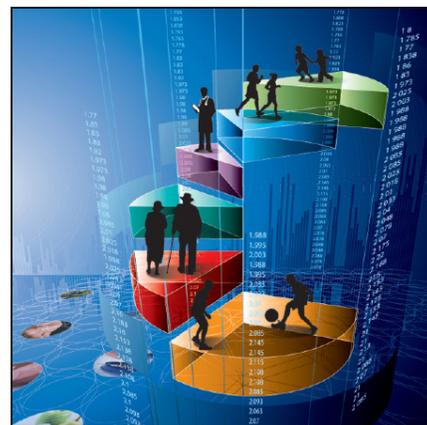


## Health Reports

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by Amanda J. Sheppard, Gabriel D. Shapiro,  
Tracey Bushnik, Russell Wilkins, Serenity Perry,  
Jay S. Kaufman, Michael S. Kramer and Seungmi Yang

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# Birth outcomes among First Nations, Inuit and Métis populations

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## Abstract

**Background:** First Nations, Inuit and Métis are at higher risk of adverse birth outcomes than are non-Indigenous people. However, relatively little perinatal information is available at the national level for Indigenous people overall or for specific identity groups.

**Data and methods:** This analysis describes and compares rates of preterm birth, small-for-gestational-age birth, large-for-gestational-age birth, stillbirth, and infant mortality (neonatal, postneonatal, and cause-specific) in a nationally representative sample of First Nations, Inuit and Métis, and non-Indigenous births. The study cohort consisted of 17,547 births to Indigenous mothers and 112,112 births to non-Indigenous mothers from 2004 through 2006. The cohort was created by linking the Canadian Live Birth, Infant Death and Stillbirth Database to the long form of the 2006 Census, which contains a self-reported Indigenous identifier.

**Results:** With the exception of small-for-gestational-age birth, adverse birth outcomes occurred more frequently among First Nations, Inuit and Métis women than among non-Indigenous women. Inuit had the highest preterm birth rate (11.4 per 100 births; 95% CI: 9.7 to 13.1) among the three Indigenous groups. The large-for-gestational-age rate was highest for First Nations births (20.9 per 100 births; 95% CI: 19.9 to 21.8). Infant mortality rates were more than twice as high for each Indigenous group compared with the non-Indigenous population, and rates of sudden infant death syndrome were more than seven times higher among First Nations and Inuit.

**Discussion:** The results confirm disparities in birth outcomes between Indigenous and non-Indigenous populations, and demonstrate differences among First Nations, Inuit and Métis.

**Keywords:** Infant mortality, large-for-gestational-age birth, preterm birth, small-for-gestational-age birth, stillbirth

Birth outcomes among Indigenous peoples—First Nations, Inuit and Métis—are consistently reported to be less favourable than among the non-Indigenous population.<sup>1</sup> However, relatively little information is available at the national level for Indigenous people overall or for specific Indigenous identity groups, who have unique languages, customs, cultures, and colonial experiences.

A systematic review and meta-analyses of birth outcomes among Indigenous women (predominantly from Canada, the United States and Australia) outlined factors associated with the higher risk: reduced access to standard prenatal care; inaccurate estimation of gestational age and subsequent complications of post-term pregnancies; pre-existing medical conditions; high rates of multiparity; young maternal age; marital status; and low educational attainment.<sup>2</sup> The determinants extend beyond health behaviours and socioeconomic characteristics<sup>3</sup> to include the legacy of policies that have resulted in intergenerational trauma that has affected the physical and mental health of individuals, families and communities.<sup>4,5</sup> As well, jurisdictional responsibilities for the provision of Indigenous health services are complex and vary by region; difficulties are heightened in small and remote communities.<sup>6,7</sup>

Data on perinatal outcomes among First Nations and Inuit are limited to the provinces of Quebec (an indicator of first language spoken is used as a proxy to identify First Nations and Inuit<sup>8</sup>), Manitoba (First Nations status is assigned via parental self-identification<sup>9</sup>), and British Columbia (self-identification and record linkage are used to identify First Nations<sup>10</sup>), and the Inuit land claims settlement areas (most infants are assumed to be of Inuit

ancestry<sup>11</sup>). Data on Métis birth outcomes are available only for Manitoba, where Métis identity has been established through the Manitoba Métis Federation membership list and self-identification in the Canadian Community Health Survey and the National Population Health Survey.<sup>12</sup>

Owing to the lack of consistent data, the use of different methods of analysis, and the rarity of some birth outcomes, widely varying estimates have been published for preterm births<sup>13-17</sup>; small-for-gestational-age births<sup>9,10,13,15,18</sup>; large-for-gestational-age births<sup>8-10,15,18</sup>; stillbirths<sup>13,15,17</sup>; and infant mortality<sup>9,10,13,15,18</sup> among Indigenous people.

This study examines adverse perinatal outcomes among First Nations, Inuit and Métis in a nationally representative sample, based on birth and death registrations that were linked with census data. The main objective is to describe and compare rates of preterm birth, small-for-gestational-age birth, large-for-gestational-age birth, stillbirth, and infant mortality (neonatal, postneonatal, and cause-specific) in an inclusive sample of the three Indigenous groups and the non-Indigenous population during the 2004-to-2006 period.

## Data and methods

### Data sources

The analysis pertains to a cohort of singleton births (May 16, 2004 through May 15, 2006) created by linking the Canadian Live Birth, Infant Death and Stillbirth Database to results from the 2006 Census, the latest census available with a long-form questionnaire. Linkage was established according to the child's

date of birth and sex, maternal and paternal dates and places of birth, and postal code. An overall linkage rate of 90% was achieved, with a false-positive match rate of less than 1%. The methods used to generate this dataset are described elsewhere.<sup>19</sup>

The long-form census questionnaire was distributed to 20% of households. It obtained data on socioeconomic and

demographic characteristics, including Indigenous identity. First Nations people living off reserve, Inuit living outside their traditional territories, and Métis people would be randomly selected in those households. As well, reserve communities and remote areas were over-sampled; that is, 100% of households in these areas were asked to complete the long-form questionnaire.<sup>20</sup> The dataset, therefore, provides perinatal information for a nationally representative cohort of births that includes identifiers for First Nations, Inuit and Métis.

### Indigenous identity

Indigenous identity was determined with the 2006 Census question: “Is this person an Aboriginal person, that is, North America Indian, Métis or Inuit (Eskimo)?” Response options were “No,” “Yes, North American Indian,” “Yes, Métis,” or “Yes, Inuit (Eskimo).” The term “Indigenous” refers to those who replied “Yes” to any of these responses; “First Nations” refers to those who replied “Yes, North American Indian.” For the present analysis, census respondents who reported more than one Indigenous identity (0.3% of the combined Indigenous category) were included in the Indigenous total, but excluded from the specific groups.

### Outcomes and descriptive factors

The perinatal outcomes were: preterm birth (before 37 weeks of completed gestation), small-for-gestational-age birth (sex-specific birth weight below the 10<sup>th</sup> percentile for gestational age, based on the Canadian reference<sup>21</sup>), large-for-gestational-age birth (sex-specific birth weight above the 90<sup>th</sup> percentile for gestational age), stillbirth, all-cause infant death, neonatal death, postneonatal death, and cause-specific infant death. Maternal age, paternal age, perinatal outcomes, and parity were from the birth registry data. Cause of death was determined from *International Statistical Classification of Diseases and Health Problems, Tenth Revision* (ICD-10) codes in death registry data and coded according to modified International Collaborative Effort on Perinatal and Infant Mortality groupings.<sup>22</sup> Marital

status and maternal education were from the census.

### Statistical analyses

Parental characteristics and adverse birth outcomes were compared by Indigenous identity. The analyses were restricted to singleton births because multiples are more likely to have adverse outcomes such as perinatal mortality.<sup>23</sup>

To address concerns about the quality of birth registration data in Ontario, a sensitivity analysis was conducted to assess the effect of omitting that province from the study.<sup>22,24</sup> After review, the Ontario data were retained because no clear evidence of bias was observed (Ontario data are available on request). This allowed the inclusion of an additional 2,085 births to Indigenous mothers (First Nations = 1,754; Métis = 302; Inuit = 22; multiple Indigenous identities = 7), which amounted to 12% of all Indigenous births in the cohort.

The distribution of study factors was compared by group. All analyses were weighted with the cohort sampling weight, and confidence intervals (CI) were calculated using bootstrap weights to account for sampling, non-response, and the linkage process.<sup>19</sup> To determine the upper 95% confidence limit for cause-specific mortality rates of 0, the upper 95% confidence limit, based on a presumed Poisson distribution with 0 observed events, was divided by the unweighted denominator. All data analyses were carried out using SAS, Version 9.1.

### Results

The cohort consisted of 17,547 Indigenous and 112,112 non-Indigenous singleton births. First Nations accounted for the majority (77%) of Indigenous births.

Overall, First Nations, Inuit and Métis mothers were younger, less likely to be married or in a common-law union, less likely to have graduated from secondary school, and had had more previous births than did non-Indigenous mothers (Table 1). Paternal age tended to be younger for Indigenous than non-Indigenous births, but was missing from the records more often (18% versus 4%).

### What is already known on this subject?

- Birth outcomes among Indigenous peoples have been consistently reported to be less favourable than those among the non-Indigenous population.
- Relatively little perinatal information is available at the national level for Indigenous people overall and for specific identity groups.

### What does this study add?

- A cohort of births that occurred from May 16, 2004 through May 15, 2006 was created by linking the Canadian Live Birth, Infant Death and Stillbirth Database with data from the 2006 long-form Census.
- The dataset provides nationally representative perinatal information for First Nations, Inuit, and Métis.
- Except for small-for-gestational-age births, Indigenous infants had higher rates of adverse birth outcomes than did non-Indigenous infants.
- Inuit infants had the highest rate of preterm birth.
- First Nations infants had the lowest rates of small-for-gestational-age birth and the highest rate of large-for-gestational-age birth.
- Rates of infant death, neonatal death and postneonatal death were significantly higher among Indigenous people, compared with the non-Indigenous population.

**Table 1**  
**Parental characteristics, by Indigenous identity, singleton births, Canada, 2004 through 2006**

Characteristics	Non-Indigenous		Indigenous							
	Unweighted number	Weighted %	Total		First Nations		Métis		Inuit	
			Unweighted number	Weighted %						
<b>Total</b>	112,112	100.0	17,547	100.0	13,506	100.0	2,267	100.0	1,730	100.0
<b>Maternal age group</b>										
Younger than 20	2,891	3.1	3,395	18.6	2,722	20.5	285	12.7	379	24.0
20 to 34	88,585	79.0	12,703	73.5	9,675	71.5	1,777	79.0	1,220	68.9
35 or older	20,597	17.9	1,445	7.9	1,105	7.9	205	8.4	131	7.2
<b>Paternal age group</b>										
Younger than 20	762	0.8	1,218	6.1	1,077	7.5	73	3.1	66	4.0
20 to 34	70,496	62.9	10,102	60.0	7,892	59.0	1,436	65.8	750	44.8
35 or older	36,770	32.4	2,831	16.3	2,218	16.3	397	16.9	203	12.1
Missing	4,084	3.8	3,396	17.6	2,319	17.1	361	14.2	711	39.1
<b>Maternal marital status</b>										
Unmarried†	25,955	26.3	10,271	68.8	7,923	73.5	959	54.0	1,363	82.0
Married or common-law	76,048	73.7	3,805	31.2	2,709	26.5	781	46.0	302	18.0
<b>Maternal education</b>										
Less than secondary graduation	13,062	11.3	9,794	46.7	7,887	52.9	743	28.5	1,147	62.4
Secondary graduation	23,866	21.9	3,743	24.5	2,849	23.2	627	29.4	260	17.4
Postsecondary diploma	40,103	36.0	3,343	23.1	2,322	19.4	713	33.0	291	18.4
University degree	35,048	30.9	622	5.6	410	4.6	182	9.1	27	1.8
<b>Parity</b>										
0	50,668	46.6	5,450	38.6	4,155	35.8	920	46.1	361	33.0
1 or 2	54,505	47.8	7,079	43.5	5,532	43.1	1,049	45.3	475	37.7
More than 2	6,735	5.7	4,327	17.9	3,646	21.1	279	8.6	396	29.3

† single, widowed, divorced, separated, and never married if not in common-law union

Note:  $p < 0.01$  from chi-square tests for all variables, comparison of Non-Indigenous versus Indigenous and comparison of three Indigenous populations.

Source: 2006 Canadian Birth-Census Cohort database.

Among the Indigenous groups, Inuit mothers were the youngest (24% were younger than age 20), the most likely to be unmarried (82%), and the least likely to be secondary graduates (62%); nearly 30% of them had had at least three previous live births. Métis mothers were the most likely to have a university degree (9%) and the least likely to be younger than 20 (13%).

Except for small-for-gestational-age births, Indigenous infants had higher rates of adverse birth outcomes than did non-Indigenous infants (Table 2). Inuit infants had the highest rate of preterm birth (11.4%; 95% CI: 9.7% to 13.1%). First Nations infants had the lowest rate of small-for-gestational-age birth (5.8%; 95% CI: 5.2% to 6.3%) and the highest rate of large-for-gestational-age birth (20.9%; CI: 19.9% to 21.8%).

Infant mortality rates were more than twice as high for each Indigenous group, compared with the non-Indigenous

population. Postneonatal deaths made up nearly half of all infant deaths in the Indigenous population, compared with about one-quarter of all infant deaths in the non-Indigenous population.

Rates of death from sudden infant death syndrome (SIDS—a sudden and unexpected death of an apparently healthy infant younger than age 1) were more than seven times higher in the First Nations and Inuit populations (2.2; 95% CI: 1.4 to 3.6 and 2.5; 95% CI: 1.9 to 3.3 per 1,000 live births, respectively) than in the non-Indigenous population (0.3; 95% CI: 0.2 to 0.5) (Table 3). SIDS accounted for 24% of First Nations infant deaths and 21% of Inuit infant deaths and was the leading cause of infant mortality in both groups, whereas it accounted for 7% of non-Indigenous infant deaths. Owing to small cell counts, cause-specific mortality rates for Métis and Inuit were generally not reportable.

## Discussion

The census-linked 2004-to-2006 birth cohort offers an opportunity to investigate birth outcomes for First Nations, Inuit, and Métis at the national level. The findings confirm previous reports of disparities between Indigenous and non-Indigenous Canadians and enhance that information with comparisons of the three major Indigenous groups.

Earlier research has shown elevated rates of preterm birth, large-for-gestational-age birth, stillbirth, and infant death among First Nations mothers compared with non-Indigenous mothers, and higher rates of large-for-gestational-age birth and stillbirth among First Nations, compared with Inuit and Métis. Pre-existing diabetes,<sup>25</sup> inadequate prenatal care,<sup>26</sup> and mothers who, themselves, were born preterm or were large-for-gestational-age have been reported as risks for these outcomes.<sup>2</sup> Additionally, many

**Table 2****Rate of adverse birth outcomes, by Indigenous identity, singleton births, Canada, 2004 through 2006**

Adverse birth outcome	Non-Indigenous			Indigenous			p-value**	First Nations			Métis			Inuit			
	Rate	95% confidence interval		Rate	95% confidence interval			Rate	95% confidence interval		Rate	95% confidence interval		Rate	95% confidence interval		
		from	to		from	to			from	to		from	to		from	to	from
Preterm birth (per 100)	6.7	6.6	6.9	8.7	8.1	9.3	< 0.01	9.0	8.2	9.7	7.6	6.3	8.9	11.4	9.7	13.1	< 0.01
Small-for-gestational-age birth (per 100)	8.6	8.5	8.8	6.6	6.0	7.1	< 0.01	5.8	5.2	6.3	8.3	6.8	9.7	8.0	6.3	9.7	< 0.01
Large-for-gestational-age birth (per 100)	10.6	10.5	10.8	18.8	18.1	19.6	< 0.01	20.9	19.9	21.8	14.4	12.7	16.1	15.6	13.5	17.7	< 0.01
Stillbirth (per 1,000)	5.6	5.3	5.8	9.0	7.0	11.0	< 0.01	10.4	7.8	12.9	5.7	1.8	9.5	9.7	5.0	14.4	0.01
Infant death (per 1,000 live births)	4.4	4.2	4.7	9.6	7.8	11.5	< 0.01	9.2	7.5	11.3	10.5	7.1	15.5	12.3	9.9	15.2	0.52
Neonatal death (per 1,000 live births)	3.4	3.1	3.6	4.9	3.5	6.3	< 0.01	4.4	3.4	5.8	7.5	4.6	12.3	7.2	5.4	9.7	0.04
Postneonatal death (per 1,000 surviving births)	1.1	0.9	1.3	4.8	3.4	6.1	< 0.01	4.8	3.6	6.4	3.1	1.5	6.1	5.1	4.0	6.4	0.29

\*\* from chi-square tests for comparison of Non-Indigenous versus Indigenous population

† from chi-square tests for overall comparison of three Indigenous populations

Source: 2006 Canadian Birth-Census Cohort database.

**Table 3****Cause-specific infant mortality rates per 1,000 live births coded according to modified International Collaborative Effort grouping, by Indigenous identity, singleton births, Canada, 2004 through 2006**

International Collaborative Effort grouping	Non-Indigenous			Indigenous											
	95% confidence interval			Total			First Nations			Métis			Inuit		
	Rate	from	to	Rate	from	to	Rate	from	to	Rate	from	to	Rate	from	to
Congenital anomalies	1.3	1.1	1.5	2.2	1.6	3.0	1.9	1.5	2.5	3.1	1.4	6.6	x	x	x
Asphyxia-related conditions	0.6	0.4	0.8	0.6	0.3	1.1	0.4	0.2	0.6	x	x	x	x	x	x
Immaturity-related conditions	1.2	1.0	1.4	1.6	1.0	2.5	2.0	1.2	3.4	x	x	x	x	x	x
Infections	0.3	0.2	0.4	1.4	0.8	2.4	1.0	0.5	1.9	x	x	x	x	x	x
Sudden infant death syndrome	0.3	0.2	0.5	2.0	1.3	2.9	2.2	1.4	3.6	x	x	x	2.5	1.9	3.3
Other unexplained causes of death	0.1	0.1	0.2	0.8	0.4	1.5	0.7	0.3	1.5	x	x	x	x	x	x
External causes	0.1	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	1.3	0.0	0.0	1.7
Other causes	0.6	0.5	0.8	1.2	0.8	1.8	1.0	0.7	1.5	x	x	x	x	x	x

x suppressed to meet the confidentiality requirements of the *Statistics Act*

Source: 2006 Canadian Birth-Census Cohort database.

Indigenous people live in remote or rural communities, where the turnover rate among health providers is high; Indigenous health professionals are scarce; and funding and jurisdictional issues may impede access to health care.<sup>7</sup>

The analysis confirms the previously reported elevated rate of preterm birth among Inuit mothers.<sup>13,27</sup> Possible explanations include high fertility, young maternal age, increased susceptibility to infections (bacterial vaginosis),<sup>11,28,29</sup> and stress due to medical evacuation for childbirth.<sup>30</sup> Mortality among Inuit infants was evenly distributed between the first month (often associated with preterm or small-for-gestational-age birth) and subsequent months of the first year of life (commonly a result of SIDS or injury). These results parallel a

study of infant mortality among Inuit in Nunavut from 1999 through 2011, which reported the leading causes of death (when documented; n = 95) to be sudden unexpected death in infancy, SIDS, and infection.<sup>28</sup> Factors such as the baby's sleep environment, overcrowding, high maternal smoking rates (up to 80%),<sup>16</sup> and preterm birth may partly explain high mortality among Inuit infants.

Métis tend to be under-represented in the peer-reviewed literature.<sup>31</sup> Nonetheless, findings have suggested poorer health outcomes compared with non-Indigenous people, but generally more favourable outcomes compared with other Indigenous groups.<sup>29,32-35</sup> A provincial report based on linked data from the Manitoba Métis Federation membership and national surveys reported

higher rates of teenage pregnancies and lower rates of breastfeeding initiation among Métis than among other Manitoba mothers, but comparable newborn hospital readmission rates within four weeks of discharge.<sup>12</sup> Infant mortality rates were slightly lower among Métis, than among non-Indigenous Manitobans (5.7 versus 6.8 per 1,000 births).<sup>12</sup> The Manitoba Métis infant mortality rate is substantially lower than the national rate reported in this analysis (7.1 per 1,000), while the Manitoba non-Indigenous rate exceeds the national rate (4.4 per 1,000). Additional research is necessary to understand these differences, and to explain the higher likelihood of neonatal versus postneonatal deaths among Métis infants.

Elevated rates of SIDS in the First Nations and Inuit populations are not a novel finding, but are of major public health importance.<sup>28</sup>

## Limitations

The overall linkage rate between the 2006 Census and the Canadian Live Birth, Infant Death and Stillbirth Database was 90% for the cohort, yielding estimates of adverse birth outcomes across Indigenous identity groups and maternal levels of education with minimal selection bias.<sup>20</sup> However, the dataset is subject to limitations that specifically concern analyses of Indigenous people, and the prevalence of adverse birth outcomes among First Nations, Inuit, and Métis may be underestimated.

Pregnancies that resulted in stillbirths and infant deaths were less likely to be linked to the 2006 Census, since fewer variables were available for matching. Births to mothers younger than age 25 and births in British Columbia, the Northwest Territories, and Nunavut were

also linked less frequently.<sup>19</sup> Because 99% of the Indigenous population in Nunavut in 2006 was Inuit, and the data show that 24% of Inuit mothers were younger than age 20, the potential for biased estimates is greater for this group. Linkage was also compromised by birth records that lacked postal code, child sex, date of birth, age of mother, or maternal place of birth.

Long-form census data were not collected for residents of institutions (such as hospitals, nursing homes, jails) or shelters. Indigenous people are more likely than non-Indigenous people to live in shelters or correctional facilities.<sup>36,37</sup> Consequently, pregnancy outcomes for the most vulnerable Indigenous women may not have been captured.

Also, causes of death may be less reliably reported in remote Indigenous communities. This would reduce the accuracy of findings for rare causes of infant deaths (many of which were already imprecise or unreportable due to small cell counts).<sup>38</sup>

Finally, the data are more than 10 years old.

## Conclusion

Before the creation of this cohort, analyses of birth outcomes in Canada were limited by the lack of Indigenous identifiers on birth registrations. The census-linked birth data can be used to compare perinatal outcomes among the three major Indigenous groups. The results confirm disparities in birth outcomes between Indigenous and non-Indigenous women and reveal differences among First Nations, Inuit, and Métis. The cause-specific infant mortality findings reveal disparities in SIDS rates and highlight the need for targeted interventions to reduce SIDS in First Nations and Inuit populations. More generally, greater health literacy, access to prenatal care, local birthing opportunities, and postpartum support may help improve the long-term health of First Nations, Inuit, and Métis infants, women, families, and communities. ■

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