Improving pregnancy and birth outcomes among Aboriginal and Torres Strait Islander women through reductions in preterm birth

Introduction

This study identifies and measures the relationship between preterm birth and various exposure or distal factors among Aboriginal and Torres Strait Islander women who gave birth in Australia during 2018–2022, and what proximate or intermediate factors mediate between the distal factors and preterm birth or the outcome variable.

The study also investigates whether and how any of these intermediate factors can be modified to reduce the incidence of preterm birth and related adverse pregnancy and birth outcomes such as stillbirths, low birthweight and neonatal mortality.

Background to the study

Improving health outcomes of Australian children is a high priority for all levels of government. In 2008, the Council of Australian Governments (COAG) committed to various strategies and targets to close various socioeconomic and health gaps, including the life expectancy gap, between Indigenous and non-Indigenous Australians (COAG 2008).

In 2020, the Joint Council on Closing the Gap updated the 2008 Closing the Gap targets to include two new outcomes to ensure that "Aboriginal and Torres Strait Islander children are born healthy and strong" and "Aboriginal and Torres Strait Islander children thrive in their early years"(Joint Council on Closing the Gap 2020).

The latter two outcomes have targets to increase the proportion of Aboriginal and Torres Strait Islander children born with a healthy birthweight and the proportion of Aboriginal and Torres Strait Islander children assessed as developmentally on track in all five domains of the Australian Early Development Census (Joint Council on Closing the Gap 2020).

However, despite overall improvements in infant and child mortality over the last 2 decades for all Australian babies and for babies born to Aboriginal and Torres Strait Islander mothers, disparities remain between Aboriginal and Torres Strait Islander and non-Indigenous babies in the proportion of low birthweight babies, stillbirths, neonatal deaths as well as infant and child mortality (AIHW 2018a). Preterm birth is the key risk factor in all these adverse pregnancy and birth outcomes.

Preterm birth is a birth before 37 completed weeks of gestation. During 2018–2022, 12% of Aboriginal and Torres Strait Islander babies were born preterm compared to 8% of non-Indigenous babies. Preterm birth is a major public health, obstetric healthcare and economic problem and a significant contributor to perinatal morbidity, mortality, as well as to short-term and long-term disability, including cerebral palsy, mental retardation, respiratory problems and vision impairment (AIHW 2021; Chang et al. 2014; da Fonseca et al. 2020; Di Renzo et al. 2018; Howson et al. 2013; Newnham et al. 2017).

There is a very close association between preterm birth and low birthweight. Most preterm births are also of low birthweight, and one cannot reduce the incidence of one without also reducing the incidence of the other. Babies are born with low birth weight because of prematurity, poor intrauterine growth or both. Almost all very low-birth-weight babies are premature or extremely premature (Jin 2015).

Between 2018 and 2021, over 72% of all low birthweight babies born in Australia were preterm, while nearly 60% of all preterm babies were of low birthweight. On the other hand, of all babies that were born at or after full term, only 28% were of low birthweight. On the flip side, of all babies born with a healthy birthweight, only 4% were born preterm.

Both preterm birth and low birthweight have similar implications for the survival as well as the short-term and long-term health of babies born preterm or with low birthweight. Like preterm birth, low birthweight is also implicated in several serious infancy childhood diseases and conditions, such as the need for special care in neonatal intensive care units, being protected against infection, and getting enough nutrition. Both preterm and low birthweight babies may also experience future developmental delays (Hack et al. 1995; Jin 2015).

Source of data

Data for this study are from the National Perinatal Data Collection (NPDC) which is compiled by the Australian Institute of Health and Welfare from perinatal data collections (PDCs) received from each of the six states and two territories in Australia. Each jurisdictional PDC covers all pregnancies that result in a live birth or a stillbirth of at least 20 weeks' gestation or with a birthweight of at least 400 grams. The section of the NPDC data used for this study cover nearly 60,000 Aboriginal and Torres Strait Islander and 1.2 million non-Indigenous mothers who gave birth in Australia during the period 2018–2022

The NPDC contains information on four key areas: (i) Demographics and geography; (ii) Antenatal period; (iii) Labour and birth; and (iv) Baby outcomes. The demographic and geographic information include area level variables such as state or territory of residence, state or territory of baby's birth, socioeconomic index of mother's geographic location (SEIFA), mother's Accessibility/Remoteness Index of Australia (ARIA), and individual level characteristics such as maternal age, marital status, total number of pregnancies, total number of pregnancies resulting in a live birth, previous stillbirths, and parity.

Information collected in the remaining three key areas include maternal health characteristics and modifiable health risk factors such as body mass index, smoking and alcohol consumption during pregnancy, pre-existing diabetes, chronic hypertension, antenatal care, pregnancy complications including gestational diabetes, pregnancy-induced hypertensive disorders labour complications, labour induction and delivery, and baby outcomes.

The NPDC further contains information on sex of baby, plurality, birthweight, gestational age at end of pregnancy, and baby outcomes including stillbirth, live birth and neonatal death.

Methods

Two analytical methods were used in this study. First, logistic regression was used to model the risk factors or the predictors associated with preterm birth, low birthweight, stillbirths and neonatal mortality, at the individual level. The model estimated the adjusted odds of each binary outcome (e. preterm birth or not a preterm birth) occurring at varying levels of different characteristics in the study population. Each outcome variable was modelled separately.

Second, the Population Attributable Fraction (PAF) was used to measure the contribution of individual risk factors to each of the outcome variables at the population level. The PAF can be interpreted as the proportion of the outcome (e.g., preterm birth) that could be prevented if there had been no exposure to a particular risk factor, such as diabetes or smoking during pregnancy (AIHW 2021; Mansournia & Altman 2018; WHO 2020).

An initial set of predictors was selected based on evidence from the scientific literature. Bivariate analysis was then carried out to test the significance of each of the selected predictors in relation to each outcome variable.

Following Utz (2014) and adopting a modification of the "mediation approach" used by McHale et al. (2022), multivariate analysis was caried out using a nested approach. The explanatory variables or predictors were organised into four groups, and entered into the model sequentially or in "steps", as shown below, according to the chronological order in which they were expected to impact on the pregnancy and birth outcomes.

- Step 1. Distal factors, or the underlying characteristics of the mother: Indigenous status, socioeconomic index of mother's geographic location (SEIFA) and mother's Accessibility/Remoteness Index of Australia (ARIA)
- Step 2. Factors that are likely to be present at the onset of the pregnancy, including maternal demographic characteristics (maternal age), modifiable lifestyle and health characteristics (body mass index, smoking, alcohol consumption, pre-existing diabetes, chronic hypertension, pregnancy history (previous pregnancies, previous stillbirths, parity etc.)
- Step 3. Factors that are likely to arise during the pregnancy, including pregnancy complications (gestational diabetes, pregnancy-induced hypertensive disorders), gestational age at first antenatal care visit, smoking, alcohol consumption etc.
- Step 4. Factors which are determined at the end of the pregnancy, including birth status (live birth/stillbirth), duration of gestation (preterm or not preterm), birthweight, number of antenatal care visits and sex of baby.

Such an approach, as demonstrated by Utz (2014), allows each set of predictors to be assessed before and after the inclusion of other predictors.

Preliminary findings

Our analysis shows that preterm birth was the single most important risk factor associated with various adverse pregnancy and birth outcomes among Indigenous women. Indigenous babies born preterm were nearly 31 times as likely to be of low birthweight, 21 times as likely to not have a healthy birthweight, nearly eight times to be a stillbirth and nearly 7 times to experience neonatal death compared to babies not born preterm.

Babies born to Aboriginal and Torres Strait Islander women were up to 30% as likely to experience preterm birth, low birthweight, stillbirth and neonatal mortality as babies born to non-Indigenous women. Indigeneity does not however wholly account for the difference in the specified pregnancy and birth outcomes between babies born to Indigenous and non-Indigenous women in the specified pregnancy and birth outcomes.

The relationship between adverse pregnancy and birth outcomes among Aboriginal and Torres Strait Islander women is mediated through a number of distal factors, such as socioeconomic status and geographical location, and modifiable maternal risk factors, such as maternal age, body mass index, smoking during pregnancy, maternal health conditions (e.g., pre-existing diabetes, chronic hypertension) and antenatal behaviour, such as gestational age at first antenatal care visit and number of antenatal care visits.

Our preliminary findings show that smoking during pregnancy is the single most important predictor of preterm birth, and together with preterm birth, are the two most important risk factors associated with the remaining adverse pregnancy and birth outcomes.

Preliminary results from the PAF analysis show that up to about one-half of low birthweight and perinatal and neonatal mortality could be prevented if preterm births were eliminated, while a similar proportion of perinatal mortality and neonatal mortality would also be eliminated if low birthweight were prevented. This finding underlines the close relationship between preterm birth and low birthweight, and the need to tackle the risk factors for both simultaneously.

In addition, all the distal and proximate factors in the various models together could explain only up to 50% of the incidence of preterm birth and the other adverse pregnancy and birth outcomes. This finding points to other risk factors that have not been identified or measured.

Analysis is continuing to identify other unmeasured distal and proximate factors that may be contributing to the occurrence of preterm birth, low birthweight, still births and neonatal mortality among Aboriginal and Torres Strait Islander babies in Australia.

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