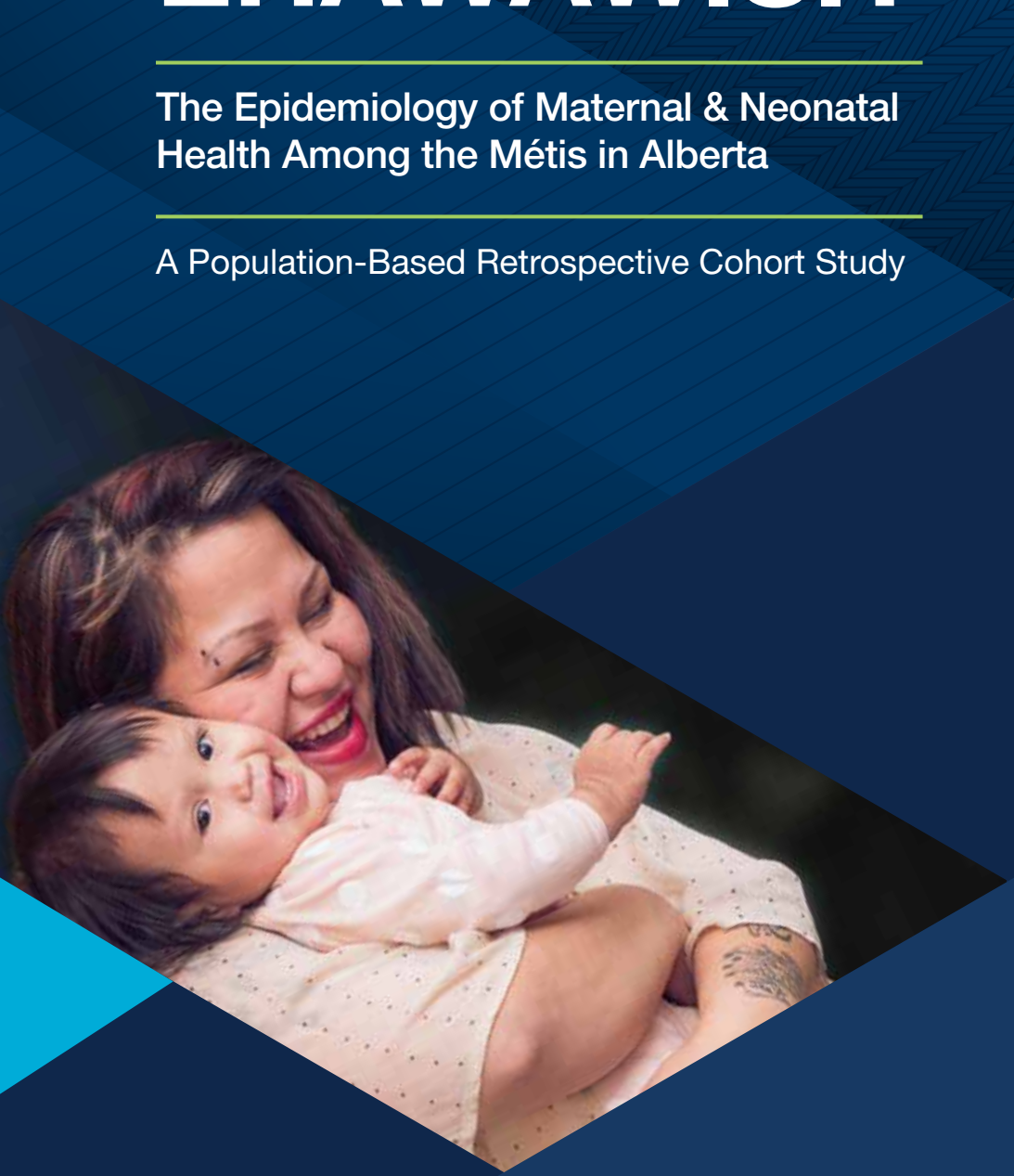
WITH CHILD

EHAWAWISIT

The Epidemiology of Maternal & Neonatal Health Among the Métis in Alberta

A Population-Based Retrospective Cohort Study



UNIVERSITY OF ALBERTA

MÉTIS NATION of ALBERTA

AUTHORS

Maria B. Ospina, PhD[1]; Omolara Sanni, PhD[1];
Jesus Serrano-Lomelin, PhD[1]; Ashton James, BA[2];
Kelsey Bradburn[2]; Susan Crawford, MSc[3];
Jeff Bakal, PhD[3]; Amy Colquhoun, PhD[4];
Britt Voaklander, MSc[5]; Kristin Black, MD[1];
Manoj Kumar, MD, MSc[6]; Rhonda J Rosychuk, PhD[6];
Calypse Agborsangaya, PhD[4]; Claire Cordingley, BSc[2];
Alvaro Osornio-Vargas, MD, PhD[6]; Radha Chari, MD[1].

[1] Department of Obstetrics & Gynecology,
Faculty of Medicine & Dentistry; University of Alberta

[2] Métis Nation of Alberta

[3] Alberta Health Services

[4] Alberta Health

[5] School of Public Health; University of Alberta

[6] Department of Pediatrics, Faculty of Medicine & Dentistry;
University of Alberta

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A MESSAGE
FROM THE PRESIDENT

As the President of the Métis Nation of Alberta, I am pleased to share with you our health report *"Ehawawisit (With Child): The Epidemiology of Maternal and Neonatal Health Among the Métis in Alberta. A Population-Based Retrospective Cohort Study."* In conjunction with our reports *"Ehawawisit (With Child): Experiences and Perspectives of Métis Women on Pregnancy, Birth, and Motherhood,"* and *"Diabetes in Pregnancy Amongst Women of the Métis Nation of Alberta,"* these reports found that inequalities exist among the health of our Métis mothers and newborns, compared to the non-Métis population. This work is an important step toward understanding the health of Métis mothers and children, showing us where we have work to do and where we are succeeding in promoting the health of Métis moms and babies.

I would like to acknowledge and thank our partners, Dr. Maria Ospina and the *Ehawawisit* research team for their continued support and expertise in the development and completion of this project, and in the preparation of this report.

Audrey Poitras
President, Métis Nation of Alberta

1. INTRODUCTION

1.1 Preamble

This research report is the result of a collaboration between the Métis Nation of Alberta (MNA) and academic partners to comprehensively characterize epidemiological profiles of maternal and perinatal health among Métis in Alberta. The Métis have been referred to as a "hidden" Indigenous people,[1] a characterization that alludes to the lack of Métis-specific health data, policies, and services that are specific to their unique needs and experiences[2,3]. This study fills an important knowledge gap, as there is little information from epidemiological studies regarding the maternal and perinatal health of Métis populations in Canada. The results presented in this report will inform effective and culturally safe initiatives led by the MNA to optimize the pregnancy, obstetric, and perinatal care for Métis in Alberta.

This report includes quotes from Métis women who shared their "stories behind the numbers" during six gatherings. These gatherings of Métis women, which were conducted as a part of this research study, are detailed in the report *"Ehawawisit: Experiences and Perspectives of Métis Women on Pregnancy, Childbirth, and Motherhood."*

1.2 Rationale and Scope of this Study

Maternal and perinatal outcomes are key indicators of health status and the impact of social determinants on population health.[4-7] Maternal and perinatal health is affected by individual factors, living conditions, social relations,[5,8] and historical power structures[6] over the life course and across generations (Figure 1). Provided in Figure 1 is an enhanced social determinants of health model that includes Métis specific factors and the traditional social determinants of health. This model conceptualizes

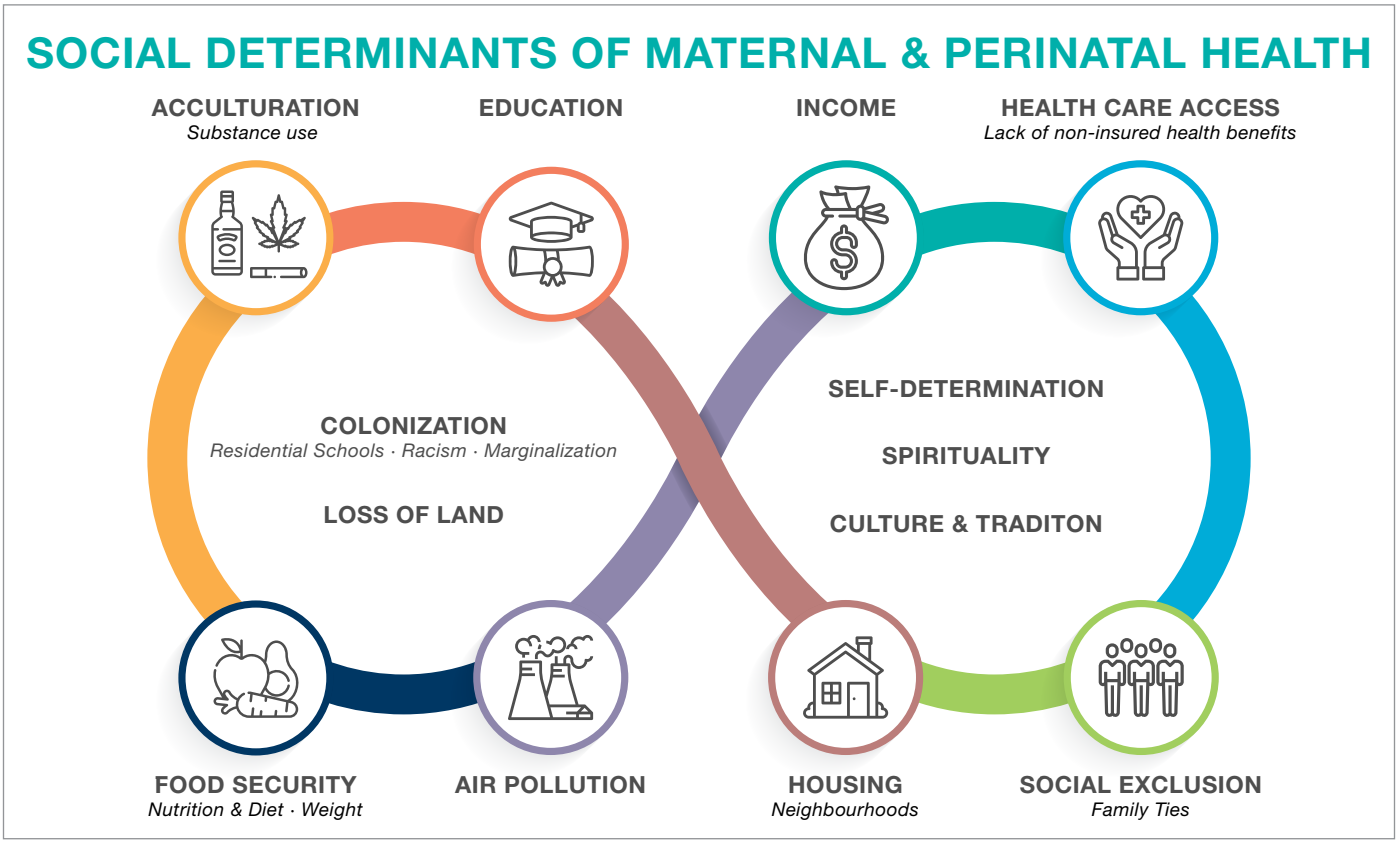

Figure 1. Social determinants of maternal and perinatal health

the complex and layered nature of many of these health determinants and how they contribute to the health of Métis mothers and their newborns.

The available scientific evidence has described increased rates of adverse birth outcomes, maternal complications, and poor access to prenatal care in Indigenous peoples across Canada compared to non-Indigenous populations.[7,9-14] There have been no population-based studies describing epidemiological profiles of maternal and perinatal health among Métis people in Canada.[15,16] This knowledge gap is critical to address, as adequate and accurate information about the health status of Métis mothers and their newborns is essential in order to develop effective and culturally safe programs that support healthy pregnancies.

Pregnancy and birth (which can be expressed with the Michif word *Ehawawisit*, meaning 'with child') can be a special time of reflection and connection with one's Métis heritage and identity. According to Métis ways of knowing, the health of the mother and the newborn are a reflection of the health of the community.[5] This holistic concept of health is articulated in the words of Métis Elder Tom McCallum, who says that "we see each other as being related to everything,"[17] which is aligned with the concept of social determinants of health.

Creating an evidence base about the epidemiological profile of Métis maternal and perinatal health in Alberta provides valuable information. This information will guide the development of Métis-specific health services and programs that address the unique challenges that Métis mothers and their newborns will likely face during this critical period of human development.

1.3 Métis People in Alberta

The Métis are an Indigenous people[1,18] with a unique combination of identity, values, language, and cultural traditions that distinguish them from the other two Indigenous peoples of Canada (i.e. First Nations and Inuit) which is recognized in section 35(2) of the Constitution Act of 1982.[19] The Métis National Council defines Métis as "a person who self-identifies as Métis, is distinct from other Aboriginal peoples, is of historic Métis Nation ancestry, and is accepted by the Métis Nation."[20] One in three Indigenous people in Canada self-identifies as Métis.[21] Alberta has the second largest population of self-identified Métis, accounting for 19.5% of all Métis in Canada,[21] and is home to the largest share of Métis women across Canada (22%).[22] The MNA is the governing body representing over 47,000 Métis citizens in Alberta. The MNA advances Métis self-determination through cultural, economic, health, educational, political, and social development.[23]

2. OBJECTIVES OF THIS REPORT

The first objective of this report is to analyze the epidemiological characteristics, maternal health outcomes and perinatal health outcomes of pregnancies of Métis women in Alberta. The second objective of this report is to offer a solid evidence base from which the MNA can enact change and improve the health outcomes of Métis mothers and newborns.

3. OVERVIEW OF STUDY METHODS

The research team conducted a population-based retrospective cohort study using de-identified data linkage between Alberta administrative health databases from 2006 to 2016 and the MNA Identification Registry.

3.1 Data Sources

The MNA, the Alberta Health Analytics and Performance Reporting Branch, the Alberta Perinatal Health Program (APHP), and the Strategy for Patient Oriented Research (SPOR) Data Access Platform provided access to individual, de-identified and anonymized data from the data repositories, as described below in Table 1.

PROVINCIAL DATABASE	DATABASE DESCRIPTION
ALBERTA HEALTH CARE INSURANCE PLAN (POPULATION REGISTRY)	Registration and demographic information of persons deemed to be residents of Alberta.
ALBERTA PERINATAL HEALTH PROGRAM (CLINICAL PERINATAL REGISTRY)	Maternal and newborn information for every birth in Alberta that occurred in a hospital and/or was attended by a registered midwife.
DISCHARGE ABSTRACT DATABASE	Maternal and newborn in-hospital data for the index delivery/birth admission using International Classification of Diseases, 10th Revision, enhanced Canadian version (ICD-10-CA) codes.[24]
MNA IDENTIFICATION REGISTRY	Demographic information for all citizens of the MNA since 2004.
PAMPALON MATERIAL AND SOCIAL DEPRIVATION INDEX	Measure of material and social deprivation using census data, based on six socio-economic indicators: the proportion of persons without a high school diploma, the employment-population ratio and the average personal income (for material deprivation), and proportion of persons living alone, separated, divorced, or widowed and of single-parent families (for social deprivation).[25,26]
PHYSICIAN CLAIMS	Inpatient and outpatient physician services for all specialties.[27,28]

Table 1. Data sources

3.2 Study Population

The study population consisted of all singleton live births (births at 22 weeks gestation or later) that occurred in Alberta between April 1, 2006 and March 31, 2016 as identified in the provincial clinical perinatal registry. A cohort of Métis births was identified from the study population based on probabilistic linkage across the population registry and the MNA Identification Registry. Once the Métis cohort was assembled, their data was directly linked to the clinical perinatal registry and other datasets. Data was then de-identified with a scrambled number prior to being released to the researchers. All other births identified as non-Métis within the study population were selected for comparison with the Métis cohort data. The flowchart in Figure 2, provided below, depicts the process for the selection of the study population, data sources and study outcomes.

3.3 Study Outcomes

The outcomes that were examined in this study were:

MATERNAL OUTCOMES

- **Antenatal factors:** Adequacy of prenatal care, pre-pregnancy weight, maternal smoking and substance use during pregnancy.
- **Pregnancy comorbidities and complications:** Preexisting chronic hypertension, gestational hypertension, preeclampsia, chronic hypertension with superimposed preeclampsia, preexisting diabetes, gestational diabetes, and anemia.
- **Labour and delivery outcomes:** Induction of labour, mode of delivery, type of attendant at delivery, obstetric hemorrhage, placenta previa, and premature rupture of membranes.

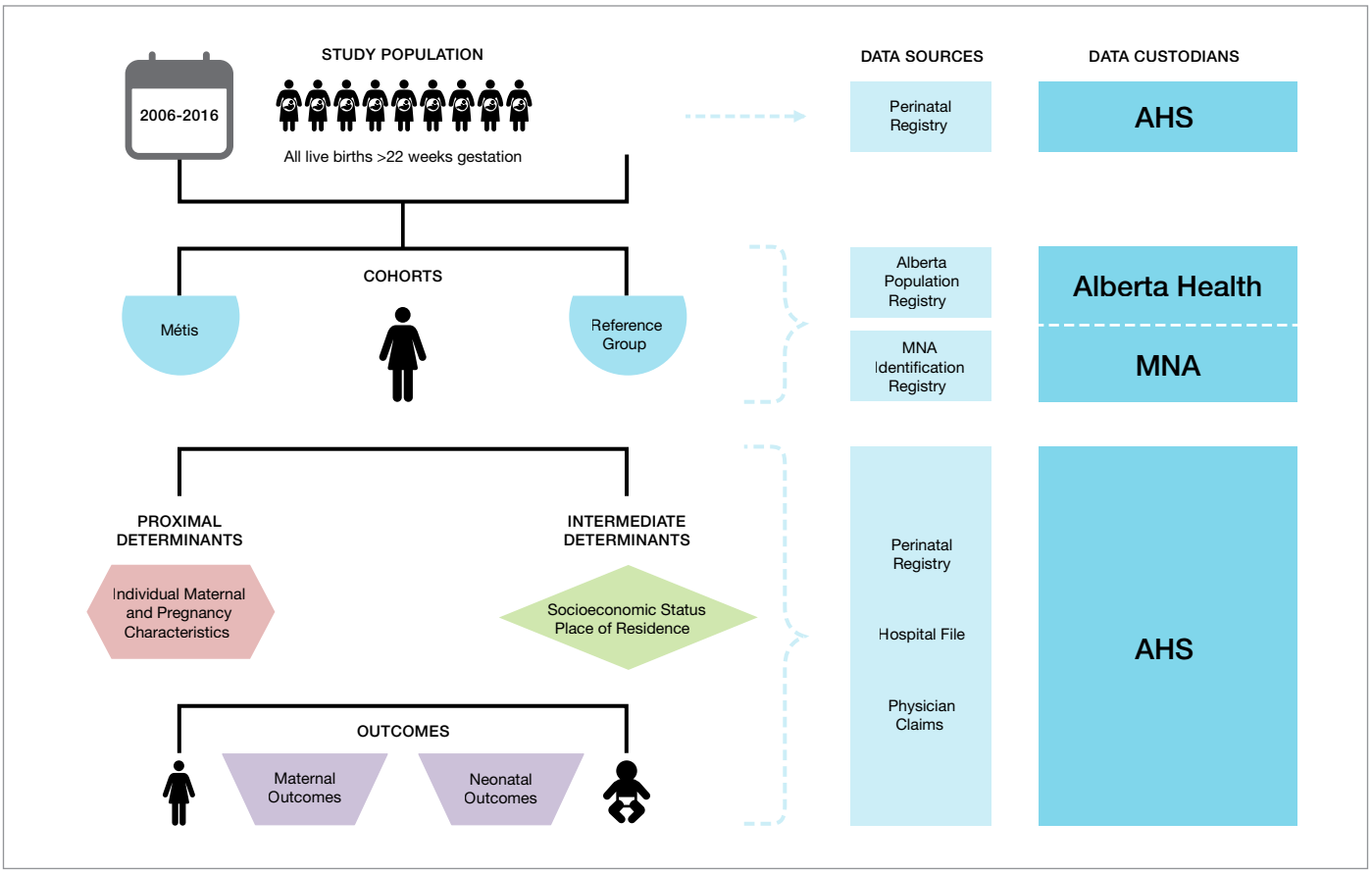

Figure 2. Study population, data sources and study outcomes

PERINATAL OUTCOMES

- **Duration of gestation:** Preterm (<37 weeks), term (37 weeks 0 days through 40 weeks 6 days), and late term (41+ weeks). Preterm was further classified as very preterm (<32 weeks) and late preterm (32 weeks 0 days through 36 weeks 6 days).[29,30]
- **Fetal growth:** Birth weight in relation to gestational age was classified as: normal for gestational age (birth weight between the 10th and 90th percentile), small for gestational age (birth weight <10th percentile) and large for gestational age (birth weight >90th percentile). Canadian sex-specific, population-based reference standards[31] were used to define these categories.
- **Neonatal complications:** Admission to a neonatal intensive care unit (NICU), neonatal death (occurring within 30 days at hospital), and congenital anomalies.

3.4 Other Study Variables

We collected data on important proximal and intermediate social determinants for which information is available in the data repositories (i.e. age at delivery, place of residence at delivery, material and social deprivation [evaluated with the area-level Pampalon index]). Table 1A in the Appendix provides a full description of the study variables.

3.5 Statistical Analysis

All study variables were described with proportions and percentages for categorical data, and mean with standard deviations or medians and interquartile ranges for continuous data. We calculated age-standardized prevalence of maternal and perinatal health outcomes for the entire study period and evaluated changes in prevalence over time between 2006 and 2016. We used multilevel multivariable logistic regression models to calculate adjusted risk ratios with 95% confidence intervals of the likelihood of experiencing the outcome of interest in the cohort of Métis births compared to a reference group of non-Métis within the study population, adjusting for relevant maternal socioeconomic factors, comorbidities, and obstetric complications. Variables in the models were included after consultation with both the MNA team members (for contextual factors) and clinical experts (for clinical and obstetric factors) using directed acyclic graphs.[32] All live births were included in the data analysis and missing values were not replaced. All statistical analyses were performed using Microsoft Excel version 2016 and STATA, Release 15 (StataCorp. College Station; TX.)

3.6 Ethical Considerations

The proposal was presented to the MNA Health Committee for discussion and feedback and following that, a formal research agreement between the MNA and the Principal Investigator (Dr. Ospina) was signed to formalize the research collaboration. Ethics approval was granted by the University of Alberta Human Research Ethics Board (Pro00078176). All data supporting this research was provided by Alberta Health Services and Alberta Health in a de-identified format. Data confidentiality was ensured, as access to data was restricted to the research team only. All data supporting this research is kept on a password-protected server and within encrypted

Reciprocal Relationships Equal involvement in research design; responsibility in data collection and analysis	**Respect For** Collective consent from MNA for data linkage, confidentiality and anonymity of data, data analyzed and released in aggregate form
Safe & Inclusive Environments Study incorporates perspectives of MNA knowledge users in planning, data analysis and interpretation of results	**Diversity** Project promotes equal partnership between MNA knowledge users and academic partners; acknowledgement of diverse disciplines and ways of living for contributions
Research Should Provide evidence base for planning of MNA intiatives supporting maternal and perinatal health	**Métis Context** Insights into Métis protocols and context through collaboration with MNA governance and community consultation.

Figure 3. The NAHO principles of ethical Métis research

files. Information was analyzed and reported in aggregate form to protect the individual identities of the study population.

This research was developed in accordance with the six principles of ethical Métis research, which have been created by the Métis Centre of the National Aboriginal Health Organization[33] (Figure 3). The results presented in this report follow an epidemiological approach "for" (rather than "about") Métis people, in which epidemiological methods are used to monitor potential inequities compared to the non-Métis population of Alberta.[34,35] Characteristics of study variables and outcomes for statistical analysis were discussed in collaboration with MNA team members to ensure that the research results inform policy and planning in a way that benefits Métis pregnant women, mothers and their babies, while mitigating the systemic harms that have historically been experienced by Métis people. Rather than supporting a deficit-based approach that further stigmatize Métis people,[36,37] a non-Métis comparison/reference group was included in the inferential analyses as a way to identify inequalities in maternal and perinatal outcomes that are rooted in complex historical, political, and socio-economic structures.[38] The analysis and interpretation of the epidemiological data in this report acknowledge the historical, political, economic, and social forces that influence health[39] and the strong historical and contemporary influences of colonialism (i.e. racism, social exclusion and socioeconomic adversity) as structural determinants and "causes of the causes" of maternal and perinatal health outcomes among Métis Albertans.[35,40]

4. RESULTS

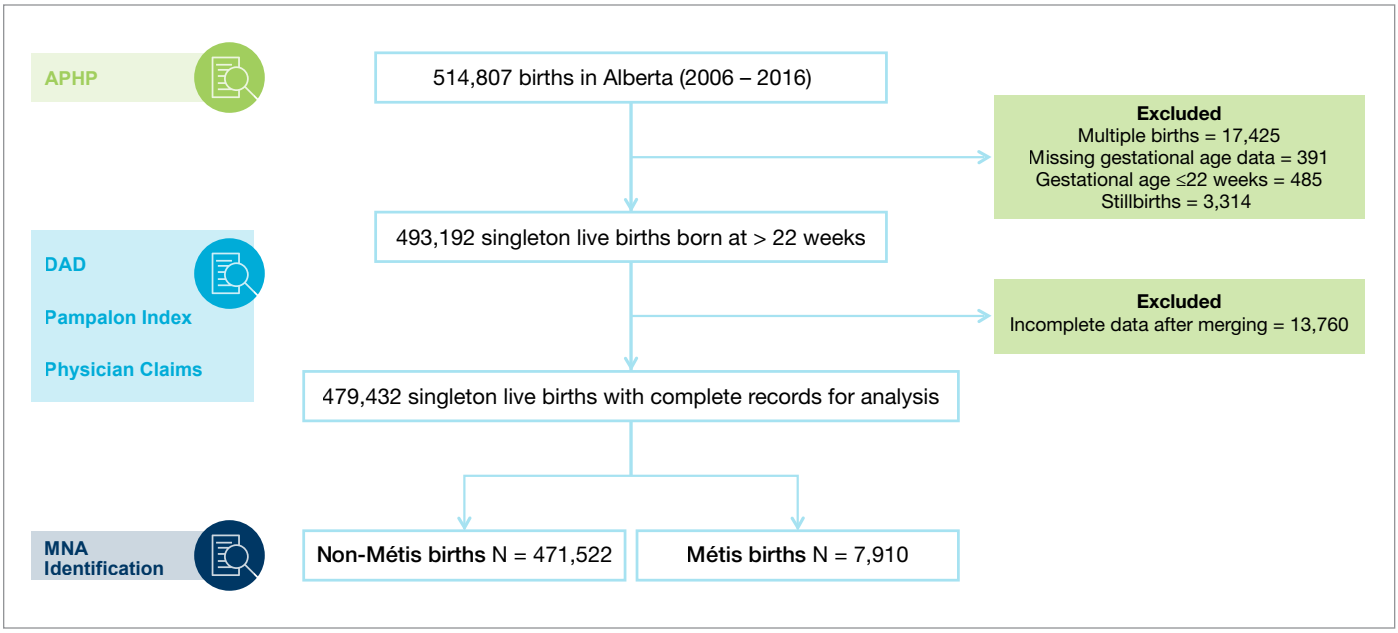

Figure 4. Study flow

A total of 479,432 singleton live births that occurred in Alberta during the study period (2006-2016) were included in the analysis (as seen in Figure 4). Of these, a total of 2% (n = 7,910) were delivered by Métis women while 98% (n = 471,522) occurred in the comparison group of non-Métis women.

4.1 Maternal Characteristics of Métis Births

The majority (70.1%) of births in the Métis group occurred among women aged less than 30 years (mean age at delivery: 27.2 years). Of these births, 9.5% were Métis mothers younger than 20 years of age. Pregnancy after 35 years of age occurred in 7% of Métis mothers (Figure 5).

For governance purposes, the MNA is divided in to six regions across the province of Alberta, as displayed in Figure 6. The majority of births from Métis women occurred in MNA Regions 4 (44.4%) and 3 (26.2%) (Figure 6). 62.2% of births were from Métis mothers living in urban areas, compared to 37.3% living in rural or remote settings (Figure 7).

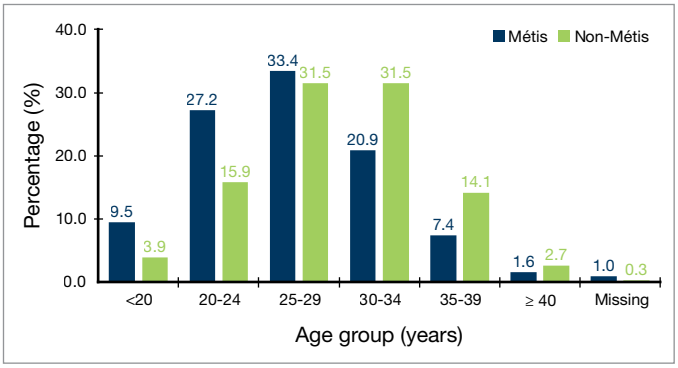

Figure 5. Age at delivery

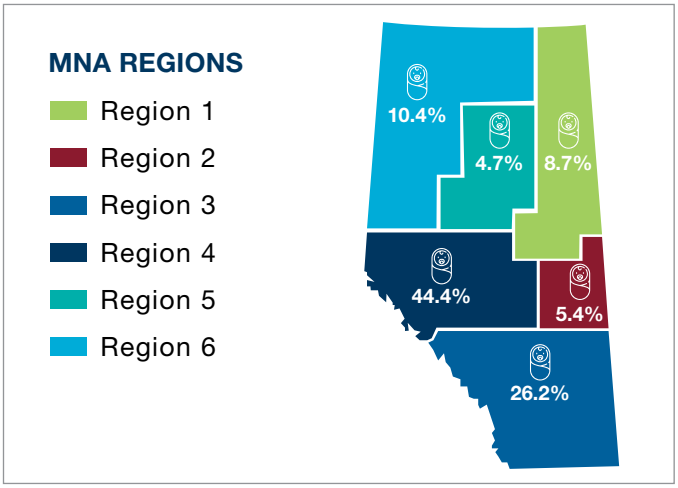

Figure 6. Distribution of Métis live births in the six MNA Regions between 2006 and 2016

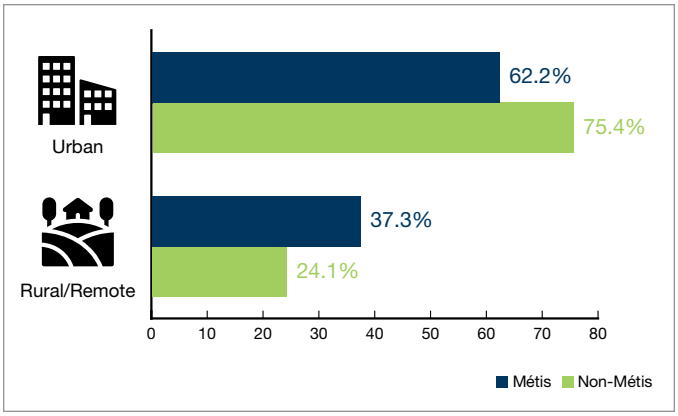

Figure 7. Area of residence

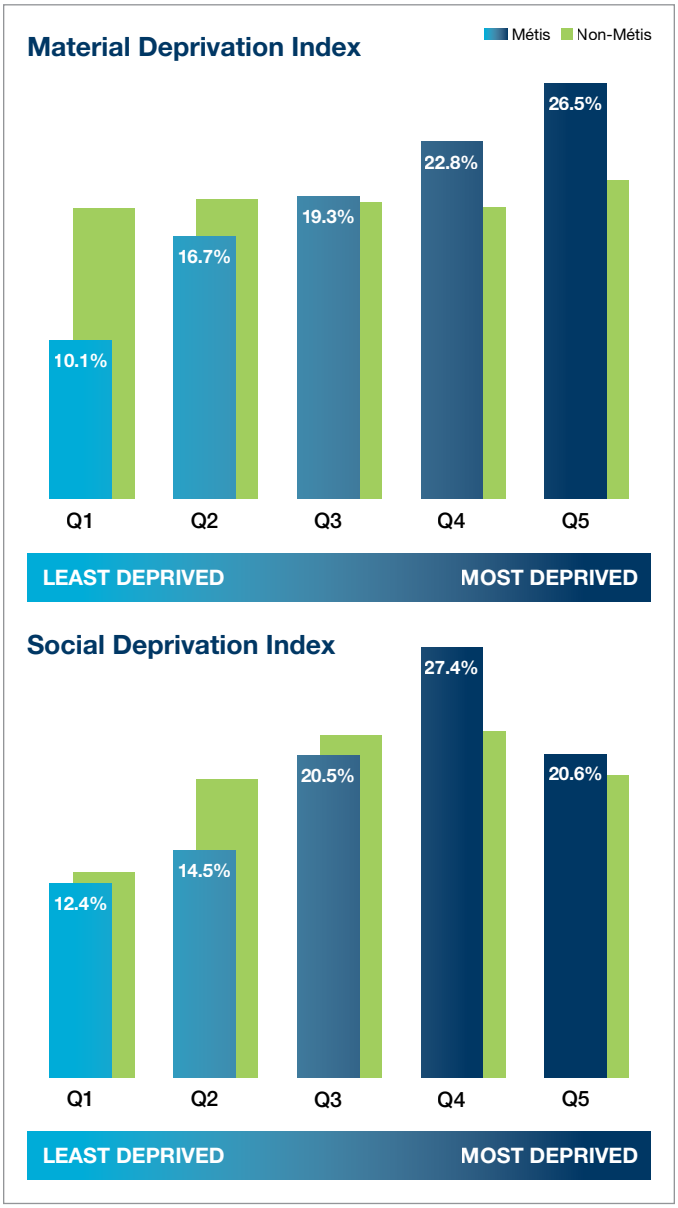

Figure 8. Material and social deprivation index

Almost half of Métis births occurred among women living in residential areas of severe material deprivation (quintiles 4-5, represented by bars 4-5 in Figure 8), while almost 27% of births occurred among Métis women living in well-off neighbourhoods (quintiles 1 and 2 in Figure 8). Similarly, 48% of Métis births occurred among mothers living in areas of severe social deprivation, while 26.8% occurred among Métis women living in areas of low social deprivation (quintiles 1-3, shown as bars 1-3 in Figure 8).

See Table A2 in the Appendix for numeric summaries of sociodemographic characteristics of Métis and non-Métis live births in the study.

> Cause you have to — and nowadays it's so hard to live. You need two incomes in the family. Everything's — the utility bills, is so high. You know, the cost of living is so high, then you have four kids... like I spend probably $1500 - $2000 a month on groceries, you know, alone. Because it's so expensive here.
>
> *– Region 6 participant*

4.2 Antenatal Factors

ADEQUACY OF PRENATAL CARE

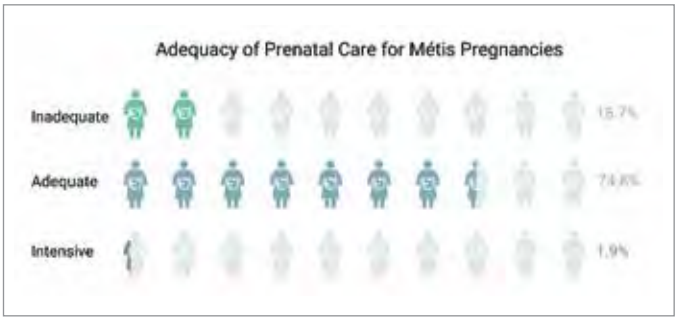

Figure 9. Adequacy of prenatal care

We used a validated index[41] to evaluate the adequacy of prenatal care received by women based on the timing of their first prenatal visit, the total number of prenatal visits during pregnancy, and gestational age at delivery. The majority of pregnancies from Métis mothers (74.8%) received adequate prenatal care, while 18.7% received inadequate prenatal care. A small proportion of Métis pregnancies (1.9%) received intensive prenatal care (Figure 9).

> One thing I wanted to discuss that we haven't really touched on is kind of the obesity rates with pregnancy. And I know I struggled with it, I was considered high risk pregnancy through all of my pregnancies because I gained so much weight, so quickly. And then … with my third I had to get approval just to deliver [in town] from the anesthesiologist, in case anything went wrong. […] The bigger babies born now… it's really shocking and I think that's why the C-section rates are so high.
>
> *– Region 1 participant*

Pregnancies of Métis mothers were more likely to receive adequate (aRR: 1.40; 95% CI 1.29, 1.53) and intensive prenatal care (aRR: 1.36; 95% CI 1.11, 1.67) compared to those in the non-Métis group after adjusting for relevant maternal socioeconomic factors, health behaviours, and the presence of important medical conditions during pregnancy (Figure 10).

PRE-PREGNANCY WEIGHT

Overall, 14% of Métis births were from woman who weighed more than 91kg before pregnancy while a very small proportion of births (0.4%) were from mothers who weighed less than 45 kg before pregnancy (Figure 11). Métis mothers were more likely to have a body weight greater than 91 kg before pregnancy (aRR: 2.49; 95% CI 2.17, 2.87) compared to non-Métis mothers. Non-Métis mothers were more likely to be underweight before pregnancy (45 kg or less; aRR: 0.35; 95% CI 0.22, 0.57) compared to Métis mothers after adjusting for relevant maternal socioeconomic and obstetric factors (Figure 10).

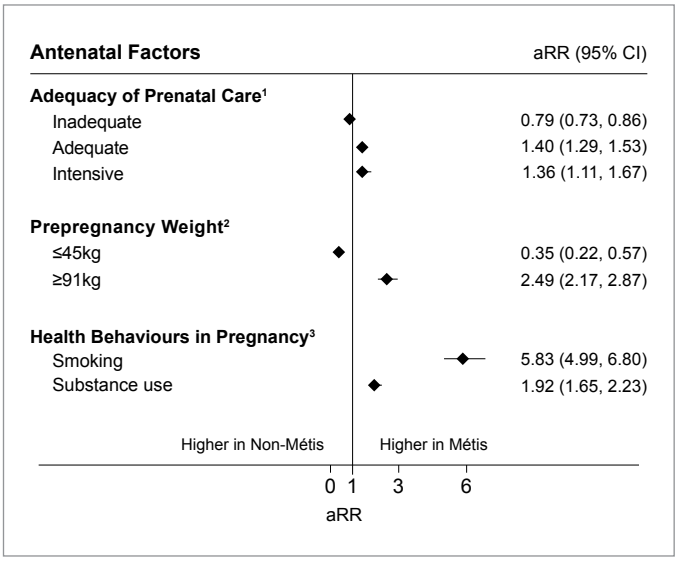

Figure 10. Adjusted risk ratios for antenatal factors comparing Métis and non-Métis study groups

[1] Adjusted for area of residence, age at delivery, parity, social and material deprivation, gestational hypertension, pre-existing hypertension, preeclampsia, eclampsia, pre-existing diabetes, smoking in pregnancy and substance use.

[2] Adjusted for age at delivery, parity, social and material deprivation.

[3] Adjusted for age at delivery, area of residence, social deprivation and material deprivation

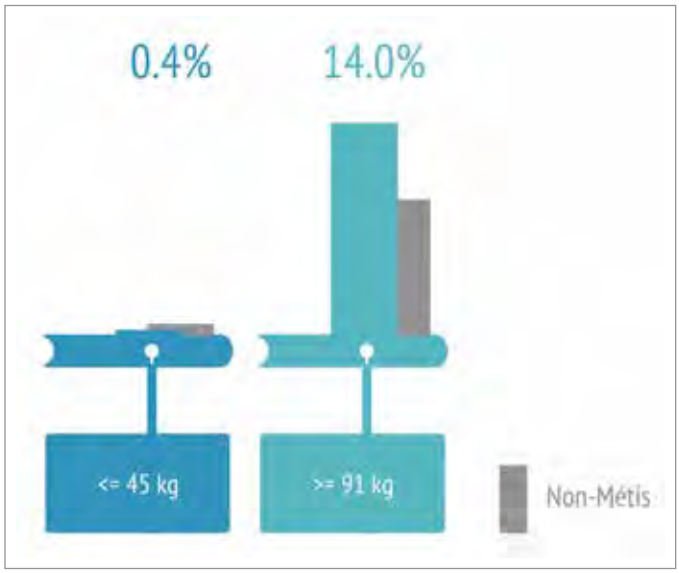

Figure 11. Pre-pregnancy weight

> I struggled with addictions... Most of my life. Not so much alcohol, that was before I had kids. But then with marijuana. And I smoked right up until I found out I was pregnant. And so when I found out I was pregnant with her I quit cold turkey and that was probably the worst time in my life. It still is - like it was my best friend. Honestly … dealing with [mental illness] … that was… my outlet, that was my way to cope, that was a way to get through everything so not being able to have that, on top of everything else I struggled with.
>
> *– Region 1 participant*

SELF-REPORTED SMOKING AND SUBSTANCE USE

Overall, 30.5% of pregnancies among Métis women had self-reported documentation of smoking and 6.1% of pregnancies among Métis women had self-reported documentation of other psychoactive substances (Figure 12). There was a significant reduction of self-reported smoking and substance use among pregnancies of Métis mothers over the study period.

Compared to non-Métis women, Métis women had a higher probability of self-reporting smoking (aRR: 5.83; 95% CI 4.99, 6.80) or substance use (aRR: 5.83; 95% CI 4.99, 6.80) during pregnancy, after adjusting for maternal socioeconomic factors (Figure 10).

Table A3 in the Appendix provides a summary of the antenatal characteristics of Métis and non-Métis births in the study. Annual trends of maternal antenatal factors are reported in Appendix B1-B3.

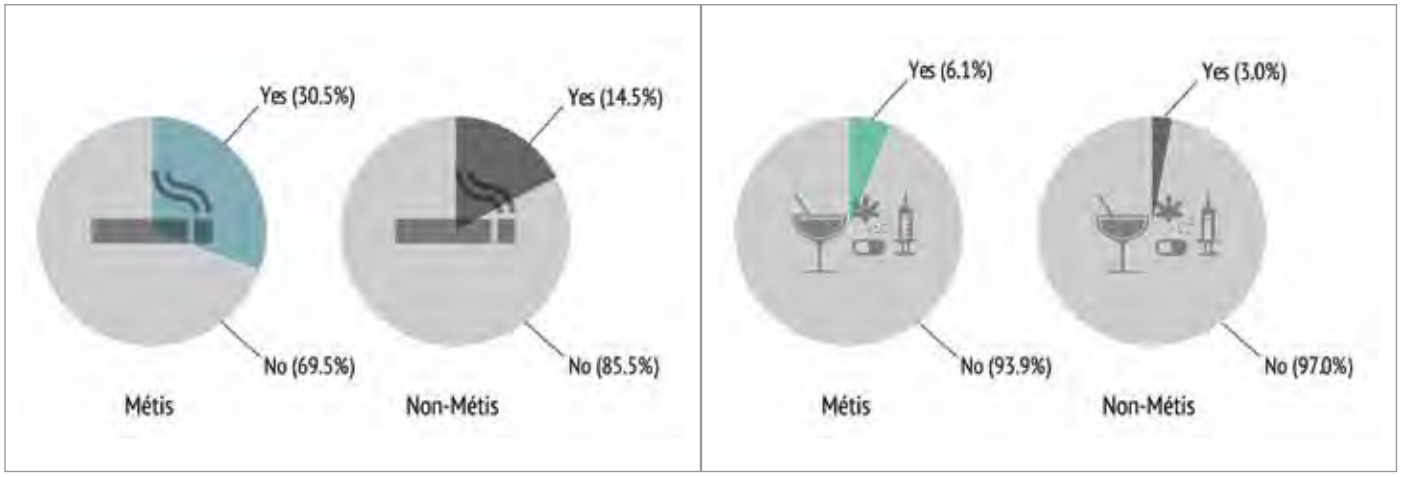

Figure 12. Self-reported smoking and substance use

4.3 Pregnancy Complications

HYPERTENSIVE DISORDERS IN PREGNANCY

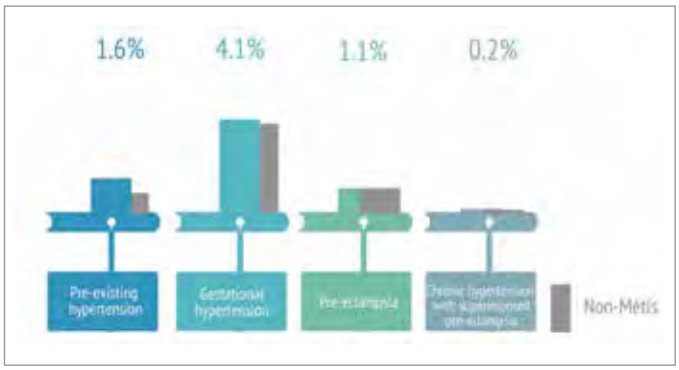

Figure 13. Hypertensive disorders in pregnancy

Figure 13 shows the prevalence of hypertensive disorders in Métis pregnancies. The prevalence of **preexisting chronic hypertension** in Métis pregnancies was low (1.6%). After adjusting for socioeconomic factors, health behaviours, and relevant medical conditions, preexisting chronic hypertension was more likely to occur among pregnancies of Métis women (aRR 1.57; 95% CI 1.11, 2.25) compared to the pregnancies of non-Métis women (Figure 14).

Gestational hypertension was diagnosed in 4.1% of Métis pregnancies over the study period. There were no significant differences between pregnancies of Métis and non-Métis women for the risk of developing gestational hypertension after adjusting for socioeconomic factors, health behaviours, and relevant medical conditions (aRR 0.98; 95% CI 0.81, 1.18) (Figure 14)

The prevalence of **preeclampsia** was 1.1% among Métis pregnancies, and the risk of developing preeclampsia in Métis pregnancies did not differ of that for non-Métis pregnancies after adjusting for socioeconomic factors, health behaviours, and relevant medical conditions (aRR 0.98; 95% CI 0.76, 1.26) (Figure 14).

Chronic hypertension with superimposed preeclampsia developed in a very small number of Métis pregnancies (less than one percent). There were no differences in the probability of chronic hypertension with superimposed preeclampsia between Métis pregnancies and non-Métis pregnancies (aRR 1.49; 95% CI 0.68, 3.27) after adjusting for socioeconomic factors, health behaviours, and relevant medical conditions (Figure 14).

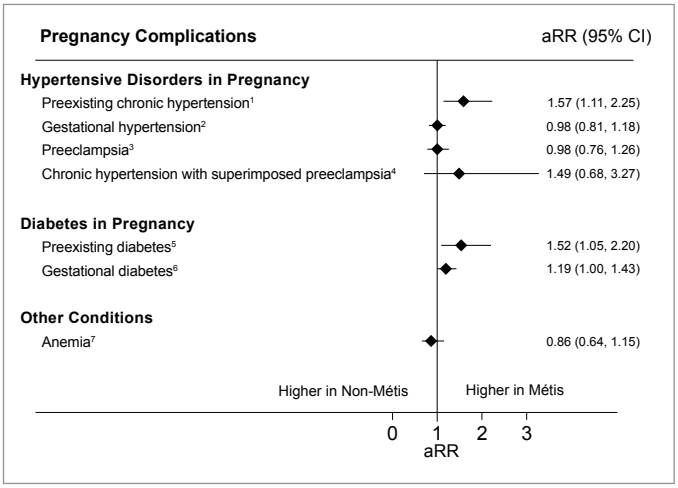

Figure 14. Adjusted risk ratios for pregnancy complications comparing Métis and non-Métis study group

[1] Adjusted for age at delivery, pre-pregnancy weight >=91kg, pre-existing diabetes

[2] Adjusted for preexisting hypertension, preexisting diabetes, gestational diabetes, age at delivery, prepregnancy weight >=91kg, substance use and smoking in pregnancy, area of residence, nulliparity, social and material deprivation

[3] Adjusted for preexisting hypertension, preexisting diabetes, gestational diabetes, age at delivery, prepregnancy weight >=91kg, substance use and smoking in pregnancy, area of residence, nulliparity, social and material deprivation

[4] Adjusted for preexisting diabetes, gestational diabetes, prepregnancy weight >=91kg, substance use and smoking in pregnancy, area of residence, nulliparity, social and material deprivation

[5] Adjusted for age at delivery, gestational hypertension, preexisting hypertension, prepregnancy weight >=91kg

[6] Adjusted for area of residence, age at delivery, preexisting hypertension, prepregnancy weight >=91kg

[7] Adjusted for age at delivery, area of residence, social and material deprivation

DIABETES AND ANEMIA IN PREGNANCY

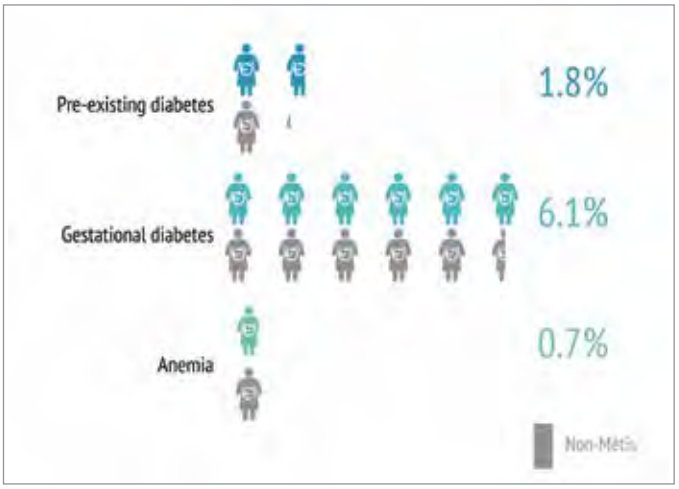

Figure 15. Diabetes and anemia in pregnancy

Figure 15 shows the prevalence of diabetes and anemia among Métis pregnancies. **Preexisting diabetes** was reported for a small proportion of Métis pregnancies (1.8%) during the study period (Figure 15). There was a significant increase over time in the number of pregnancies complicated with preexisting diabetes in both Métis and non-Métis groups. After adjusting for maternal age at delivery, health behaviours, and presence of important medical conditions, Métis pregnancies had a higher probability of being complicated by preexisting diabetes compared to non-Métis pregnancies (aRR 1.52; 95% CI 1.05, 2.20) (Figure 14).

The prevalence of **gestational diabetes** in Métis pregnancies was 6.1%. After adjusting for socioeconomic factors, maternal age at delivery, preexisting chronic hypertension, and health behaviours, we observed small differences in the probability of gestational diabetes among Métis pregnancies as compared to non-Métis pregnancies (aRR 1.19; 95% CI 1.00, 1.43) (Figure 14).

Anemia was reported for a very small proportion (0.7%) of pregnancies of Métis women during the study period (Figure 15). While the prevalence of anemia in Métis pregnancies remained steady during the study period, the numbers increased among non-Métis pregnancies. However, after adjusting for maternal age at delivery and socioeconomic factors, there were no differences between the two groups in the probability of developing anemia during pregnancy (aRR 0.86; 95% CI 0.64, 1.15) (Figure 14).

Table A4 in the Appendix provides a summary of pregnancy complications of Métis and non-Métis births in the study. Annual trends of maternal antenatal factors are reported in Appendix B4-B5.

> I should have went right after I took my two hour [glucose tolerance] test… I was one point over the line, and he said "we'll just take care of it with diet," and then he took off to [another province] for 6 weeks. While I'm suffering with headaches, and feeling sick, and not being able to eat anything. And then I started testing my [blood sugar] on my own, and they were all over 14 [mmol/L]. I went and seen another doctor - that doctor was the one who sent the referral out to [urban centre], a month later. Now... and I was - they put me on insulin for a week, and a week and a half later she was born. [laughs] So I mean it really wasn't any help for me, but I mean, I suffered for... a month with high [blood sugar].
>
> *– Region 1 participant*

4.4 Labour and Delivery Outcomes

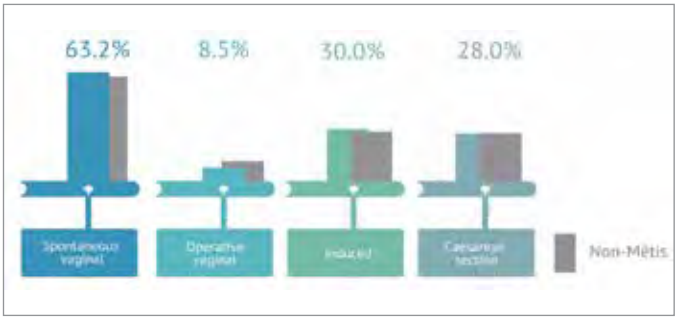

Figure 16. Mode of delivery

MODE OF DELIVERY

Figure 16 shows the prevalence of different delivery modes in Métis pregnancies. There were 63% of Métis births that were delivered vaginally, without assistance from forceps or a vacuum. Métis births were more likely to have a spontaneous vaginal delivery compared to the non-Métis group after adjusting for maternal age at delivery, socioeconomic status and parity (aRR 1.25; 95% CI 1.11, 1.40) (Figure 17).

Operative vaginal delivery (vaginal delivery with assistance from forceps or a vacuum) was the method of birth in 8.5% of Métis pregnancies. After adjusting for maternal age at delivery, socioeconomic factors and fetal growth, operative vaginal delivery was less likely to occur among Métis births as compared to non-Métis births (aRR 0.69; 95% CI 0.63, 0.75) (Figure 17).

Labour was induced in 30% of Métis births. The proportion of induced births increased over time in both Métis and non-Métis groups. There were no differences between Métis births and non-Métis births in the probability of being induced at labour (aRR 1.03; 95% CI 0.96, 1.09) after adjusting for sociodemographic and medical factors during pregnancy (Figure 17).

A total of 28% of Métis births were delivered by Cesarean section. After adjusting for sociodemographic factors, reproductive history, and relevant obstetric conditions, there were no differences between Métis births and non-Métis births in the proportion of births delivered by Cesarean section (aRR 1.02; 95% CI 0.97, 1.07) (Figure 17).

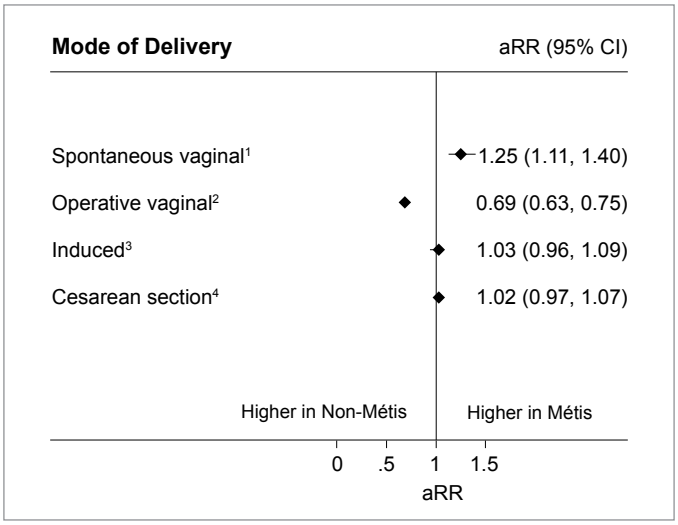

Figure 17. Adjusted risk ratios for mode of delivery outcomes comparing Métis and non-Métis study groups

1 Adjusted for spontaneous vaginal: age at delivery, area of residence, social deprivation, material deprivation and parity

2 Adjusted for operative vaginal: age at delivery, area of residence, social deprivation, material deprivation, large for gestational age and birth weight

3 Adjusted for pre-existing hypertension, pre-existing diabetes, gestational diabetes, gestational hypertension, age at delivery, pre-pregnancy weight >=91kg, birth weight, area of residence, social deprivation and material deprivation

4 Adjusted for cesarean section: age at delivery, area of residence, social deprivation, material deprivation, parity, placenta previa and premature rupture of membranes

> I wasn't able to have natural births, I had C-sections. And sometimes with having a C-section, people sometimes will make you feel like less than, because you couldn't do it naturally, but for whatever reason, I was in labour for two days and could not have her naturally, so I had to have a C-section. I was the only one in my family, my grandmother had ten children and my mom had four children and then there was me, it made me feel like, in a way, like somewhat of a failure, because I couldn't do the one thing that we're supposed to do, right?
>
> *– Region 4 participant*

TYPE OF ATTENDANT AT DELIVERY

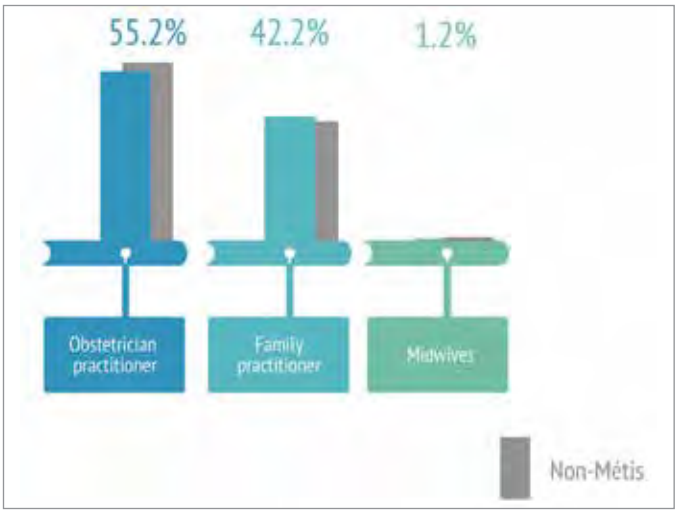

Figure 18. Type of attendant at delivery

Figure 18 shows the types of attendants among Métis deliveries. In this study, 55.4% of deliveries by Métis mothers were attended by obstetricians, with numbers increasing over the study period. There were no differences between the proportion of Métis and non-Métis deliveries attended by an obstetrician after adjusting for maternal, socioeconomic status and medical factors during pregnancy (aRR 1.03; 95% CI 0.93, 1.16) (Figure 19).

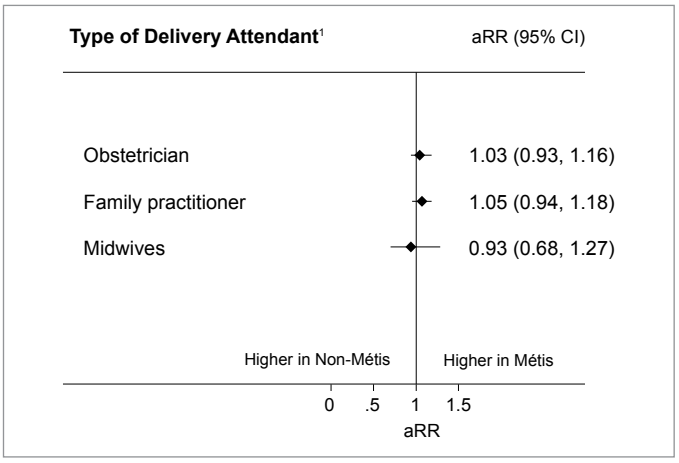

Figure 19. Adjusted risk ratios for type of delivery attendant comparing Métis and non-Métis study groups

1 Adjusted for age at delivery, area of residence, social deprivation, material deprivation, pre-existing diabetes, pre-existing hypertension, preeclampsia, gestational diabetes, gestational hypertension

> I lived, with my oldest, I lived in [town], which is not too far from here, and there it's different; you see the doctor kind of just once a month, and if you happen to go into labour during the weekdays, you can have your baby in [town]. But if you go into labour on the weekends, they fly you to [urban centre] because they don't have no doctor. And for the first time they flew me, I got so scared in the plane, because I'd never been in a plane before, my contractions and everything stopped by the time I got to [urban centre]. I was totally freaked out.
>
> *– Region 5 participant*

Overall, 42.1% o Métis mothers' deliveries were attended by a family practitioner. There were no differences between Métis and non-Métis groups in the proportion of deliveries attended by a family practitioner after adjusting for maternal socioeconomic status and medical factors during pregnancy (aRR 1.05; 95% CI 0.94, 1.18) (Figure 19).

A small proportion (1.2%) of Métis deliveries were attended by a midwife. There were no differences between the proportion of Métis and non-Métis deliveries attended by a midwife after adjusting for maternal socioeconomic status and medical factors during pregnancy (aRR 0.93; 95 CI% 0.68, 1.27) (Figure 19).

> A midwife is more like that precious care that my family or in the olden days that our mothers and grandmothers and sisters would be there to give us but the doctor is still available. And the midwife is also a voice for me so that there was no abuse in the hospital. To her, you know, as far as she could go with that… I mean, she could say hey, you know, you have a choice here, you can do this or you don't have to… instead of just being led along.
>
> *– Region 4 participant*

COMPLICATIONS OF LABOUR AND DELIVERY

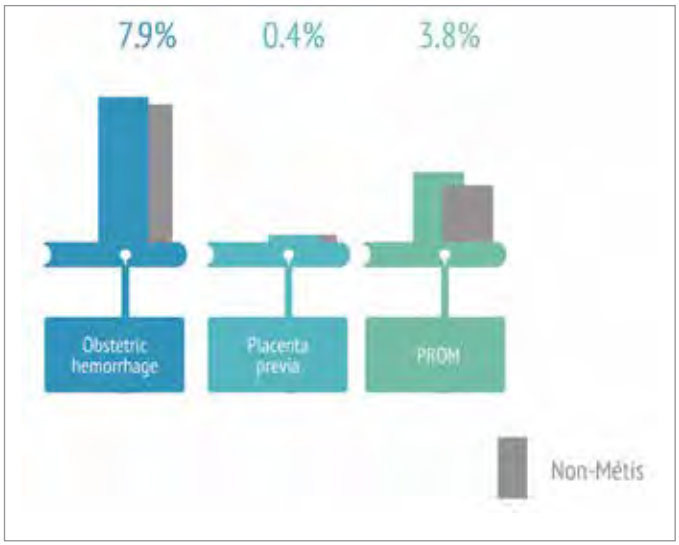

Figure 20. Complications of labour and delivery

Figure 20 shows the prevalence of labour and delivery complications in Métis pregnancies. A total of 7.9% of Métis pregnancies experienced **obstetric hemorrhage** before, during or after delivery. Métis mothers were more likely to have an obstetric hemorrhage (aRR 1.11; 95% CI 1.01, 1.23) after adjusting for maternal age at delivery, socioeconomic status, health behaviours and other pregnancy-related factors (Figure 21).

A very small number (0.4%) of Métis pregnancies were complicated with **placenta previa**. There were no differences between Métis and non-Métis mothers in the likelihood of having placenta previa (aRR 0.97; 95% CI 0.64, 1.48) after adjusting for maternal age at delivery and health behaviours (Figure 21).

Overall, 3.8% of Métis pregnancies had premature rupture of membranes. There were no differences in the likelihood of **premature rupture of membranes** between Métis and non-Métis pregnancies (aRR 1.02; 95% CI 0.88, 1.18) after adjusting for health behaviours and socioeconomic factors (Figure 21).

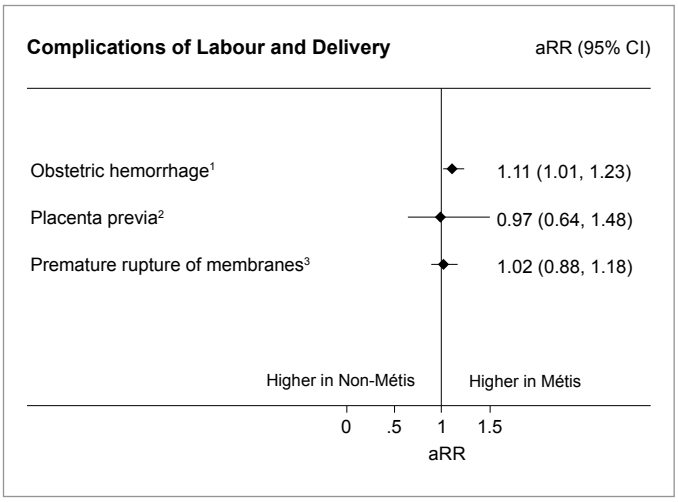

Figure 21. Adjusted risk ratios for complications of labour and delivery comparing Métis and non-Métis study groups

1 Adjusted for age at delivery, pre-pregnancy weight >=91kg, area of residence, social deprivation, material deprivation, parity and birth weight

2 Adjusted for age at delivery, smoking in pregnancy and substance use in pregnancy

3 Adjusted for smoking in pregnancy, social deprivation and material deprivation

Table A5 in the Appendix provides a summary of labour and delivery outcomes in both Métis and non-Métis pregnancies. Annual trends of labour and delivery outcomes are reported in Appendix B6-B8.

4.5 Birth Outcomes

DURATION OF GESTATION

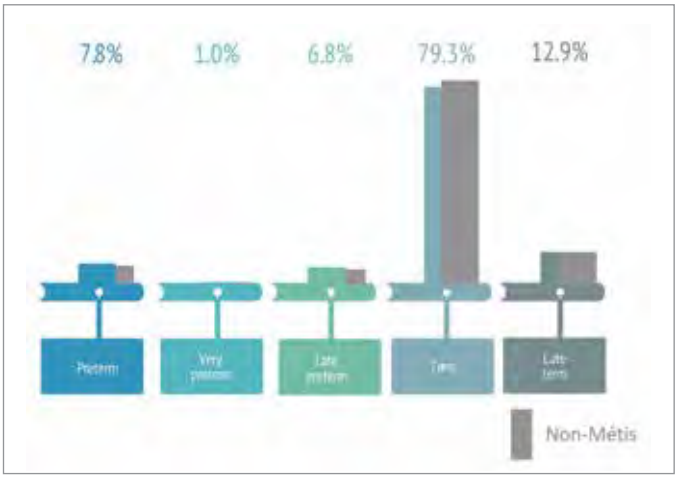

Figure 22. Duration of gestation

Figure 22 shows the prevalence of duration of gestation types among Métis newborns. The prevalence of **preterm** birth (<37 weeks) was 7.6% among Métis babies in the study. There was no difference in the proportion of preterm births between Métis and non-Métis babies (aRR 0.97; 95% CI 0.86, 1.09) after adjusting for relevant maternal socioeconomic and obstetric factors (Figure 23).

> My last pregnancy I did have to have [my daughter] at the hospital, but I still got to have a midwife, I just had a very high-risk pregnancy, I hemorrhaged throughout my whole pregnancy. So yeah, it was a little bit different. We still very much had control, it just had to be in the hospital.
>
> *– Region 3 participant*

The prevalence of very **preterm births** (<32 weeks) was very small (less than 1%) among babies of Métis mothers. There was no difference in the proportion of very preterm births between Métis and non-Métis babies (aRR 0.93; 95% CI 0.70, 1.23) after adjusting for relevant maternal socioeconomic and obstetric factors (Figure 23).

There were 6.8% of Métis babies born **late preterm** (32 weeks – 36.6 weeks). There was no difference in the proportion of late preterm births between Métis and non-Métis babies (aRR 0.97; 95% CI 0.86, 1.10) after adjusting for relevant maternal socioeconomic and obstetric factors (Figure 23).

The majority (79.3%) of Métis births occurred at **term** (i.e., between 37 weeks and 40.6 weeks gestation). There were no differences in the proportion of births at term between pregnancies of Métis mothers and pregnancies of non-Métis mothers after adjusting for relevant maternal socioeconomic and obstetric factors (aRR 1.01; 95% CI 0.95, 1.08) (Figure 23).

The prevalence of **late term birth** (at least 41 weeks) was 12.9% among babies of Métis mothers and showed a decline over the study period. We observed no difference in the likelihood of late-term births between babies of Métis mothers and babies of non-Métis mothers after adjusting for relevant maternal socioeconomic and obstetric factors (aRR 0.94; 95% CI 0.86, 1.02) (Figure 23).

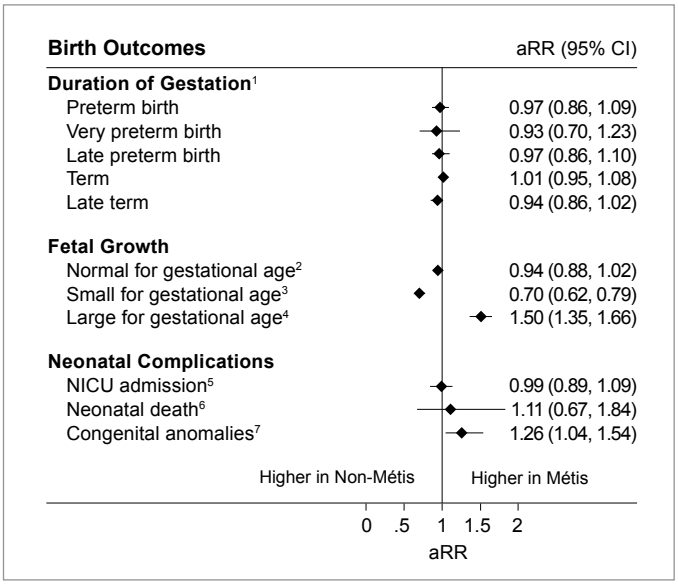

Figure 23. Adjusted risk ratios for birth outcomes comparing Métis and non-Métis study groups

1 Adjusted for age at delivery, area of residence, social deprivation, material deprivation, obstetric hemorrhage, gestational hypertension, smoking in pregnancy, substance use in pregnancy, multiparity and grand multiparity

2 Adjusted for age at delivery, area of residence, social deprivation, material deprivation, pre-pregnancy weight ≥ 91kg, pre-pregnancy weight <45k

3 Adjusted for age at delivery, area of residence, social deprivation, material deprivation, pre-pregnancy weight <45kg, smoking in pregnancy, substance use in pregnancy use and parity

4 Adjusted for age at delivery, area of residence, social deprivation, material deprivation, pre-pregnancy weight ≥ 91kg, pre-existing diabetes, gestational diabetes and parity

5 Adjusted for nulliparity, large for gestational age, small for gestational age, cesarean section, gestational age at delivery and area of residence

6 Adjusted for age at delivery, parity, area of residence, gestational age at delivery and mode of delivery

7 Adjusted for age at delivery, substance use in pregnancy, smoking in pregnancy, social deprivation, material deprivation, pre-existing diabetes and pre-pregnancy weight ≥ 91kg

FETAL GROWTH

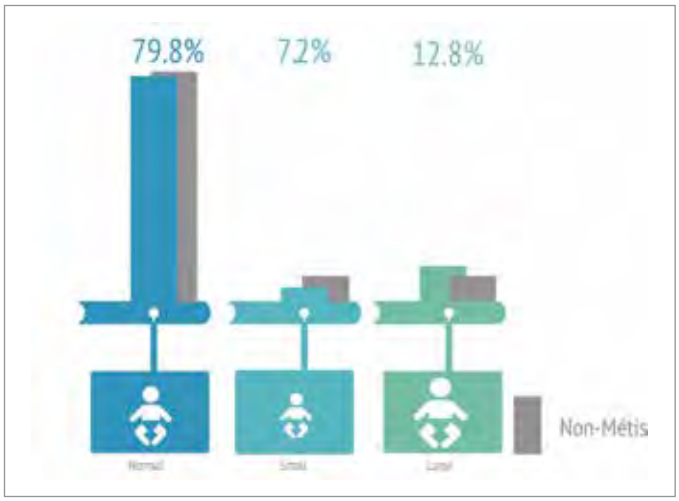

Figure 24. Fetal growth, categorized as "normal for gestational age", "small for gestational age", and "large for gestational age"

Figure 24 shows the prevalence of fetal growth types among Métis newborns. Overall, 79.5% of newborns from Métis mothers were of a normal size for their gestational age at birth. There were no differences in the proportion of newborns of **normal size for gestational age** at birth between Métis and non-Métis babies after adjusting for relevant maternal socioeconomic and obstetric factors (aRR 0.94; 95% CI 0.88, 1.02) (Figure 23).

Research results show that 7.2% of babies born to Métis mothers were small for gestational age. Babies of Métis mothers were less likely to be **small for gestational age** compared to the non-Métis group after adjusting for relevant maternal socioeconomic and obstetric factors (aRR 0.70; 95% CI 0.62, 0.79) (Figure 23).

A total of 12.8% of babies of Métis mothers were large for gestational age, with numbers decreasing over the study period. Babies of Métis mothers had a greater likelihood of being born **large for gestational age** compared to babies of non-Métis mothers after adjusting for relevant maternal socioeconomic and obstetric factors (aRR 1.50; 95% CI 1.35, 1.66) (Figure 23).

NEONATAL COMPLICATIONS

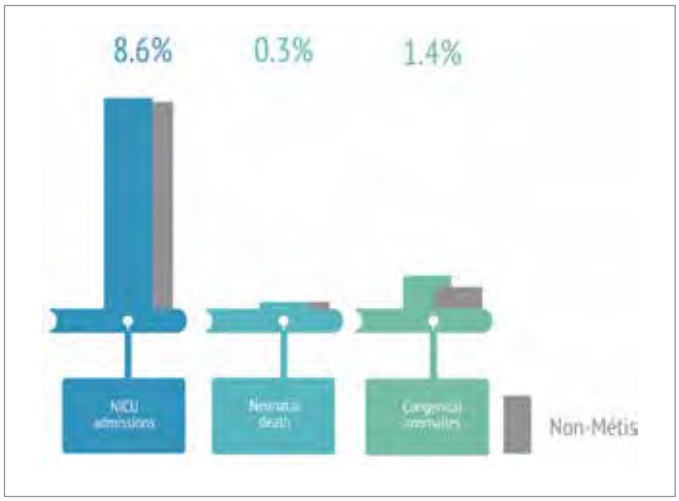

Figure 25. Prevalence of neonatal complications including NICU admission, neonatal death, and congenital anomalies

Figure 25 shows the prevalence of neonatal complications among Métis newborns. The prevalence of **NICU admissions** was 8.6% among babies of Métis mothers. There was no difference between babies of Métis mothers and babies of non-Métis mothers in the likelihood of having a NICU admission after adjusting for maternal socioeconomic, obstetric and perinatal factors (aRR 0.99; 95% CI 0.89, 1.09) (Figure 23).

The number of **neonatal deaths** among babies of Métis mothers during the study period was less than 1%. There was no difference in the risk of neonatal death between babies of Métis mothers and babies of non-Métis mothers after adjusting for maternal socioeconomic, obstetric and perinatal factors (aRR 1.11; 95% CI 0.67, 1.84) (Figure 23).

The overall prevalence of babies born with conditions that were recorded at the time as **congenital anomalies** was 1.4% among babies of Métis mothers, with the numbers increasing over the study period. Babies of Métis mothers had a greater likelihood of experiencing conditions that were recorded as congenital anomalies after

adjusting for maternal socioeconomic, obstetric and perinatal factors (aRR 1.26; 95% CI 1.04, 1.54) (Figure 23). The proportion of **congenital anomalies** should be interpreted with caution due to inconsistent reporting across regions in Alberta.

Table A6 in the Appendix provides a summary of birth outcomes in both Métis and non-Métis births in the study. Annual trends of birth outcomes are reported in Appendix B9-B12.

5. DISCUSSION

The language of health outcomes reporting in epidemiology often runs the risk of perpetuating negative stereotypes of Indigenous peoples.[7] In this report, the results are discussed within a social determinants framework that is culturally aligned with a Métis lens that integrates physical, spiritual, mental and social dimensions of health.[38,42] The analysis and interpretation of the epidemiological data in this report acknowledge the influence of a broad range of environments, systems and institutions that have led to maternal and perinatal health inequalities compared to non-Indigenous peoples.[39]

> I know as... a young mom when I was pregnant and stuff like that, there was nothing for me. There was.... and to go and seek it out, especially as a teen mom, who's pregnant for the first time - you're afraid. You're absolutely afraid, there's so many stigmas going against you to begin with. Let alone having to find supports, you're always having that fear of judgement.
>
> *– Region 2 participant*

This report analyzed the epidemiological characteristics, maternal and perinatal health outcomes of pregnancies of Métis women in Alberta. Maternal outcomes that were evaluated included antenatal factors, pregnancy comorbidities and complications, and labour and delivery outcomes. Newborn outcomes included duration of gestation, fetal growth, and neonatal complications. We found a pattern of sociodemographic and antenatal factors among Métis pregnancies characterized by young maternal age at delivery, residence in urban areas and in areas of severe socioeconomic deprivation, reception of adequate and intensive prenatal care, pre-pregnancy weight greater than 91kg, and a high proportion self-reported smoking.

> But I find it's very... you know, especially when it comes to childbirth, there's not really a lot of options in this area in terms of if you don't want to have say a hospital birth. Like... the options are... more limited. So for this pregnancy, I really wanted to have a midwife and do an out of hospital birth, but it requires us having to travel all the way up to [hamlet] for all of my prenatal visits, and then the birth as well. So it'll be - so it's like over a two hour drive each way…
>
> *– Region 2 participant*

Significant pregnancy complications among Métis mothers were low in numbers, but higher in comparison to non-Métis mothers for preexisting chronic hypertension, preexisting and gestational diabetes, and anemia. The majority of Métis births were vaginal deliveries, and the rates of cesarean section were similar to those of non-Métis births. Métis deliveries were likely to be attended by obstetricians, while a small proportion were attended by a midwife. Métis pregnancies had a small proportion of complications during labour and delivery, with the exception of a higher proportion of obstetric hemorrhage when compared to non-Métis pregnancies. For birth and neonatal outcomes, there were no differences between Métis and non-Métis babies in the prevalence of preterm birth, NICU admissions, and neonatal deaths. There was a higher number of babies born large for gestational age and small differences in the proportion of babies born with congenital anomalies compared to non-Métis babies.

Overall, the majority of Métis pregnancies occurred among women aged less than 30 years, living in urban areas, and mainly residing in Region 4. Nearly half of pregnancies were from Métis mothers living in areas of severe material and social deprivation. The results align with previous reports of Indigenous women in Canada, that have shown that pregnant Indigenous women are at a high risk of experiencing poor physical environments and living under conditions of social and economic marginalization.[43,44] Social and economic deprivation have been consistently associated with adverse pregnancy and birth outcomes in both urban and rural settings.[45] These factors work in concert with other structural determinants (i.e. historical and contemporary colonial policies, suppression of self-determination and culture[46-48]) to impact Métis people, translating in to high levels of poverty, low levels of education, poor housing, home insecurity and food insecurity. These implications of colonization further widen maternal and perinatal health inequities among Métis mothers and babies as compared to non-Métis mothers and babies.[49]

> I think mainly - it's just a huge barrier, it's a huge barrier to having regular prenatal - like some people go... you know, only see - like I know people who only go to see the doctor like twice or whatever their whole pregnancy, right? Like... because it's not easy to get to [town].
>
> *– Region 5 participant*

5.1 Maternal Outcomes

Adequacy of prenatal care was evaluated with a validated index based upon the time of initiation of prenatal care (i.e. timing of visits related to the weeks of gestation in which prenatal care was initiated), and the number of prenatal care visits that were received throughout pregnancy.[50] Pregnancies of Métis mothers (74%) were more likely to receive adequate prenatal care. These results contrast with reports of Indigenous women in Manitoba being five times more likely to not have accessed adequate prenatal care than non-Indigenous women.[51] Differences in the results between the two studies may be attributed to the use of different indices to measure adequacy of prenatal care and

> Yeah. Definitely our community has limited services, as far as prenatal stuff goes... And the services that are offered, are offered through AHS and they're not offered from an Indigenous perspective at all. So you're not getting any of that kind of stuff in with your prenatal education if you - if you are lucky enough to get classes. Like basically now, there are no group classes... You can still get prenatal classes at the public health here, but you have to call and… ask for like a one on one session kind of thing, cause they don't do group ones.
>
> *– Region 6 participant*

differences in the selection criteria and definition of the study cohorts. Despite these encouraging results, it is important to note the proportion of pregnancies in Alberta that still receive inadequate prenatal care (~19%) is at a rate that is higher than that reported in other jurisdictions in Canada (11.5%).[52] There is evidence that social inequities exist in prenatal care in Alberta, despite having a universally funded health care system. Consideration should be given to financial, cultural, social, geographical or accessibility factors that account for these inequities.[7] Intensive prenatal care was more frequent among Métis pregnancies than non-Métis pregnancies. These results may suggest potential comorbidities or complications among Métis pregnant women that need closer monitoring. Alternatively, results can signal stigmatization and prejudice towards Métis women as being in need of more frequent visits throughout pregnancy compared to non-Métis women.[7] The adequacy of prenatal care index in this study only measures the timing of initiation and number of times these services were accessed, and do not address the quality or content of care. Therefore,

gaps in our knowledge about the adequacy of prenatal care should be filled in by Métis knowledge and experiences with the use of these health care services.[38]

Maternal weight greater than 91kg before pregnancy has been associated with maternal complications (i.e. gestational diabetes and hypertensive disorders), and perinatal morbidities (i.e. macrosomia)[53] particularly among Indigenous women.[54] We found that weight before pregnancy equal or greater than 91kg was more frequent among Métis mothers compared to non-Métis mothers. An analysis by Indigenous groups in a systematic review and meta-analysis of the prevalence of being overweight and obesity in Canada showed the prevalence of being overweight to be ~30% among Indigenous peoples.[55] Structural factors such as lack of food sovereignty, economic barriers, and difficulties accessing traditional foods have largely influenced a growing reliance on market and ultra-processed foods.[56] Interventions to support a healthy weight before and during pregnancy should promote Métis cultural restoration of traditional foodways[57] while supporting holistic, self-affirming, and strength-based approaches to nutrition and diet.

> Yeah, because there's no grant money and there's no money coming in to the community for addictions. Where right now it should be - it should be the main priority.
>
> *– Region 2 participant*

For many Métis women, both smoking and substance use during pregnancy are common mechanisms to cope with trauma (individual and inter-generational), and stress in response to domestic violence, marginalization, and experiences of social exclusion and isolation during a critical period of life.[58,59] Furthermore, many communities lack access to substance use education programs, and treatment options for those who are looking to reduce their use of various substances. Smoking and substance use during pregnancy is a public health concern. Knowledge of the burden of these health behaviours during pregnancy is important, considering the well-documented negative impacts they have on maternal and infant health.[47,60,61] This study found that self-reported rates of smoking

> And that a lot of the diseases that we're seeing now are typically caused by the white person's contributions to it. In that like diabetes is, you know, we don't talk about that it actually can be caused by stress, the body is stressed. And that's how I feel about the guilt that we have with post-partum and Caesarean and that's what I mean… Nobody should ever be made to feel guilty, but the problem that I see is that we don't have the support. So people feel like they're failing, but when actually society, our communities are failing us when they're not putting those first.
>
> *– Region 4 participant*

and substance use during pregnancy were high among Métis mothers and similar to those reported for Métis young women in other studies (31%).[62] Results compare with other studies conducted in Manitoba which reported a greater prevalence of smoking (62.1% versus 26.2%) and substance use (30.6% versus 10%) during pregnancy in Indigenous women compared with their non-Indigenous counterparts.[63]

Pregnancy complications such as preexisting chronic hypertension, preexisting diabetes, gestational diabetes, and anemia were high among Métis mothers. Results align with other provincial studies reporting high rates of chronic hypertension and diabetes among Métis Albertans.[64-66] These pregnancy complications are typically attributed to biological characteristics and behavioural influences; however, social determinants such as income, education, housing,

and access to nutritious food are central to their development and progression.[67,68] The impact of these determinants on Métis women's health and well-being has – and continues to be – magnified by the effect of colonial legacies[8].

The majority of Métis births were delivered vaginally and attended by obstetricians. The rates of Cesarean delivery were similar to those of non-Métis women in the province. These results reflect how colonization has overturned Métis women's collective knowledge about birthing practices in favour of assimilation policies towards birth medicalization, and evacuation from rural communities to birth in urban, tertiary care hospitals. The low number of Métis births attended by midwives speak about the subjugation of traditional midwifery knowledge, and the barriers women face in accessing midwifery care.[7,69,70] We heard from Métis women that it was difficult for them to access midwives due to the low number of midwives in Alberta, especially those who practice in rural Alberta. For women who wished to become midwives, many faced barriers, including there being few programs available, with high educational admissions requirements and racism in those programs.

Similar to national trends,[71] the induction of labour was frequent for Métis deliveries. Labour is often induced for those with gestational diabetes, which is found slightly more often in Métis women.[72]

> And there's like a whole history there as to why people have this perception of midwives, especially in Alberta. People have no idea, but back when they used to forbid us from practicing our culture, midwifery went along with that. Indigenous midwives who would deliver babies in the communities were discredited, they were pushed aside, and what they were doing was made illegal. So there's a whole history behind that that I think if we kind of explore, people might start having different perceptions.
>
> *– Region 4 participant*

Complications in pregnancy are a threat to maternal health. We found that Métis mothers had a higher probability of experiencing obstetric hemorrhages, while no differences between Métis mothers and non-Métis mothers were identified for placenta previa or premature rupture of membranes.

There is scant evidence about the occurrence of complications of labour and delivery among Métis women. The high prevalence of obstetric hemorrhage cases among Métis mothers may be related to fetal macrosomia, as this is a frequent adverse birth outcome among Métis mothers.[73] Obstetric hemorrhage has also been related to smoking during pregnancy. Both of these factors could explain the higher rates of obstetric hemorrhage among Métis mothers, as epidemiological studies have shown a strong association between these two factors.[74,75]

5.2 Perinatal Outcomes

Preterm birth occurred in about 7.8% of Métis mothers in Alberta, a number that is close to the national rate of preterm birth calculated for Métis mothers (7.6%)[76] and to the provincial rate in Alberta for the general population (6.8%).[77] There were no differences between Métis and non-Métis mothers in the rates of preterm birth. This does not align with other reports that examine the differences in rates between Indigenous and non-Indigenous groups.[76,78] Additional research is needed to understand these inconsistencies in the results.

The lower rates of babies born small for gestational age among Métis mothers compared to non-Métis mothers has been previously reported.[76] This finding may be due to a higher maternal age of non-Métis mothers.[79] There was a higher rate of Métis babies born large for gestational age, a result that is likely associated with the higher rates of gestational diabetes and weight greater than 91kg before pregnancy among Métis mothers.[53,80,81]

The proportion of congenital anomalies described in this report is lower than data reported by the Alberta Congenital Anomalies Surveillance System, which is the most comprehensive Canadian source of birth defects, including both stillbirths and live births.[82] Congenital anomalies are a heterogeneous and multifactorial group of structural, functional or metabolic conditions that occur during the intrauterine life. They can be identified during the perinatal period, at birth, or later in early childhood. We found a marginal difference in the rates of congenital anomalies between Métis and non-Métis births. Despite the small numbers, consideration about potential mechanisms for main congenital anomalies should be further explored.

5.3 Strengths & Limitations of this Study

This is the first study to describe Métis-specific maternal and neonatal epidemiological outcomes in Alberta. We used a validated clinical perinatal registry that includes all live births in the province occurring in hospitals and attended by registered midwives. Data from the registry was linked with high-quality provincial administrative health data and the MNA Identification Registry to provide a comprehensive portrait of maternal and perinatal health among the Métis over a 10 year period from 2006 to 2016.

An important strength of this research and report is the collaboration between researchers at the University of Alberta and the MNA, and the active engagement of allied and Métis academic researchers and provincial government data custodians. The research question was developed in partnership with MNA team members, who provided significant input into the proper observance of the cultural context to analyze and report results based on Métis data.

Collaboration with provincial government partners allowed for the identification of MNA members in data registries and removed structural barriers that have impeded the consolidation of epidemiological health data for Métis mothers and babies in previous research. Access to this data is a fundamental step for devising adequate policy responses to address inequalities and to monitor the effectiveness of interventions to overcome discrimination and other colonial impacts affecting Métis maternal and perinatal health.[83]

The adoption of a social determinants of health framework for the analysis and interpretation of the results is another strength of this report. Conventional health statistics have traditionally focused on Indigenous maternal and child health "deficits,"[84] while masking Indigenous women's strengths and resilience towards sociopolitical determinants of health inequities.[85] Comparisons with a reference/non-Métis group were contextualized to understand how health inequalities are embodied and reproduced, and how they can be challenged, and overcome.[4] To begin to address these health inequities, respectful approaches should be collaborative, sustainable and culturally sensitive to reflect the unique identities of Métis people. This report acknowledges that pathways for the associations among social determinants, maternal health, and adverse birth outcomes are complex and likely multifactorial.[15] This emphasizes the role of epidemiology research to inform sociopolitical determinants of inequitable health, policy, advocacy, and practice change for Métis health equity.[85]

This project also incorporates a qualitative component that gathered the voices and stories of Métis women, in an effort to capture some of the "stories behind the numbers" that are represented through the epidemiological data that has been shared in this report. The stories of Métis women that were gathered as part of this project are further detailed in the sister report "*Ehawawisit (with Child): the Experiences and Perspectives of Métis Women on Pregnancy, Birth, and Motherhood."* The combination of both qualitative and quantitative methods enables us to present a more holistic picture of the health of Métis mothers in Alberta.

As with all epidemiological research that is observational in nature, this study has a number of limitations related to under-enumeration of Métis people in the MNA Identification Registry. Misclassification bias in ascertainment of the Métis group was not entirely eliminated in the study and therefore, Métis people without citizenship registration under the MNA would have been incorrectly classified in the non-Métis group. For example, a mother in the non-Métis group can be: 1) a Métis person who is not a citizen of the MNA, 2) a registered member or citizen of another Indigenous people or Nation, or 3) a non-Indigenous person. Since 2009, Alberta does not identify Registered First Nations and Inuit in administrative datasets as a result of the elimination of premiums in the province. Furthermore, as a consequence of Canada's colonial system of classifying Indigenous people as either First Nations, Métis, or Inuit, the way in which Indigenous peoples have interwoven across communities, nations, and peoples has become obscured, and masks the ways in which many Indigenous peoples belong or have kinship connections to multiple communities and peoples. Health data linkage based on an incomplete registry of Métis who are not MNA citizens may lead to under-estimation of study outcomes.[86,87]

Considerable data gaps remain in this study, particularly in the environmental and cultural domains. Relevant information about educational attainment, income, breastfeeding, food security and employment conditions are not recorded in the data repositories used in this study. Similarly, the lack of culturally relevant data in administrative health repositories to inform Métis focused indicators of health and wellbeing highlights a tension that has long existed between the reporting of epidemiological data and Métis perceptions of what constitutes useful and meaningful data.[38]

5.4 Study Significance and Implications

The research presented in this report is one of the first studies in Canada and is the first in Alberta that provides a comprehensive epidemiological depiction of maternal and perinatal health outcomes among Métis people. The results presented in this document have important implications for Métis Albertans, healthcare professionals, researchers and policy makers.

The results from this report will be able to inform Métis-led initiatives to support healthy Métis pregnancies and to decrease the burden of chronic hypertension, diabetes, obstetric hemorrhage, smoking and substance use during pregnancy, alternations in fetal growth and congenital anomalies. Strategies should acknowledge the intergenerational, social, political, and economic circumstances that drive many of the inequalities in maternal and perinatal outcomes described in this report.

This report and its sister report *"Ehawawisit: the Experiences of Métis Women in Pregnancy, Childbirth, and Motherhood"* provide important information to health care practitioners involved in the care of Métis pregnant women. Deeper knowledge about the root causes of maternal and perinatal health inequalities affecting Métis people in Alberta, the social determinants of health, and the cultural values of the Métis population being served would be an initial step towards providing culturally and socially competent care. Métis women exhibit tremendous strength and resiliency while overcoming challenges during pregnancy and childbirth that have often been impacted by systematic marginalization, social exclusion, and dispossession of Métis health and identity. By recognizing these challenges, health care practitioners can support women to overcome structural barriers, enhance self-determination, support women's choice and autonomy over their own bodies and pregnancies, and by doing so, build a healthier future for themselves, their babies, families, and communities.

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APPENDIX A: TABLES

Table A1. Study variables

VARIABLE TYPE	VARIABLE NAME	DESCRIPTION
Socio-demographic	Maternal identifier	Mother's scrambled PHN/ULI
	Métis cohort	Métis, non-Métis
	Maternal age at delivery	Maternal age in years at time of delivery (Date of delivery – Date of birth)
	Area of residence at delivery	Urban if Peer Group = Lethbridge, Fort McMurray, Grande Prairie, Greater Calgary, Greater Edmonton, Medicine Hat or Red Deer Rural if Peer Group = Rural North, Remote North, Remote West, Rural Calgary, Rural Central, Rural South
	Material and Social Deprivation	Pampalon Index. Calculations based on aggregated/area-based data from Census data 2006 or 2011 + Six-digits postal code of maternal residence at delivery **Material Deprivation:** Average household income, unemployment rate and high school education rate **Social Deprivation:** Marital status (partnered, single, widowed or divorced), proportion of population living alone, proportion of single parent households
	Pregnancy type	Single, multiple
	Parity	Total number of previous pregnancies that progressed beyond 20 weeks gestation, regardless of outcome.
	Site of birth	Hospital, Birth centre, Home/Planned, Home/Unplanned
	Type of labour	Spontaneous, Induced
	Attendant at birth	Delivery Care; 01=General Practitioner, 02=Obstetrician, 03=Midwife, 04=Nurse, 05=Pediatrician 06=Neonatologist, 95=Medical Doctor, 96=Other, 97=Unknown
	Type of delivery	Vaginal, Cesarean
	Duration of labour	Hours, min, Stage
	Maternal morbidities at delivery	ICD-10 codes: C-section (O82 [O820–O829], O842), preeclampsia (O14 [O140–O149]), eclampsia (O15 [O150–O159]), gestational hypertension (O13), gestational diabetes mellitus (O24.4), placenta previa (O44 [O440–O441]), abruptio placentae (O45 [O450–O459]), obstetric hemorrhage (O67 [O670–O679], O72 [O720-O723]), premature rupture of membranes (O42.0, O42.1, O42.9), and need of operative vaginal delivery (O66.5).
	Other problems in current pregnancy	Pregnancy induced hypertension, Proteinuria >=1+, Gestational diabetes documented, Anemia (Hgb <100 gm/l), Diabetes controlled by diet only, Diabetes controlled by insulin, Diabetes: documented retinopathy. Chronic hypertension with superimposed preeclampsia (Chronic hypertension + Gestational hypertension + proteinuria)
	In-hospital maternal mortality	In-hospital deaths in the first 30 days after date of delivery.

VARIABLE TYPE	VARIABLE NAME	DESCRIPTION
Antenatal factors	Adequacy of prenatal care	Composite R-GINDEX (inadequate, adequate, and intensive) based on 1) Trimester of first visit; 2)Number of visits, and 3) Gestational Age at delivery
	Pre-pregnancy weight	Weight ≥ 91 kg, Weight ≤ 45 kg
	Substance use	Drug dependency, Alcohol use (≥ 3 drinks on any occasion during pregnancy, Alcohol use (≥ 1 drink per day throughout pregnancy)
	Smoking	Smoker – Anytime during pregnancy
Perinatal (Newborn)	Newborn identifier	Scrambled baby personal health number/ULI
	Sex	Male, female, not known
	Date of birth	Day, month, year
	Gestational age	Completed weeks
	Birth weight at delivery	In gr
	Birth length at delivery	In cm
	Head circumference	In cm
	Apgar score	(1 min, 5 min, 10 min)
	Size for gestational Age	Sex, gestational Age at delivery, birth weight at delivery
	In-hospital infant mortality (Neonatal death)	In-hospital infant deaths in the first 30 days after date of birth
	Resuscitative measures	Yes, No, Type
	NICU admission	Yes, No
	Breastfeeding	At delivery, at discharge
	Congenital Anomalies	Major fetal anomalies (from APHP). ICD-10 codes in the index hospital admission for delivery for the following conditions: Neural tube defects, heart septal defects, Down syndrome, fetal alcohol syndrome.

ICD-10-CM = International Classification of Diseases, 10th version, Canadian Enhanced Version; NICU = neonatal intensive care unit; PHN = personal health number; ULI = unique life identifier

Table A2. Maternal sociodemographic characteristics of Métis and non-Métis live births in Alberta (2006 – 2016)

CHARACTERISTIC	MÉTIS N = 7,910	NON-MÉTIS N = 471,522
MATERNAL AGE AT DELIVERY (MEAN, SD)	**27.2 (5.52)**	**29.7 (5.4)**
AGE GROUPS		
<20 years	750 (9.5)	18,515 (3.9)
20-24 years	2,143 (27.2)	74,845 (15.9)
25-29 years	2,633 (33.4)	148,646 (31.5)
30-34 years	1,647 (20.9)	149,255 (31.5)
35-39 years	585 (7.4)	66,276 (14.1)
≥ 40 years	127 (1.6)	12,827 (2.7)
Missing data	25 (<1)	1,158 (0.3)
MATERNAL AREA OF RESIDENCE (N, %)		
Urban	4,418 (62.2)	355,711 (75.4)
Rural/remote	2,951 (37.3)	113,548 (24.1)
Missing data	41 (0.5)	2,263 (0.5)
Material deprivation quintiles (n, %)		
Q1 (least deprived)	798 (10.1)	87,385 (18.5)
Q2	1,320 (16.7)	89,826 (19.1)
Q3	1,526 (19.3)	89,206 (18.9)
Q4	1,801 (22.8)	87,562 (18.6)
Q5 (most deprived)	2,099 (26.5)	95,511 (20.3)
Missing data	366 (4.6)	22,032 (4.7)
MATERNAL SOCIAL DEPRIVATION QUINTILES (N, %)		
Q1 (least deprived)	977 (12.4)	61,675 (13.1)
Q2	1,150 (14.5)	89,493 (19.0)
Q3	1,618 (20.5)	102,960 (21.8)
Q4	2,170 (27.4)	104,209 (22.1)
Q5 (most deprived)	1,629 (20.6)	91,153 (19.3)
Missing data	366 (4.6)	22,032 (4.7)

Table A3. Annual and period age-standardized prevalence (%) of antenatal factors in pregnancies of Métis and non-Métis women in Alberta (years 2006 – 2016)

VARIABLE	GROUP	YEAR											TREND	PERIOD PREVALENCE (%)	BETWEEN-GROUPS % DIFFERENCE (95% CI)
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
ADEQUACY OF PRENATAL CARE															
Inadequate	Métis	46.1	13.1	14.6	16.5	15.2	15.1	16.9	14.2	18.8	16.2	19.2	↔	18.7	0.2 (-8.16, 7.68)
	Non-Métis	44.0	14.8	15.4	16.1	15.1	15.4	15.8	15.6	17.1	17.0	17.0	↔	18.5	
Adequate	Métis	45.0	78.3	78.9	77.5	78.4	79.5	77.5	80.6	76.7	77.3	73.6	↔	74.8	0.5 (-8.1, 9.1)
	Non-Métis	46.3	78.3	78.1	76.8	78.4	77.9	77.5	77.3	75.6	75.8	75.6	↔	74.3	
Intensive	Métis	1.3	2.0	2.3	2.5	2.2	1.9	1.9	1.9	0.6	1.5	2.6	↔	1.9	0.4* (0.02, 0.83)
	Non-Métis	0.9	1.8	1.4	1.4	1.5	1.3	1.3	1.5	1.4	1.7	1.9	↔	1.5	
PRE-PREGNANCY WEIGHT															
<= 45 kg	Métis	0.4	0.6	0.4	0.3	0.1	0.5	0.1	0.1	0.5	0.1	1.1	↔	0.4	-0.3* (-0.51, -0.12)
	Non-Métis	0.5	0.7	0.7	0.6	0.6	0.6	0.8	0.8	0.7	0.8	0.9	↑*	0.7	
>= 91 kg	Métis	12.4	13.6	13.7	13.8	13.9	13.3	15.9	15.5	14.2	17.1	11.0	↔	14.0	4.9* (3.75, 6.03)
	Non-Métis	8.5	8.9	9.2	9.3	9.3	9.5	9.4	9.2	9.1	9.2	9.0	↑*	9.1	
MATERNAL HEALTH BEHAVIOURS DURING PREGNANCY															
Smoking	Métis	35.5	35.8	31.7	33.0	36.3	29.4	29.0	29.4	25.4	26.3	24.1	↓*	30.5	16* (12.8, 19.3)
	Non-Métis	18.5	17.9	16.9	16.5	15.2	14.5	13.6	12.8	11.6	11.2	10.8	↓*	14.5	
Substance use	Métis	6.4	6.6	8.1	5.8	6.2	5.3	6.6	6.4	4.5	5.2	6.2	↓*	6.1	3 (2.44, 3.78)
	Non-Métis	3.3	3.1	3.5	3.5	3.1	3.0	2.9	2.9	2.4	2.5	2.8	↓*	3.0	

(↔) = no change; (↑) = increase; (↓) = decrease; CI = confidence interval; kg = kilograms * p<0.05

Table A4. Annual and period age-standardized prevalence (%) of pregnancy complications of Métis and non-Métis live births in Alberta (years 2006 – 2016)

VARIABLE	GROUP	YEAR											TREND	PERIOD PREVALENCE (%)	BETWEEN-GROUPS % DIFFERENCE (95% CI)
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
Preexisting hypertension	Métis	2.4	1.1	1.6	1.1	2.0	1.3	1.2	1.0	2.5	1.9	0.9	↔	1.6	0.7* (0.25, 1.22)
	Non-Métis	0.9	0.8	0.8	0.9	0.8	0.9	0.9	0.9	0.9	1.1	1.1	↑*	0.9	
Gestational hypertension	Métis	3.1	3.3	5.1	3.9	4.4	2.9	4.3	4.0	3.7	4.6	6.4	↔	4.1	0.2 (-0.96, 0.36)
	Non-Métis	4.1	4.0	3.8	3.9	3.9	3.7	3.7	3.6	3.7	3.8	4.1	↔	3.9	
Preeclampsia	Métis	1.9	1.3	0.5	1.9	0.9	0.8	0.8	1.3	1.2	1.2	0.9	↔	1.1	0 (-0.38, 0.22)
	Non-Métis	1.2	1.2	1.2	1.1	1.1	1.0	1.1	1.0	0.9	1.0	1.0	↓*	1.1	
Chronic hypertension with superimposed preeclampsia	Métis	0.0	0.2	0.3	0.0	0.2	0.2	0.2	0.0	0.0	0.3	0.9	↔	0.2	0.1 (-0.27, 0.07)
	Non-Métis	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	↔	0.1	
Preexisting diabetes	Métis	1.2	1.7	1.3	1.0	2.4	1.7	1.4	2.0	2.0	2.5	2.5	↑*	1.8	0.6* (0.25, 1.22)
	Non-Métis	1.0	1.0	0.9	1.0	1.1	1.1	1.1	1.3	1.6	1.4	1.4	↑*	1.2	
Gestational diabetes	Métis	3.9	4.7	5.3	4	8.4	6.4	8.3	6.2	8.1	6.6	5.2	↑↓*	6.1	0.7 (-1.93, 0.44)
	Non-Métis	4.0	4.3	4.5	4.8	5.6	5.6	5.8	5.7	6.1	6.3	6.2	↑*	5.4	
Anemia	Métis	0.7	0.1	1.4	0.7	0.4	0.9	0.8	0.6	0.8	1.1	0.0	↔	0.7	-0.2 (-0.09, 0.50)
	Non-Métis	0.6	0.6	0.7	0.7	0.9	0.9	1.0	1.0	1.1	1.1	1.2	↑*	0.9	

(↔) = no change; (↑) = increase; (↓) = decrease; CI = confidence interval * p<0.05

Table A5. Annual and period age-standardized prevalence (%) of labour and delivery outcomes of Métis and non-Métis pregnancies in Alberta (years 2006 – 2016)

VARIABLE	GROUP	YEAR											TREND	PERIOD PREVALENCE (%)	BETWEEN-GROUPS % DIFFERENCE (95% CI)
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
MODE OF DELIVERY															
Spontaneous vaginal	Métis	64.3	64.7	62.3	59.2	64.6	63.9	66.0	65.0	63.0	60.6	61.5	↔	63.2	3.4* (1.94, 4.78)
	Non-Métis	60.2	59.3	59.1	59.8	60.1	60.4	59.6	60.2	59.8	60.4	59.2	↔	59.8	
Operative vaginal	Métis	7.2	7.9	11.1	10.4	9.9	6.5	8.2	7.8	8.5	7.0	8.9	↔	8.5	-3.6* (-4.64, -2.59)
	Non-Métis	12.5	12.6	13.0	12.3	12.3	12.4	12.3	11.6	11.7	11.1	11.4	↓*	12.1	
Induced	Métis	26.3	29.3	29.2	31.2	29.1	27.9	29.7	31.4	32.6	31.9	30.8	↑*	30.0	1.5 (-0.42, 3.24)
	Non-Métis	25.9	26.0	26.3	27.2	27.7	27.9	28.7	29.8	30.6	31.7	32.1	↑*	28.5	
Caesarean section	Métis	28.4	26.9	25.9	29.7	25.3	29	25.7	27.1	28.5	32.4	29.6	↔	28.0	0.1 (-1.27, 1.64)
	Non-Métis	27.1	27.9	27.9	27.6	27.4	27.1	27.9	27.9	28.3	28.3	29.1	↑*	27.9	
TYPE OF ATTENDANT AT DELIVERY															
Obstetrician practitioner	Métis	49.3	51.9	57.2	54.6	51.8	56.9	56.2	53.4	58.9	58.9	58.4	↑*	55.2	-2.3 (-4.85, 0.30)
	Non-Métis	52.8	53.1	57.5	56.8	57.7	58.4	58.9	58.2	59.7	59.6	59.8	↑*	57.5	
Family practitioner	Métis	46.3	43.8	40.7	43.1	47.3	40.7	42.3	44.8	38.2	37.3	39.3	↓*	42.2	3.5* (1.19, 5.77)
	Non-Métis	37.5	37.2	40.3	40.7	40.1	39.4	39.1	39.1	37.7	37.3	37.1	↔	38.7	
Midwifes	Métis	2.2	0.5	0.8	0.7	0.5	1.1	1.2	1.0	1.8	1.9	1.2	↔	1.2	-0.2 (-0.68, 0.26)
	Non-Métis	0.8	0.8	0.9	1.0	1.3	1.4	1.5	1.7	1.7	1.9	2.2	↑*	1.4	
LABOUR AND DELIVERY COMPLICATIONS															
Obstetric hemorrhage	Métis	7.5	6.7	7.3	7.9	8.4	8.9	8.5	8.1	8	7.6	8.4	↔	7.9	0.4 (-0.86, 0.05)
	Non-Métis	7.7	7.1	7.9	7.6	7.5	7.4	7.6	7.6	7.6	7.3	7.3	↔	7.5	
Placenta previa	Métis	0.4	0	0.1	0.6	0.2	0.1	0.2	0.3	1.2	0.6	0.7	↔	0.4	0 (-0.25, 0.22)
	Non-Métis	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.3	↔	0.4	
PROM[5]	Métis	3.8	5.9	2.9	3.2	2.9	2.4	3.1	2	4.7	3.6	7.1	↔	3.8	0.7 (-1.69, 0.40)
	Non-Métis	3.5	3.3	3.2	3.3	3.2	3	3	3.1	2.9	2.8	3.2	↓*	3.1	

(↔) = no change; (↑) = increase; (↓) = decrease; CI = confidence interval * p<0.05

Table A6. Annual and period age-standardized prevalence (%) of birth outcomes of Métis and non-Métis pregnancies in Alberta (years 2006 – 2016)

VARIABLE	GROUP	YEAR											TREND	PERIOD PREVALENCE (%)	BETWEEN-GROUPS % DIFFERENCE (95% CI)
		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016			
DURATION OF GESTATION OUTCOMES															
Preterm birth	Métis	6.9	9.3	7.1	7.9	8	6.9	7.8	5.1	8.9	8.3	9.6	↔	7.8	0.6 (-0.39, 1.61)
	Non-Métis	7.3	9.9	6.9	7.1	6.9	6.6	6.9	6.9	6.9	6.6	7.1	↔	7.2	
Very preterm birth	Métis	1.2	1.6	0.8	0.6	1.6	0.8	1	0.3	1.1	0.8	0.8	↔	1.0	0 (-0.29, 0.25)
	Non-Métis	1.1	1.0	1.0	1.0	1.0	1.0	0.9	1.0	0.9	0.9	1.0	↓*	1.0	
Late preterm birth	Métis	5.6	7.6	6.3	7.3	6.4	6.1	6.8	4.8	7.9	7.5	8.8	↔	6.8	0.8* (0.09, 1.62)
	Non-Métis	6.2	5.9	6	6.2	6.0	5.7	6.0	5.9	6	5.7	6.1	↔	6.0	
Term	Métis	78.4	76.9	79.2	77.9	78.3	79.8	81.6	81.3	81.4	78.3	78.7	↔	79.3	-0.6 (-1.86, 0.58)
	Non-Métis	78.6	78.5	79.1	78.7	79.4	80.1	80.6	80.4	80.5	81	81.9	↑*	79.9	
Late term	Métis	14.7	13.7	13.8	14.2	13.7	13.2	10.6	13.6	9.6	13.4	11.7	↓*	12.9	-0.2 (-1.47, 0.98)
	Non-Métis	14.1	14.6	13.9	14.2	13.7	13.3	12.5	12.7	12.6	12.4	10.9	↓*	13.1	
FETAL GROWTH OUTCOMES															
Normal for gestational age	Métis	80.7	80	76.7	81.1	78.3	78.2	78.5	80.5	82	79.4	82.2	↔	79.8	-1.4* (-2.56, -0.26)
	Non-Métis	81.3	80.9	81.1	81.3	81.3	81.2	81.3	81	81.2	81.3	81.4	↔	81.2	
Small for gestational age	Métis	6.9	5.3	6.9	5.5	7.5	7.8	6.8	9	6.7	7.9	8.8	↑*	7.2	-2.2 (-3.11, -1.38)
	Non-Métis	8.6	8.9	8.6	8.9	8.9	9.5	9.6	10.1	10.2	10.3	10.2	↑*	9.4	
Large for gestational age	Métis	12.4	14.2	16.1	13.1	14.2	13.9	14.6	10.4	11.1	12.6	8.6	↓*	12.8	3.5 (2.11, 5.07)
	Non-Métis	9.9	10.1	10.1	9.7	9.7	9.2	9.1	8.7	8.5	8.4	8.3	↓*	9.3	
NEONATAL COMPLICATIONS															
NICU admissions	Métis	8.5	12.1	9.5	7.6	8.2	7.1	8.8	5.4	8.9	7	8.7	↔	8.6	0.2 (-0.97, 1.54)
	Non-Métis	10	9.1	10	9.5	9.2	8.6	8.3	7.7	7.6	7.2	7.7	↓*	8.4	
Neonatal death	Métis	0	0	0.4	0.4	1.0	0.2	0.2	0.1	0.3	0.4	0.4	↔	0.3	0 (-0.24, 0.13)
	Non-Métis	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.3	↔	0.3	
Congenital anomalies	Métis	0.6	0.9	1.3	0.3	1.9	1.1	1.4	1.6	2.3	1.9	2.6	↑*	1.4	0.5* (0.03, 0.99)
	Non-Métis	0.6	0.7	0.8	0.8	0.9	1.0	1.0	1.1	1.3	1.0	1.1	↑*	0.9	

(↔) = no change; (↑) = increase; (↓) = decrease; CI = confidence interval; NICU = neonatal intensive care unit * p<0.05

APPENDIX B: SUPPLEMENTARY FIGURES

Note: Lines for annual age-standardized prevalences were modeled using regression trend analyses. Curves were smoothed using polynomial regression models.

Antenatal Factors

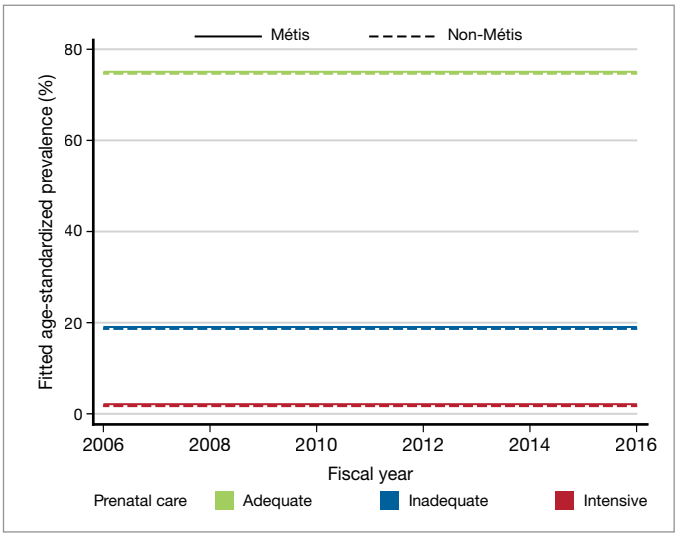


Figure B1. Annual age-standardized prevalence (%) of adequacy of prenatal care in Alberta (2006 – 2016)

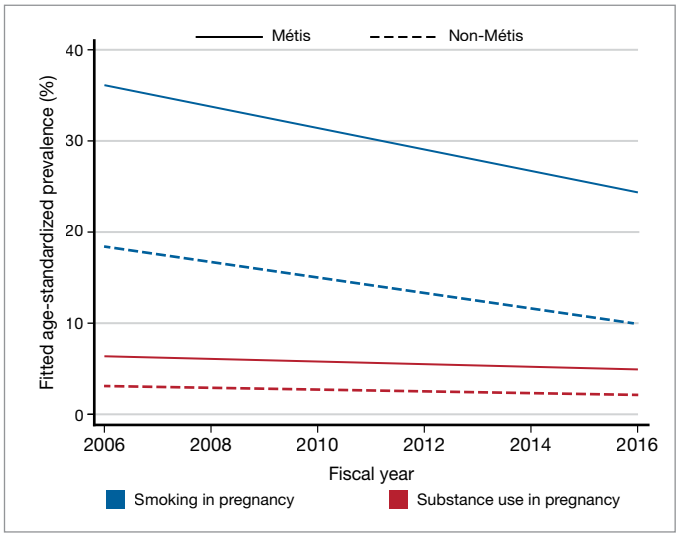


Figure B3. Annual age-standardized prevalence (%) of smoking and substance use during pregnancy in Alberta (2006 – 2016)

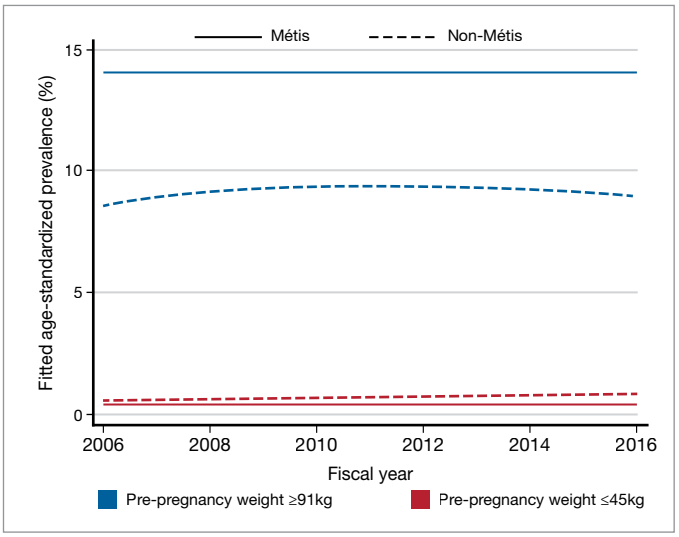


Figure B2. Annual age-standardized prevalence (%) of pre-pregnancy weight in Alberta (2006 – 2016)

Pregnancy Complications

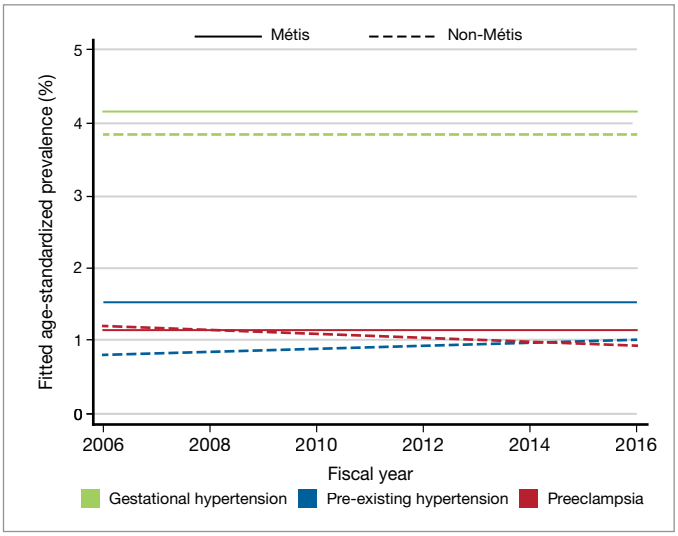


Figure B4. Annual age-standardized prevalence (%) of hypertensive disorders in pregnancy in Alberta (2006 – 2016)

The prevalence of preexisting chronic hypertension with superimposed preeclampsia was close to zero for both Métis (0.2%) and non-Métis (0.1%) groups. These lines were not included in the graph.

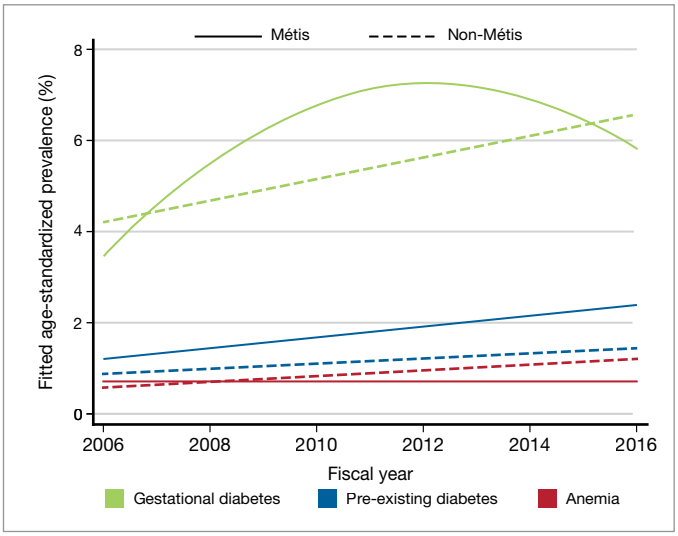
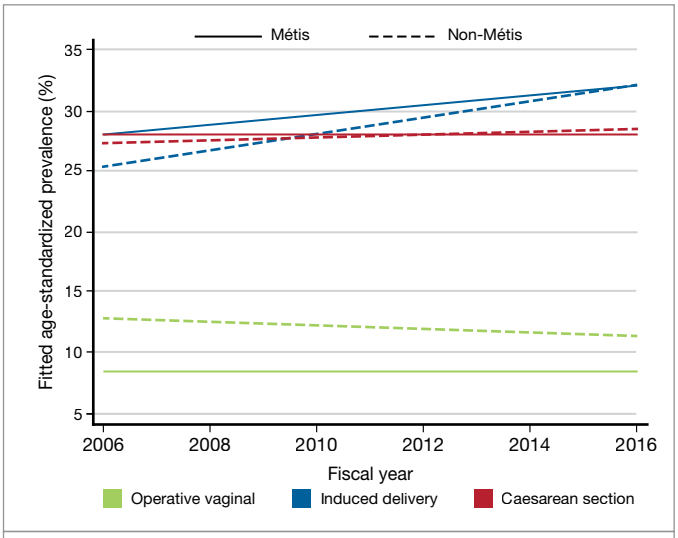


Figure B5. Annual age-standardized prevalence (%) of diabetes (gestational diabetes, pre-existing diabetes) and anemia in pregnancy in Alberta (2006 – 2016)

Labour and Delivery Outcomes



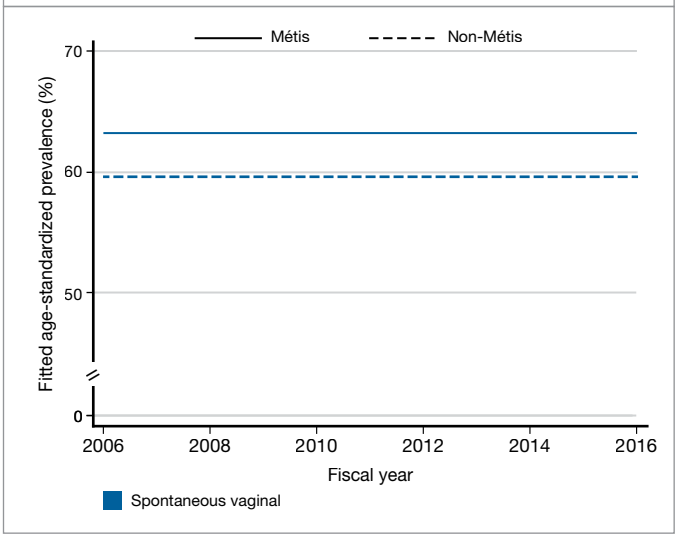


Figure B6. Annual age-standardized prevalence (%) of different types of mode of delivery in Alberta (2006 – 2016)

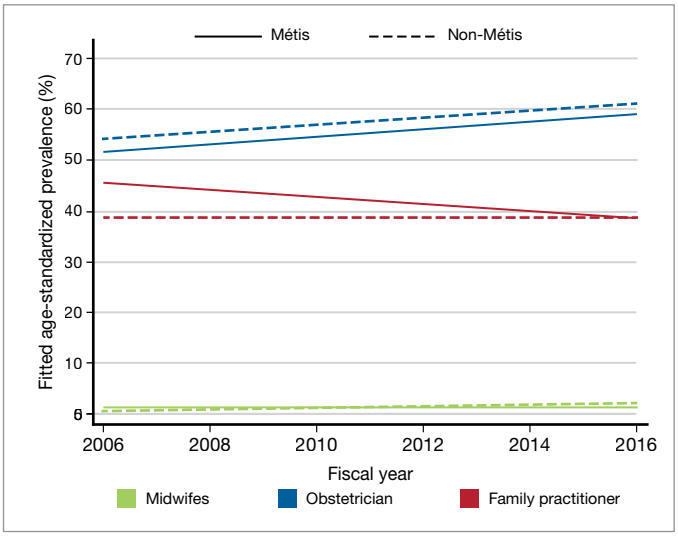


Figure B7. Annual age-standardized prevalence (%) of different types of attendants at delivery in Alberta (2006 – 2016)

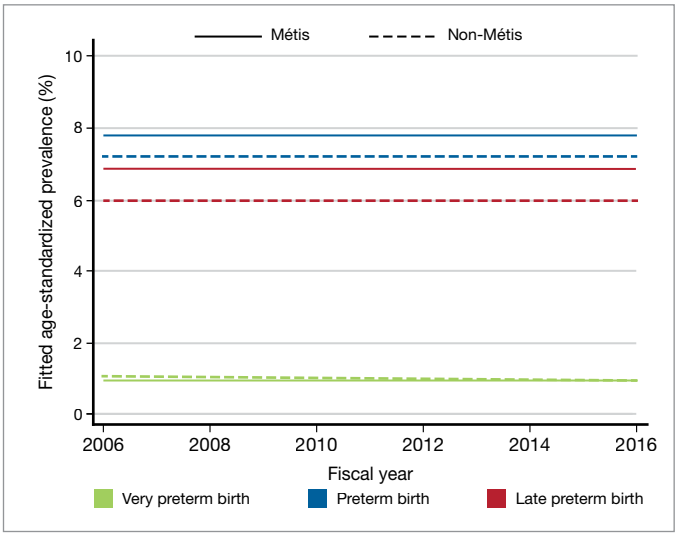


Figure B9. Annual age-standardized prevalence (%) of preterm, late preterm and very preterm birth in Alberta (2006 – 2016)

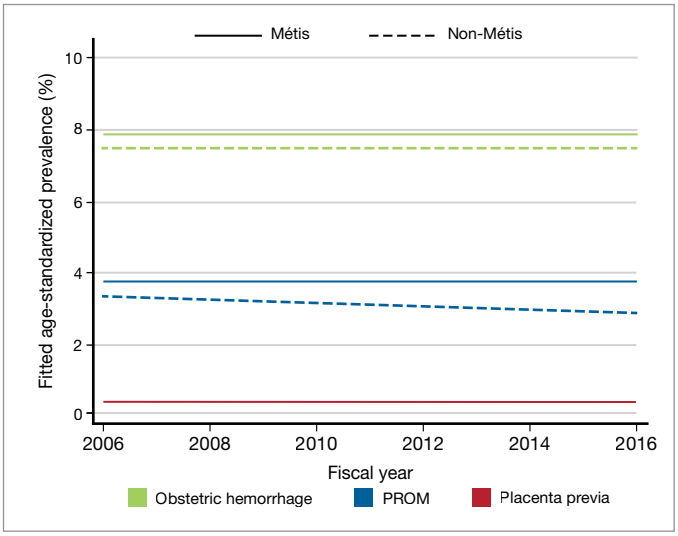


Figure B8. Annual age-standardized prevalence (%) of labour and delivery complications in Alberta (2006 – 2016)

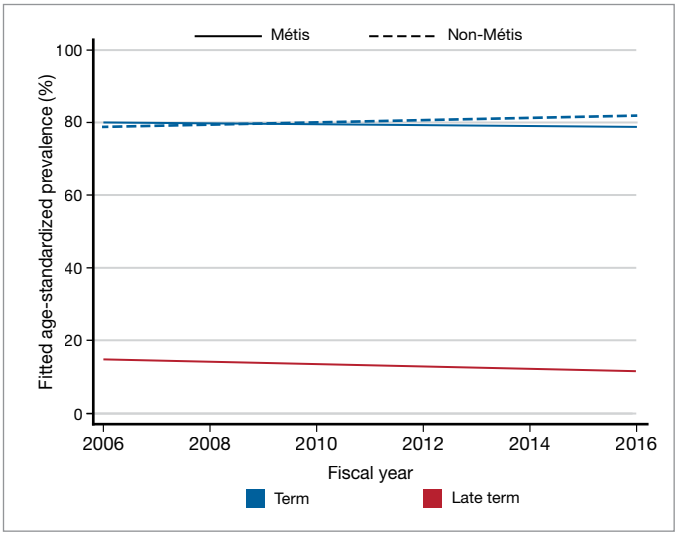


Figure B10. Annual age-standardized prevalence (%) of term and late term birth in Alberta (2006 – 2016)

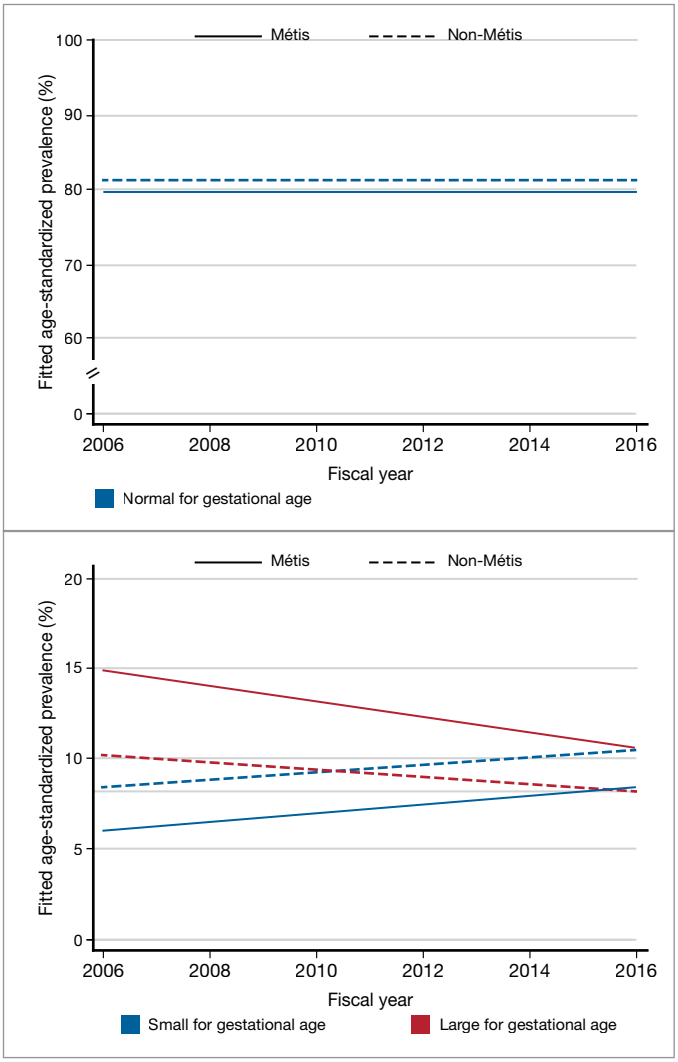


Figure B11. Annual age-standardized prevalence (%) of normal, small, and large size for gestational age in Alberta (2006 – 2016).

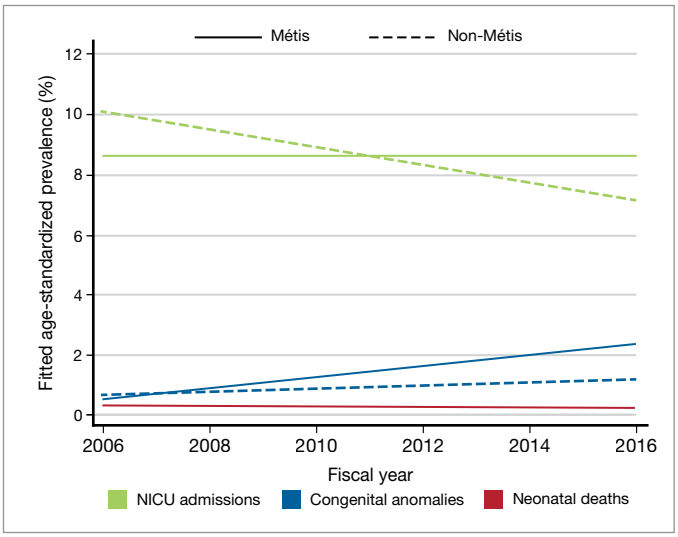


Figure B12. Annual age-standardized prevalence (%) of neonatal complications in Alberta (2006 – 2016).

APPENDIX C: GLOSSARY

Adequacy of prenatal care: the appropriateness of the level of prenatal care received by women; categorized as "inadequate," "adequate," and "intensive" based on several factors: trimester of first visit; number of visits, and gestational age at delivery.[41]

Antenatal: before birth.[88]

Chronic hypertension: hypertension that develops either pre-pregnancy or at <20+0 weeks' gestation.[89]

Chronic hypertension with super imposed preeclampsia: a condition occurring in women with chronic hypertension prior to pregnancy whose blood pressure increase and develop protein in the urine during pregnancy.[89, 90]

Comorbidity: two or more diseases and/or illnesses occurring at the same time in the same person.[90]

Congenital anomalies: "structural or functional anomalies (for example, metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth, or sometimes may only be detected later in infancy, such as hearing defects."[91]

Data custodians: those responsible for the definition of and access to data.[92]

Distal determinants of health: factors that influence both intermediate and proximal determinants of health, comprising the historical, political, social, and economic contexts of those determinants. Distal determinants of health can include colonialism, racism, and self-determination.[93]

Gestation: the amount of time a baby is in the uterus.[88]

Gestational hypertension: hypertension that develops for the first time at ≥20+0 weeks' gestation.[89]

Hemorrhage: extreme bleeding.[88]

Hypertension: high blood pressure.[94]

Intermediate determinants of health: factors that influence proximal determinants of health, such as community infrastructure, resources, systems, and capacities. Proximal determinants of health include healthcare and educational systems, and social and cultural community.[93]

Macrosomia: a larger than average newborn.[95]

Material deprivation: occurring when an individual or household is unable to purchase material goods and activities that are common in the society in which they life.96 In this study, material deprivation was assessed based on average household income, unemployment rate, and high school education rate.

Misclassification bias: occurring when an individual is assigned to a different category than the one they should be in.97 In our study, this would occur when a Métis mother is included in the non-Métis group.

Pampalon index: an index used to approximate social and material deprivation based on six socioeconomic indicators measured in the Canadian census. Indicators used are: proportion of people aged 15 years and older with no high school diploma; the population/employment ratio of people aged 15 years and older; the average income of people aged 15 years and older; the proportion of individuals aged 15 years and older living alone; the proportion of individuals aged 15 years and older whose marital status is either separated, divorced, or widowed; and the proportion of single-parent families in a geographic area.[25, 26]

Perinatal: the period prior to and after giving birth.[98]

Pregnancies complicated with pre-existing diabetes: pregnancies where women were diagnosed with diabetes prior to getting pregnant.[99]

Placenta previa: a condition in which a baby's placenta covers the mother's cervix, either partially or fully, potentially causing severe bleeding during pregnancy and birth.[100]

Preeclampsia: a complication during pregnancy where the pregnant woman has high blood pressure and damage to her organs (most commonly the liver and kidneys).[89]

Proximal determinants of health: factors having a direct influence on health, such as health behaviors, and physical and social environments. Proximal determinants of health include employment, income, and education.[93]

Quintile: one of five ordered subgroups of data.[101]

Rural: defined by Alberta Health Services as three distinct categories, based on a number of variables including demographics and urbanization processes, and land use. The three categories are: (1) large rural centres and surrounding areas (population greater than 10,000 but less than 25,000); (2) rural areas (population less than 10,000, population density between 100 – 10,000 per square km, within 200km from a regional centre, and a mixed land use and industry primarily based on farming and ranching, and Indigenous lands), and; (3) rural remote (population density less than 100 per square km, greater than 200km distance from a regional centre, and land use and industry predominately based on oil and gas and forestry, and a larger proportion of Indigenous communities).[102]

Singleton birth: a delivery where only one baby is born.[103]

Social deprivation: deprivation relating to social relationships; can include family, personal, and professional relationships.[96] In this study, measured based on Marital status (partnered, single, widowed or divorced), proportion of population living alone, proportion of single parent households.

Social determinants of health: the social and economic factors that can influence an individual's health, including but not limited to income, education, employment, discrimination, and historical trauma.[104]

Urban: defined by Alberta Health Services as four distinct categories, based on a number of variables including demographics and urbanization processes. The four categories are: (1) metro centres and capital cities (population greater than 100,000, population density greater than 30,000 per square kilometer, includes tertiary care centres where there is a minimal travel distance to a wide variety of services); (2) metro influenced areas (areas in close proximity to metro centres and are deemed commuter cities, such as the communities surrounding Edmonton and Calgary); (3) urban (with populations greater than 50,000 and less than 100,000, population density greater than 20,000 per square km and where there is minimal travel distance to a wide variety of services), and; (4) urban influenced areas (local geographic areas surrounding urban centres).[102]

Métis Nation of Alberta · Department of Health
Delia Gray Building · 11738 Kingsway Avenue · Edmonton
780-455-2200 · 1-800-252-7553 · albertametis.com

@abmetis @albertametis