hospital, mental health, and family relationship records of 12,865 Aboriginal singletons born 1998 to 2011 in WA whose mother also linked to a WA birth record from 1980 onwards, and their parents' records.

Results

17% of births were small for gestational age. Using a linear regression model with a generalised estimating equation approach for offspring birthweight z-score (BWZ), the coefficient for maternal BWZ was 0.17 (95% CI: 0.14, 0.20), compared to 0.13 (95% CI: 0.10, 0.16) for paternal BWZ. The difference in coefficients (0.03 [95% CI: -0.01, 0.08]) provides only limited support for the fetal programming hypothesis. Other associations with offspring BWZ were much larger, including maternal smoking (-0.39 [95% CI: -0.45, -0.34]). After restricting the sample to cousins with shared maternal grandparents (fixed-effects model), the mother-offspring association was fully attenuated (-0.01 [95% CI: -0.07, 0.05]), suggesting transmission of maternal genetic and environmental factors alone can explain the association, though the 95% confidence interval was wide.

Conclusion/Implications

If fetal programming is an important cause of low birthweight, Aboriginal people would be disproportionately affected, following generations of low birthweight and chronic disease. However, the family studies indicate fetal programming has a limited role compared to other risk factors in the current pregnancy.

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