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**Project Title:** Person and place in perinatal outcomes: how the interaction between rural residence and Aboriginal heritage alters birth outcomes

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**SUMMARY: (no more than 250 words single spaced)**

The centralization of health care services to urban centres has led to the closure of many maternity wards and prenatal clinics in rural Canada. Many rural populations are ethnically Aboriginal (First Nations, Inuit, Metis). We examined the differences in birth outcomes between rural and urban Aboriginal, and rural and urban non-Aboriginal mothers, with the suspicion that rural Aboriginal populations would have the worst outcomes as they are doubly vulnerable. Birth outcomes examined include infant mortality, large and small for gestational age, high and low birth weight, and preterm birth. We found that there was considerable variation by province in the rates of individual birth outcomes, but generally speaking, Aboriginal populations did have higher rates of poor birth outcomes, especially in urban and very remote settings. Post-neonatal infant mortality rates were also high in Aboriginals, demonstrating the need for improved social support systems in these communities. We conclude by reasoning that as health care accessibility as well as socioeconomic and cultural context vary so much between communities, the best approach to reduce the disparities in birth outcomes is to individually assess the birth outcomes of each community in question and tailor new health care programs to fit their individual needs.



**Student Signature**



**Supervisor Signature**

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## ACRONYMS

CI *confidence interval*

FN *First Nations*

HBW *high birth weight*

LBW *low birth weight*

LGA *large for gestational age*

OR *odds ratio*

OB/GYN *obstetrician-gynecologist*

PTB *preterm birth*

RR *relative risk*

SGA *small for gestational age*

## INTRODUCTION

Canada is a very large but sparse country, with most of its citizens living along the southern border in urban clusters. It is also a very diverse country, and within it a multitude of cultures and ethnicities are represented. It is therefore unsurprising that there is a considerable amount of variability in the birth experiences of Canadian women, depending on their heritage and where they live. This literature review will attempt to refresh readers on how a rural residence and Aboriginal ancestry interact to yield birth outcomes different from those of urban and non-Aboriginal Canadian women.

Canada has for some decades now been in the process of centralizing health care services to urban centres, in an attempt to yield better health outcomes through a holistic approach, where a variety of specialists are available to patients “in house”, and to help cut taxpayer costs, as health care in this country is financed by a single-payer system. Despite these good intentions, the centralization of health care has led to some unforeseen negative consequences, especially for those rural citizens who have now lost access to health care in or near to their community.

Unsurprisingly, these women experience increased travel times from their homes to the hospital, and this is particularly true of rural Manitoban women, where almost a third (30.2%) travel more than two hours to deliver their child.<sup>1</sup> There is a positive correlation between travel time to the hospital and poor birth outcomes, such as preterm birth (PTB) and birth of large for gestational age (LGA) infants.<sup>1</sup> Rural women are less likely than urban women to have their delivery attended by an OB/GYN, and instead more likely to have a Family Physician as the attending<sup>1</sup>. They are less likely to have Cesarean sections while being more likely to have spontaneous vaginal births<sup>1</sup>, likely because of the closure of surgically equipped obstetric units in rural areas.

Some of the above differences may be explained in part by population characteristics. For example, rural mothers tend to be younger: there is a higher rate of rural women giving birth in their teenage years, and a lower rate of women giving birth at a more advanced age of 35 and up.<sup>1</sup> Maternity for rural women is associated with low socioeconomic status; in fact, rural Canadian women delivering in hospital are more than twice as likely to come from a deprived neighbourhood (low levels of education, employment and income).<sup>1</sup> In Manitoba, as many as 59.0% of pregnant rural women were from the most deprived neighbourhoods, while only 21.4% of pregnant urbanites lived in equally disadvantaged neighbourhoods.<sup>1</sup>

First Nation and Inuit communities represent a significant percentage of the rural communities in Canada. Statistics Canada reported in 2011 that 4.3% of the Canadian population identified as Aboriginal: 2.6% were First Nations, 0.2% Inuit and 1.4% Metis. This population increased in size by 20.1% between 2006 and 2011.<sup>2</sup> Across the globe

there are several Aboriginal populations, not limited to but including Canadian Aboriginal Peoples, Native Americans of the U.S.A and Indigenous Australian Peoples.

Some research suggests that infants of Aboriginal (North American and Australian) women are at risk for poorer birth outcomes. A meta-analysis of data, unadjusted for maternal risk factors, revealed that low birth weight (LBW), PTB, stillbirth, neonatal mortality and perinatal mortality rates are higher in this population.<sup>3</sup> Canadian Aboriginals have been found to have increased rates of PTB,<sup>3,4,5</sup> macrosomia,<sup>3</sup> stillbirth,<sup>3,5,6</sup> neonatal mortality<sup>3</sup> and perinatal mortality.<sup>3</sup> On the other hand, certain unfavourable outcomes are less common in Aboriginal people. Inuit infants, for example, have been found to be at a lower risk for shoulder dystocia,<sup>7</sup> and Inuit adolescent pregnancy is not as risky as in other ethnicities.<sup>8</sup> Much of the data on the birth outcomes of Aboriginal Canadians is inconsistent, and varies based on the whether the population under study is First Nation, Inuit or Metis, and whether the mother lives on- or off-reserve.<sup>9</sup> For this reason, research efforts persist today. It is probable that different Aboriginal populations living in different parts of Canada experience different risks and outcomes of pregnancy.

In rural communities that have lost their obstetrics wards, the birth experiences of women have declined in quality. Women are required to leave their community and go to the nearest urban hospital, often alone, at around 37 weeks gestation, a week before their expected date of delivery. There has been substantial descriptive research into the psychosocial costs of transferring Aboriginal women in this way. Quite understandably, women feel stressed by the forced separation from their family.<sup>8</sup> It also remains important to Aboriginal families that maternity services are returned home in order to reinforce the sense of identity that comes from being born within one's own community and traditional territory.<sup>10</sup>

In an ideal world, women from every community would have access to maternal care close to home. The harsh reality is that centralization of health care to urban centres has led to the closure of many rural maternity services. Many rural physicians feel uncomfortable even offering perinatal care, concerned that with the low birth volume in their rural community, they will be unable to maintain competency in this field.<sup>11</sup> Furthermore, access to surgical and anesthetic services in rural hospitals is quite uncommon. Despite this, recent evidence has shown that perinatal services can be safely provided even without a surgical and anesthetic service, and that the benefit of delivering closer to home outweighs the risk of requiring emergency intervention (when proper prenatal risk assessments have been performed, of course).<sup>12,13,14</sup> For this reason, the Society of Obstetricians and Gynecologists of Canada has included the following recommendations in their most recent SOGC Joint Position Paper (2012).<sup>12</sup>

*1. Women who reside in rural and remote communities in Canada should receive high-quality maternity care as close to home as possible.*

*[...]*

*4. While access to surgical and anaesthetic services is desirable, there is evidence that good outcomes can be sustained within an integrated perinatal care system without local access to operative delivery. There is evidence that the outcomes are better when women do not have to travel far from their communities. Access to an integrated perinatal care system should be provided for all women.*

The rationale for this literature review is simple. Information on the birth outcomes of Aboriginal Canadians who live rurally is scarce, and so, we intend to find it and recognize any trends that lie within. We expect that in different rural communities across Canada, birth outcomes in Aboriginal Peoples will be fairly varied, with maybe a few commonalities based on the high maternal risk profiles faced by Aboriginals and rural women. We hope to help answer the question: could community of residence be an influential factor in the birth outcomes of this population?

## **METHODS**

In the form of a literature review, this article will examine the relationship between rural and remote residence, Aboriginal heritage and birth outcomes such as: high or low birth weight, large or small for gestational age, infant mortality (death in the first year of life), and preterm birth, specifically in the Canadian population. Articles for review were identified using PubMed keywords: obstetrics, parturition, birth, outcomes, preterm, weight, rural, remote, First Nations, Aboriginal, Indigenous, Inuit, Metis, Canada.

Several articles by a group of Canadian researchers were identified and selected for review based on their common use of Statistics Canada's Linked Stillbirth, Live Birth and Infant Death Database for participant selection. The Public Health Agency of Canada has sponsored this database, which has collected and linked birth and infant death registration records, from 1991-2000. Statistics Canada serves as the custodian of this data. The validity of the linked birth and death database is well established.<sup>15</sup>

These researchers also used the live birth registrations to identify the mothers' ethnic heritage, based on recorded mother tongue or self-identified First Nations status, as well as the mothers' place of residence based on recorded postal code. Since the live birth registrations also include data on infant sex, maternal age, marital status, parity, and multiple vs. singleton birth, researchers were able to use this database to account for "maternal factors" or "individual characteristics" during their analyses. We will see that many articles describe research of a Quebecois population, as this province records maternal education on birth registrations, allowing for socioeconomic status to be more accurately accounted for as a possible confounding variable. In British Columbia, pregnancy complications, abortion history and method of delivery are also recorded, and thus controlled for when adjusting data.

## **LITERATURE REVIEW**

### ***Birth Outcomes by Degree of Rurality***

*Birth Outcomes and Infant Mortality by the Degree of Rural Isolation Among First Nations and Non-First Nations in Manitoba, Canada*<sup>16</sup>

In 2010, Zhong-Cheng Luo et al. published a study in the Journal of Rural Health, which examined the variation in birth outcomes in First Nations and non-First Nations Manitobans. The purpose of this study was to determine whether rural isolation affects rates of infant mortality and morbidity similarly in First Nations and non-First Nations people; to accomplish this, data for infant mortality and morbidity, First Nations status and rural isolation was extracted from the Statistics Canada database. Participants were

categorized into categories of increasing rurality based on the percentage of community members who do not commute to an urban centre for work. Luo et al.'s article highlights a few key findings. First, regardless of ethnicity, there was about a 15-20% lower rate of "small" babies (PTB, small for gestational age (SGA), and LBW) born to rural mothers. However, LGA, high birth weight (HBW), and infant mortality rates decreased as urban influence increased, but only in the non-First Nations group. There did not appear to be any such trends in infant mortality contingent on rural isolation in the First Nations group, and yet overall, the infant mortality rate was 1.96 times higher (95% CI 1.69-2.27) than for non-First Nations. While non-First Nations mothers likely benefitted from more comprehensive maternal care services offered in urban areas, it would appear that First Nations mothers had an equally difficult time accessing care in urban and rural areas.

Luo et al. comment on the fact that their study did not include, into the First Nations group, the Inuit and Metis that did not self-identify as First Nations on the registration records. They justify the results of their study nonetheless as only 6% of the Manitoban population identified as either Inuit or Metis in the 2001 census. Because of this low percentage, they presume that including Inuit and Metis people in the non-First Nations group likely did not significantly bias their sample.

*Urban Living is Not Associated with Better Birth and Infant Outcomes among Inuit and First Nations in Quebec<sup>17</sup>*

For perspective on the birth outcomes of Inuit Canadians, we can look to another article published in *Open Women's Health Journal*, 2010, by Fabienne Simonet et al. The methodology for this study is nearly identical to Luo et al.'s: data on infant mortality, morbidity, Inuit or First Nation's status, and degree of rural isolation was extracted from the Statistics Canada database, but this time rural living was defined as a community of less than 10,000 people or where less than 50% of workers commuted to a city for work. The population in this study was Quebecois, therefore, instead of categorizing the participants into First Nations and Non-First Nations categories, participants were categorized as Inuit, First Nations or French, based on the maternal mother tongue listed on the birth registration. The results shown below have undergone adjustments for maternal characteristics, and were overall quite similar to what was found in Luo et al., except for one important detail: ethnicity appeared to have an effect on the rate of "small" babies. Infants of French mothers living in rural areas were slightly more likely to be SGA (OR 1.05, CI 1.03-1.0) or to die during their first year of life (OR 1.10, CI 1.01, 1.20) than those of urban living mothers, while infants of rural Inuit and First Nations mothers were actually only half as likely than their urban counterparts to be SGA (Inuit: OR 0.35, CI 0.18-0.67) (FN: OR 0.55, CI 0.38-0.78). Simonet et al. also noted that First Nations infants were more likely than French infants to die in their first year of life, especially in urban areas, and especially in the post-neonatal period (OR 2.75, CI 1.13-6.71). The odds of being LGA as an urban Inuit infant instead of an urban French infant were 2.54 (CI 1.48-4.37), higher than the odds for the same comparison in rural groups. These findings suggest that for Inuit and First Nations mothers, rural living may confer a protective benefit.

By examining Luo et al. and Simonet et al., it appears that living in an urban area tends to improve birth outcomes by lowering rates of "large" babies (LGA, HBW) and infant mortality in non-First Nations people. However, First Nations Manitobans do not see this improvement, and Inuit and First Nations Quebecois actually see the reverse, birth outcome improvements like reduced rates of SGA, in rural areas. Infant mortality rates

also tend to be higher in First Nations than non-First Nations people, both in Manitoba and Quebec, and this is alarming as the difference persisted in both studies despite controlling for maternal risk factors and social determinants of health such as maternal age, parity, education, marital status, infant sex and multiple births.

*Community Remoteness, Perinatal Outcomes and Infant Mortality among First Nations in Quebec*<sup>18</sup>

Authors Wassimi et al. identified mothers residing on First Nation Reserves in Quebec from 1991 to 2000, using the same Statistics Canada database as discussed above. The First Nation Reserves were stratified into four degrees of remoteness based on an index developed by Indian and Northern Affairs Canada, which takes into account availability of year-round road access, distance to the nearest health service centre and climate. The most remote First Nations communities saw the lowest rates of PTB (P value for significance of trend 0.0006), but the highest rates of fetal and infant mortality (P value 0.007). These findings are inconsistent with each other and with our prior conclusion that rural living is protective in Aboriginals.

If we were to plot risk of poor birth outcomes from high to low, against rurality from urban to rural to remote, we might end up with something like a bell-curve. First Nations and Inuit people appear to be a population underserved by health care, and by the interpretation of this literature review, this is evident especially in urban and remote settings. In rural settings that are “intermediate” (i.e. not too remote, and not urban either), expecting mothers may benefit from quicker access to urgent health care and specialized services, typically provided in urban settings, while still experiencing the benefits of the rural “protective factor”. This would be an interesting avenue for future research.

***Northern vs. Southern Residence and the Effect on Birth Outcomes***<sup>19</sup>

*North-South Gradients in Adverse Birth Outcomes for First Nations and Others in Manitoba, Canada*

Across Canada, most of the cities are clustered along the Southern border, creating a gradient of increasing population density from North to South. The province of Manitoba is no exception to this rule. In this research by Patricia Martens et al., the province is divided into four unequally sized zones from North to South, with a map based upon social and geographical considerations. According to the estimates in this article, 80% of those in the most Northern division of Manitoba lived in a rural setting, while only 10% in the southernmost division did the same. Using the Statistics Canada database, eight groups were created: First Nations and non-First Nations in each of the four topological zones. The birth outcomes were compared to each other, before and after controlling for individual-level characteristics, and the following trends were noted. After controlling for confounds, from South to North, First Nations infants were at a decreasing risk of being a “small” baby, born preterm (OR 0.62, CI 0.53-0.72), being SGA (OR 0.72, CI 0.63-0.83), and of LBW (OR 0.62, CI 0.52-0.75), but at an increasing risk of being a “large” baby, as in LGA (OR 1.20, CI 1.10-1.32) and of HBW (OR 1.25, CI 1.14-1.36). Non-First Nations also saw an increasing risk of being a “large” baby, from South to North, but rates of PTB and LBW did not change with the gradient. In non-First Nations, infant mortality in the northernmost division was twice as high as in the southernmost (OR

1.94, CI 1.33-2.81), but among First Nations people, North and South had the same infant mortality rates (OR 1.02, CI 0.69-1.51).

*Birth outcomes and infant mortality among First Nations, Inuit and non-Indigenous women by northern versus southern residence, Quebec<sup>20</sup>*

Luo et al. used the same map as in the previous article to divide the province of Quebec into two sectors, North and South. They used the Statistics Canada database to create five groups: North and South First Nations, North Inuit, North and South non-Indigenous. Luo et al. analyzed the data using southern non-Indigenous women as the baseline. They found that “large” baby (LGA, HBW) rates were highest in First Nations, especially in the North of Quebec (LGA: OR 4.91, CI 4.52-5.34) (HBW: OR 4.03, CI 3.71-4.38); they also found that northern groups were at a significantly increased risk of infant mortality. However, in distinction to the other article, the risks of infant mortality were not the same in North and South First Nations. In fact, infant mortality rates of southern First Nations women were not significantly different from rates in the baseline sample (OR 1.13, CI 0.70-1.83). For northern First nations women, however, infant mortality rates were significantly higher than baseline (OR 1.72, CI 1.15-2.59).

It appears that among First Nations women who live in the North, “large” babies are more common and “small” babies are less common. Northern residence in First Nations may be protective against poor birth outcomes, according to Martens et al., with decreased “small” baby outcomes without an increase in infant mortality. However, this is still up for debate, as Luo et al. found that infant mortality rates were significantly higher only in Northern First Nations, when compared to southern non-First Nations.

***Trends Over Time in Aboriginal Birth Outcomes***

*Temporal trends in Inuit, First Nations and non-Aboriginal birth outcomes in rural and northern Quebec<sup>21</sup>*

We will now move our focus to the temporal trends in Aboriginal birth outcomes, and how they have improved or worsened over the past decades. Simonet, Wilkins and Luo published an article in the International Journal of Circumpolar Health, 2012, with just this goal in mind. Again using the Statistics Canada database, all births from 1991-2000 in rural Quebec were polled, and grouped based on maternal mother tongue as First Nations, Inuit or non-Aboriginal. Births to predominantly First Nation or Inuit communities were also flagged and analyzed for any differences from births to non-Aboriginal rural communities. A third dimension analyzed was whether northern rural residence had a significant effect on birth outcome, as opposed to southern rural residence. A summary of the results is as follows: from 1991-1995 to 1996-2000, in all study groups, rates of PTB increased while rates of SGA decreased, which probably reflects advances in prenatal and perinatal care. Only non-Aboriginal communities saw a significant reduction in infant mortality (RR 0.85, CI 0.74-0.98). The Inuit mother tongue group saw a significant increase in LBW rates (RR 1.45, CI 1.05-2.01), as did the Inuit communities (RR 1.51, CI 1.13-2.03), and interestingly, the northern Non-Aboriginal communities (RR 1.38, CI 1.08-1.78). The First Nations group, specifically those living in northern Quebec, saw an increase in perinatal death rates that was almost significant (RR 2.19, CI 0.99-4.85).

*Infant mortality among First Nations versus non-First Nations in British Columbia: temporal trends in rural versus urban areas, 1981-2000<sup>22</sup>*

In this study of the British Columbian population by Luo et al., the study design and results were a little different than those of the previous article. An extra decade's worth of data was added by the British Columbia Vital Statistics Agency, and the population was divided into four groups: rural First Nations, urban First Nations, rural non-First Nations, and urban non-First Nations. Categorization of ethnicity was based on self-identification as First Nations on the birth registration or on federal or provincial record; categorization of rurality was based on postal code on the birth record, with rural being defined as a community of less than 10,000 people. For analysis, non-First Nations groups were used as a standard to which to compare First Nations groups. Some of the author's key findings were: First Nations had higher rates of infant mortality than non-First Nations, in rural (RR 2.27, CI 1.97-2.60) and urban (RR 2.08, CI 1.89-2.29) settings, due mostly to the higher rate of post-neonatal death (rural: RR 3.61, CI 2.97-4.40) (urban: RR 3.62, CI 3.18-4.14). Rural First Nations saw a decrease in infant mortality from 1981 to 2000, from 20.7 to 7.5 per 1,000 live births, but this decrease was not enough to close the gap between rural First Nations and rural non-First Nations infant mortality. Urban First Nations initially saw an increase in infant mortality over the 80s, but then a steeper decline over the 90s, to 7.1 per 1,000 live births. This led to roughly equal infant mortality rates between urban and rural First Nations people by the year 2000. However, when the researchers adjusted for infant sex, parity, multiple births, maternal age, marital status, abortion history, mode of delivery, pregnancy complications, community size (urban areas), neighbourhood income quintiles and distance to the nearest hospital with obstetricians, some of the findings lost their statistical significance. By the year 2000, rural First Nations and non-First Nations did not have significantly different infant mortality rates (OR 1.44, CI 0.89-2.33), but did still have different post-neonatal death rates (OR 2.23, CI 1.08-4.59). Urban First Nations and non-First Nations still had significantly different infant and post-neonatal mortality rates (OR 1.61, CI 1.18-2.21), but this difference disappeared after further controlling for gestational age (OR 1.32, CI 0.92-1.91).

The temporal trends observed in Quebec and B.C. were similar for non-Aboriginal groups: a decrease in infant mortality rates over the 80s and 90s. However, the trend among Aboriginal populations is still up for debate. In Quebec, it appears that Aboriginals have suffered from an increase in poor birth outcomes such as LBW and perinatal death, and no decrease in outcomes such as neonatal and infant mortality. In B.C., post-neonatal death was the culprit of high infant mortality rates in First Nations people. Luckily, this population did see a decrease in infant mortality rates over 20 years, and by the end of the millennium, after controlling for confounds, infant mortality rates were the same for First Nations and non-First Nations people.

## **DISCUSSION**

### ***Limitations and Strengths***

The weaknesses of this research model relate to its nature as a literature review, and to some of the limitations of the literature itself. First, as a literature review, this research was unable to contribute any new data to the state of knowledge. Also, this is not a meta-analysis and therefore no raw data was manipulated; parallels and conclusions



drawn in this paper are hypothetical, and require future research into their veracity. As for the articles reviewed, the weaknesses are: 1) maternal risk factors, although controlled for, cannot totally account for maternal health's effect as a confound, and 2) the type of demographic information recorded in the database changes with time, and this research model may not be usable in the future. As much as possible, maternal risk factors were extracted from the database, but in most cases, factors such as maternal education (outside Quebec), income, occupational exposures, drug exposures, and pre-existing medical conditions (as type-2 diabetes rates are high in First Nations populations) were not considered. Furthermore, the options to capture mother tongue on the vital statistics survey have recently been reduced to French, English, or Other, and this means an Aboriginal mother tongue will not be able to be used as a proxy for Aboriginal ethnicity on live birth registrations.

The strength of this research model rests on the established validity of Statistics Canada databases.<sup>15</sup> The sample of the Canadian population captured by Statistics Canada is almost all-encompassing, and even if some participants were not categorized into the proper ethnic group (ex. an Inuit mother who does not speak an Inuit mother tongue), this would only serve to reduce the disparities between the groups and *underestimate* them in our report.

### ***Integration with other research***

Research on the topic of rural influence on Aboriginal birth outcomes in Canada is scarce, as demonstrated by this literature review. Results should be viewed within the context of other research on the birth outcomes of Aboriginal peoples, regardless of where they live, and to other research on the birth outcomes of rural women, regardless of their ethnicity.

For simplicity's sake, we have previously included SGA, LBW and PTB into a "small baby" outcome category, and LGA and HBW into a "large baby" one. Our review agrees with evidence that Inuit and First Nations babies are more likely to be LGA,<sup>23</sup> and less likely to be SGA,<sup>24,25</sup> especially if they live rurally. There is some evidence that LBW rates are slightly higher in the Inuit,<sup>26</sup> concordant with the temporal trend we witnessed in our literature review, but generally speaking, evidence demonstrates LBW rates in Aboriginal Canadians tend to be low or similar to non-Aboriginal populations.<sup>23</sup> The PTB rates have been found to be higher Aboriginal people in some studies,<sup>23</sup> yet in other studies, PTB rates were higher only in Inuit<sup>4,27</sup> and not First Nations Canadians.<sup>4</sup> In our literature review we saw that PTB rates were generally on the rise for all ethnicities except the First Nations living in remote Quebec.

Other research on the infant mortality rate in Inuit and First Nations people has found it to be significantly higher<sup>24,26,28</sup> than in non-Aboriginal people. Post-neonatal mortality seems to be the largest contributor to infant death in this population,<sup>23,25,28</sup> which is disheartening as this is typically a marker of poor social and financial circumstances for the mother and child returning home from the hospital. On a positive note, there is evidence that infant mortality rates have been decreasing in British Columbia since the 1940s,<sup>29</sup> which is consistent with the temporal trends we observed in B.C. but not what we saw in Quebec.

With regard to birth outcomes in rural women, some research suggests that rural infants are at higher risk of LBW and SGA,<sup>30</sup> but at a lower risk of preterm birth,<sup>1,30</sup> while yet other research suggest rural women are at a lower risk for SGA<sup>1</sup> and at higher risk for LGA<sup>1</sup> and perinatal death.<sup>31</sup> Still other research tells us that PTB rates are higher in communities with no Cesarean section capabilities and with high outflow to other communities for delivery.<sup>32,33</sup> The evidence is so conflicting, it is difficult to make heads or tails of any of it. Even across Canada's provinces and territories, there seems to be variation in the rates of "small" and "large" babies, and there is even variation in these outcomes based on travel time to the hospital where a woman will deliver.<sup>1</sup>

### ***Interpretation of results: the importance of place and person***

There is too much conflicting data for us to draw a sweeping conclusion such as: "First Nations infants are more likely to be "large" in rural communities" or "Urban living only confers beneficial birth outcomes to non-First Nations peoples". Perfect synthesis of the data was impossible even though these studies all used essentially the same methodology. The best approach in cases like these is to appreciate the differences between the results and try and figure out why these seemingly similar populations across Canada have had such variable birth outcomes. One theory, elegant in its simplicity, is that "place and person matter". A person's unique ethnic and geographic identities are tightly intertwined, and it stands to reason that Canadians from every community have a distinctive combination of these identities that makes them, as a people, highly unique as well. Rurality is one part of a person's geographic identity. There are countless rural communities across Canada, and nearly one fifth (19.0%) of Canadians live in a rural setting. Aboriginal Canadians are a diverse population, composed of over 600 First Nations bands, the Inuit and Metis People, and speaking over 60 different languages.<sup>34</sup> Therefore, even Aboriginal ethnic identity is very unique to each person. For reasons that are still being elucidated, these identities interact to yield differing birth outcomes on the individual and community level.

The birth outcomes of seemingly similar populations varied at the provincial level in our literature review, so to start, we briefly identified some of the differences between the Aboriginal populations in different provinces. In 2011, 16.6% of status Aboriginals lived in B.C., 14.0% in Manitoba, and 10.1% in Quebec.<sup>34</sup> In Quebec, nearly three quarters of status Aboriginals lived on Indian reserves.<sup>34</sup> The urban centre with the largest registered status First Nation population was Winnipeg, Manitoba.<sup>34</sup>

This information led us to come up with a couple of possible explanations for the variation in birth outcomes. For example, since most Quebecois Aboriginals live on reserves, most of which are rural, we postulate that the reason they saw reduced rates of infant mortality and SGA was not due to their rurality, but instead because of a better community environment during the pregnancy. This is supported by current evidence that birth outcomes are better for Inuit than non-Aboriginal people in Inuit communities in Quebec, while non-Aboriginal people have better outcomes than Inuit in non-Aboriginal communities.<sup>4</sup> We also postulate that the reason urban Manitoban Aboriginals did not benefit from reduced "large baby" outcomes or infant mortality is because, although there are many First Nations people living in Winnipeg, this population is well documented to be under-served in prenatal health care and at increased risk of low socioeconomic status,<sup>35</sup> which certainly increases the risk of poor birth outcomes on it's own.

We suspect that with further inspection of even smaller geographic divisions, the variability of birth outcomes within the population of rural Aboriginals will persist, and new unique trends will be observed at the regional and community levels. Communities will likely need to be empowered and assisted to improve health care accessibility and the socioeconomic standing of those most in need, because the risk of post-neonatal infant death absolutely needs to decrease. Thus, it will be important in the near future to work one-on-one with rural Aboriginal communities, including First Nations reserves, find their unique maternal health care challenges and outcomes, and start reducing the disparities.

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