

OBSTETRICS

What birthweight percentile is associated with optimal perinatal mortality and childhood education outcomes?

Ellie C. McEwen, BMedSci (Hons I); Steven L. Guthridge, MPhil; Vincent YF. He, PhD; John W. McKenzie, PhD; Thomas J. Boulton, MBChB, MD; Roger Smith, MBBS, PhD

BACKGROUND: Small for gestational age, defined as birthweight <10th percentile for gestational age, is known to be associated with clinically meaningful impairments in health and development. The effects of variation within the normal range of birthweight percentile on perinatal mortality and childhood education remain less well defined.

OBJECTIVE: We sought to quantify the association among birthweight percentile, perinatal mortality, and educational outcomes and to determine the optimal birthweight percentile for those outcomes in Aboriginal and non-Aboriginal Australian children.

STUDY DESIGN: This was a retrospective cohort study. Perinatal data for all children born in the Northern Territory, Australia, from 1999 through 2008 were linked to measures of educational attainment at age 8–9 years. Multivariable analysis was used to determine the optimal birthweight percentile for low perinatal mortality and high reading and numeracy scores.

RESULTS: The birth cohort contained 35,239 births (42% Aboriginal), of which 11,214 had linked and valid education records. Median birthweight percentile was 29.2 in Aboriginal infants and 44.0 in non-Aboriginal infants. The odds of perinatal mortality decreased by 4% with each 1-percentile increase birthweight percentile overall (adjusted odds ratio, 0.96; $P = .000$) and lowest mortality rates were at the 61st and 78th

percentile in Aboriginal and non-Aboriginal infants, respectively. Although birthweights <10th percentile were associated with greatly increased odds of perinatal mortality, the increased risk extended well beyond this cut-off. Birthweight percentile was also positively correlated with scores in reading ($P = .000$) and numeracy ($P = .000$). In non-Aboriginal children, reading and numeracy scores peaked at the 66th percentile, but for Aboriginal children there was continuous benefit with increasing birthweight percentile. Birthweight percentile explained 1% of the variation in education outcomes, with much greater variation explained by other perinatal and sociodemographic factors.

CONCLUSION: Birthweights between the 50th–93rd percentiles were most consistently associated with both low perinatal mortality and high reading and numeracy scores, suggesting that small for gestational age does not sufficiently capture the risks associated with variation in fetal growth. Our data indicate that the effect of birthweight percentile accounts for 1% of variation in perinatal and education outcomes.

Key words: Aboriginal, Australia, birthweight, birthweight percentile, data linkage, education, fetal growth, indigenous, National Assessment Program—Literacy and Numeracy, Northern Territory, numeracy, perinatal mortality, pregnancy, reading, school, small for gestational age

Introduction

Small for gestational age (SGA) (<10th percentile) is the outcome of a spectrum of influences on fetal growth and well-being that includes, but is not limited to, maternal malnutrition, placental pathology, and maternal exposure to stress, smoking, and alcohol consumption during pregnancy.¹ The short- and long-term outcomes for infants born SGA has been documented since 1967,² and range from perinatal morbidity and mortality to developmental delays, poor academic achievement, mental illness, and non-communicable diseases.^{3–6} The outcomes associated with variation of fetal growth

within the normal range (>10th percentile) is less clear. Although it has long been recognized that fetal growth is a continuum with no precise at-risk cut-off, clinicians and researchers continue to dichotomize fetal growth. Recent studies have shown unambiguous variation in perinatal mortality rates across the entire spectrum of fetal growth, suggesting the existence of an optimal birthweight for gestational age and challenging the dichotomization paradigm.^{3,4} Whether or not an optimal birthweight could be applied across different populations is heavily debated,^{7,8} but results of the INTERGROWTH-21st project suggest that fetal growth patterns are highly comparable between different populations when maternal conditions are optimal.⁹

In common with many indigenous and disadvantaged peoples worldwide, in Australia, Aboriginal and Torres Strait Islander people (hereafter referred to respectfully as Aboriginal Australians) experience higher rates of health and

socioeconomic disadvantage compared to the wider population.^{10,11} The negative impacts of colonization, structural violence, and the historical removal of children of mixed ethnicity on current Aboriginal health and well-being are now widely acknowledged.¹⁰ Australian governments, at both national and state levels, have identified focus areas to improve Aboriginal outcomes, including infant mortality, early childhood development, and education.¹² Studies have identified the critical importance of early childhood development on long-term outcomes and economic burden,¹³ but one area that remains less explored is the possible role of fetal growth and development in the perpetuation and intergenerational transmission of disadvantage through poor health and education.

The aim of this study was to examine the association between birthweight percentile and: (1) perinatal mortality and (2) education in Aboriginal and

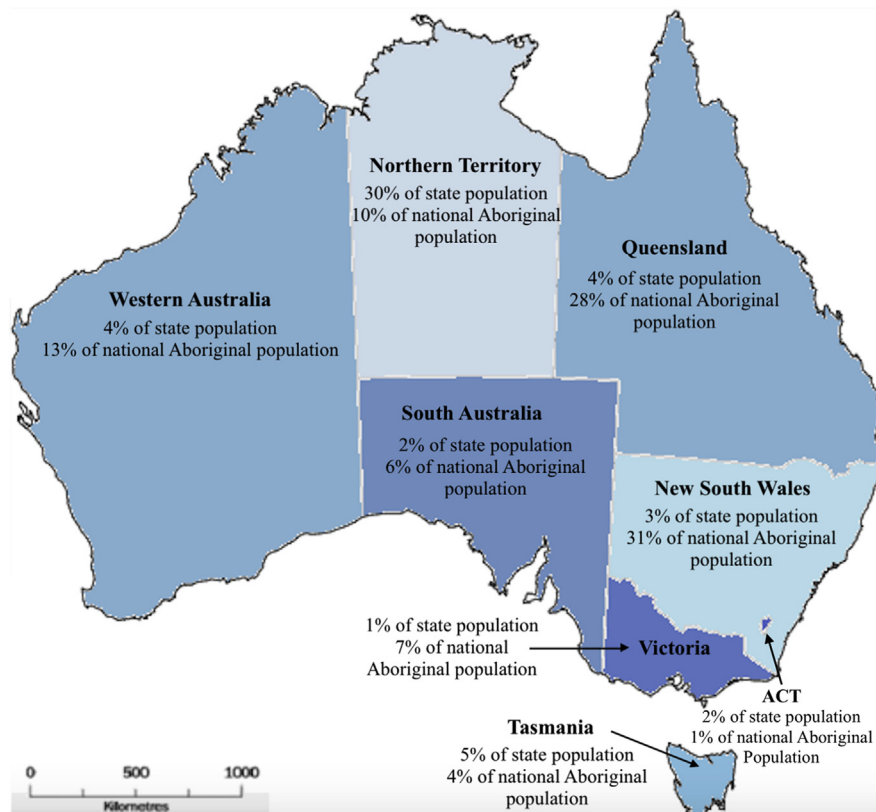
Cite this article as: McEwen EC, Guthridge SL, He VYF, et al. What birthweight percentile is associated with optimal perinatal mortality and childhood education outcomes? *Am J Obstet Gynecol* 2017;volume;x:ex-x.ex.

0002-9378/\$36.00

© 2017 Elsevier Inc. All rights reserved.

<https://doi.org/10.1016/j.ajog.2017.11.574>

FIGURE 1
Percentage of Aboriginal Australians by state and territory



Percentages are expressed as proportion of total state population and as proportion of national Aboriginal and Torres Strait Islander population. Total Australian population was 22,620,600 in 2011. Of population, 1% resided in Northern Territory, 32% in New South Wales, 25% in Victoria, 20% in Queensland, 11% in Western Australia, 7% in South Australia, 2% in Tasmania, 2% in Australian Capital Territory. Generated using data from Australian Bureau of Statistics Census of Population and Housing, 2011.

ACT, Australian Capital Territory.

McEwen et al. Birthweight percentile: perinatal mortality and childhood education. *Am J Obstet Gynecol* 2017.

non-Aboriginal Australian children, with the hypothesis that optimal outcomes would occur in infants born between the 50th-97th percentiles and that lower birthweight percentiles in Aboriginal infants would contribute to the disparity in outcomes.

Materials and Methods

This was a retrospective, whole-of-population, data linkage study spanning pregnancy and childhood up to 8-9 years of age. The study used existing data from 3 administrative data sets: the Northern Territory perinatal data register, Northern Territory government school student information, and the Australian National Assessment

Program—Literacy and Numeracy (NAPLAN) database. Probabilistic record linkage was undertaken by a data linkage facility (SA-NT DataLink, Adelaide, Australia), and involved calculating the probability that records in different data sets belong to the same person, based on concordance of predetermined identifiers (eg, name, date of birth, gender, address). Records were assigned a unique linkage key for each individual, and then returned to the respective data custodian, who then compiled a deidentified research data set.

Subjects

The birth cohort included 35,239 births occurring in the Northern Territory

(Figure 1) to Northern Territory resident mothers, from Jan. 1, 1999, through Dec. 31, 2008, after the exclusion of plural births, births occurring <20 weeks or >42 weeks completed gestation, and neonates with unknown Aboriginal status. Of this cohort, 11,214 were linked to both student information and year-3 reading and numeracy results (Figure 2).

Data sources

The Northern Territory perinatal data set is a statutory collection that contains antenatal and labor information for all births in the Northern Territory, collected by the birth attendant. Death registration data were added to the data set. The student information data set contains demographic information of children and their primary caregivers, provided at the time of school enrollment. NAPLAN is an Australia-wide, standardized, academic test. Results from this test were available from 2008 through 2014, for students enrolled in a government school.

Outcome measure

The first outcome measured was perinatal death, defined as a fetal death (of at least 20 weeks completed gestation) or neonatal death (within 28 days of birth).¹¹ The second outcome examined was year-3 school test results, as measured by NAPLAN (median age 8.4 years). Scores in reading and numeracy were chosen due to their reported consistency and previous utility and because they allow for direct comparison of performance across all years and year levels.^{14,15}

Birthweight percentiles were used as the primary explanatory variable, due to their previously reported utility and standardization for gestational age. Birthweight percentiles were calculated for each record using birthweight, gestational age, and gender. An Australian-European standard developed by Gardosi et al¹⁶ and incorporating Hadlock intrauterine estimated fetal weight standard was used for all infants. This prevented the normalizing of lower birthweights in Aboriginal fetuses and neonates. In addition to maintaining the continuous birthweight percentile variable a categorical variable, with cut-offs

Download English Version:

<https://daneshyari.com/en/article/8752807>

Download Persian Version:

<https://daneshyari.com/article/8752807>

[Daneshyari.com](https://daneshyari.com)