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Factors Affecting Initiation and Duration of Breastfeeding Among Off-Reserve Indigenous Children in Canada

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Abstract
Indigenous children in Canada are less likely to be breastfed compared to non-Indigenous children; however, little information about rates and correlates of breastfeeding exist. We used a nationally representative survey to examine breastfeeding initiation (n = 9,330) and duration (n = 6,760) among First Nations, Métis, and Inuit children. In our sample, 72.5% of children had been breastfed, and 57.9% of these individuals were breastfed until six months. Factors associated with increased breastfeeding included mothers' educational attainment, children's weight at birth, mothers' residential school attendance, and region of residence. Having Indian Status and lower household income were associated with lower breastfeeding initiation and duration. Our findings suggest that targeted efforts to encourage and support breastfeeding among Indigenous women are needed. Additional research using contemporary data are required in Canada.

Keywords
Indigenous population, breastfeeding, children's health

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Disclaimer
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Factors Affecting Initiation and Duration of Breastfeeding of Off-Reserve Indigenous Children in Canada

Breastfeeding is one of the most effective means of promoting infant and child health. Nutritional, hormonal, and microbial contents of mothers' milk have short-term benefits in reducing the risk of respiratory infections and diarrhea among infants, and there is evidence of longer term effects that are associated with higher intelligence, lower risk of becoming overweight or obese, and being less likely to develop type II diabetes (Horta, Loret de Mola, & Victora, 2015a, 2015b; Victora et al., 2016). Breastfeeding also has implications for mothers' health through a reduced risk of developing ovarian and breast cancers (Victora et al., 2016). The World Health Organization (2003) has recommended that breastfeeding be the exclusive mode of feeding for at least six months, and it should be continued for at least two years (see also Kramer & Kakuma, 2004). These recommendations have been adopted in Canada (Bank, 2012; Critch, 2014) and the United States (Eidelman, 2012).

The percentage of Canadian infants initially breastfed is high, with estimates at 90.3% in 2006, the year of the data used in our analysis (Al-Sahab, Lanes, Feldman, & Tamim, 2010). Rates of continuation are low, however, with only 13.8% of babies being breastfed exclusively for six months (Al-Sahab et al., 2010). Both breastfeeding initiation and duration have been found to be associated with socioeconomic and demographic factors. In high-income countries, such as Canada, higher education and family income are associated with higher rates of breastfeeding; whereas in low- and middle-income countries, children from impoverished households are most likely to be breastfed. Studies of breastfeeding in the United States and Australia have also found racial and ethnic differences in breastfeeding initiation and duration, both among Indigenous groups and other racialized minority communities (Adams et al., 2016; Jones, Power, Queenan, & Schulkin, 2015; Thulier & Mercer, 2009).

Breastfeeding is part of a web of social, behavioral, and biological determinants that affect the health of North American Indigenous children (Greenwood & de Leeuw, 2012). Within First Nations, Métis, and Inuit communities, it is often viewed as an important practice that allows a mother to offer nourishment, protection, and comfort to her children, and traditionally would have been combined with other feeding practices for as long as five years (Best Start Resource Centre, 2013). As in the United States and Australia, colonization and the loss of traditional culture, as well as the lower average socioeconomic status of Indigenous populations, likely contribute to lower rates of breastfeeding among Indigenous mothers and their children in Canada. Results from the 2009 to 2010 Canadian Community Health Survey (CCHS) estimated breastfeeding initiation at 77.8% among Indigenous mothers and 88.0% among non-Indigenous mothers (Health Canada, 2012a). The percentage of Indigenous mothers who had breastfed their last child for six months or more was 16.5%, compared with 26.7% of non-Indigenous women (Health Canada, 2012b). These results represent the most recent published source of Canadian breastfeeding statistics providing nationally representative comparisons of Indigenous and non-Indigenous women. Given the strong traditional cultural ties to breastfeeding among Indigenous Peoples in Canada, the inequitable discrepancy between belief and practice is particularly concerning from a public health and sociodemographic perspective. The issue deserves important consideration of the Indigenous-specific factors influencing breastfeeding initiation and duration. Indigenous youth—one of the fastest growing groups in Canada—should be prioritized in health planning and promotion efforts that aim to build a healthier future, especially in relation to maternal and child health.

Although lower socioeconomic status, measured in terms of income and education, has been associated with lower breastfeeding initiation and duration among Canadian women (Health Canada, 2012a, 2012b), there has been no analysis of the factors that predict breastfeeding among Indigenous women. The objective of our research has been to utilize this most recent set of nationally representative data on breastfeeding among off-reserve Indigenous children, in order to emphasize the importance of these efforts at a public health and policy level. Our analysis examined associations between characteristics of Indigenous children and their households, including parents' and children's Indigenous identity and residential schooling experience, and breastfeeding initiation and duration.

Theoretical Framework

We have adopted the life-course perspective as a theoretical framework through which to view the implications of breastfeeding practices on health and wellbeing within the context of Indigenous-specific determinants of health. The life-course perspective frames health outcomes as influenced by early life events and further shaped by the broader social circumstances within which lives are situated (Cable, 2014). Provided the list of proximal and distal health benefits that breastfeeding has been shown to offer children and their mothers, adoption of this theoretical approach to understanding the importance of breastfeeding on life-course trajectories is warranted. This approach has been used previously in public health research addressing the wellbeing of Indigenous populations (Cooke & McWhirter, 2011; Estey, Kmetic, & Reading, 2007).

Moreover, this framework may help define breastfeeding practices as important trajectory outcomes in and of themselves. We hope to demonstrate an example of how the social, cultural, historical, and political environments experienced by Indigenous Peoples in Canada work to shape breastfeeding practices that may, in turn, also influence the life-course trajectories of subsequent generations of Indigenous children (Estey et al., 2007). As such, several components of our analysis reflect important environmental contexts surrounding the predictors of breastfeeding initiation and duration, including measures of socioeconomic status, geographic location, and residential school attendance. According to the life-course perspective, variable life opportunities and obstacles that Indigenous people may encounter could play a part in shaping vulnerabilities or resiliencies (Cable, 2014), which we suggest may influence breastfeeding practices and patterns.

The ongoing impacts of colonization, as well as intergenerational effects of historical trauma, have come to be widely known as important determinants of health status among First Nations, Métis, and Intuit Peoples in Canada (Neufeld, 2017). In adopting the life-course perspective alongside a social equity lens and public health policy approach, we aim to contribute to the area of breastfeeding promotion among Indigenous populations in Canada. The benefits of breastfeeding during infancy should be further appreciated in light of long-term and broad views of health, as well as the positive traditional beliefs and practices connected to breastfeeding within Indigenous communities.

By adopting this theoretical framework we hope to shed light on the broader factors influencing the phenomenon under question: *Why are Indigenous children in Canada less likely to be breastfed and to be breastfed for a shorter duration than their non-Indigenous counterparts?* Given our use of secondary data from the 2006 Aboriginal Peoples Survey, we are not able to address our research question longitudinally in such a way that informs life-course trajectories. Despite this, we apply the life-course

perspective to our methods by accounting for determinants of breastfeeding that are seemingly distal and historical, such as mothers' residential school attendance, but which may play an important role in influencing health trajectories of Indigenous children throughout their own life-courses.

Materials and Methods

Data

We used the 2006 Aboriginal Peoples Survey (APS) Child and Youth File to estimate rates of breastfeeding initiation and duration to six months, and to assess the effects of correlates of these practices.[1] Although there are other national sources of data on breastfeeding by Canadian women, particularly the Maternal Experiences-Breastfeeding module of the Canadian Community Health Survey (CCHS; Health Canada, 2012a, 2012b) and the 2006 Maternity Experiences Survey (MES; Al-Sahab et al., 2010), those surveys do not include large enough samples to investigate the predictors of breastfeeding initiation or duration among Indigenous women. These surveys also do not include detailed information regarding Indigenous identity group or other Indigenous-specific factors. In particular, we were interested in the potential relationship between mothers' residential schooling experiences and breastfeeding behaviors, as well as the roles of socioeconomic and geographic indicators. As such, we present findings from the most recent and relevant nationally representative data available in Canada.

The APS is a voluntary post-censual survey of the population identifying as Aboriginal (First Nations, Métis, or Inuit) in the census who live outside of First Nations reserve communities.[2] Data from the APS only represent off-reserve Indigenous persons, who constitute the majority of the total Indigenous population in Canada (Kelly-Scott & Smith, 2015). Statistics Canada administered the 2006 APS, which had a sample of 61,040 people (Statistics Canada, 2009). This represented a national population of 623,470 Indigenous people living outside of reserves, more than 50% of the total Indigenous population in 2006 (Nguygen, 2011). The questionnaire was administered by telephone in most regions other than the North where it was administered in person. The 2006 APS was the only wave of the survey to ask respondents about breastfeeding.

In the APS, questions about breastfeeding were asked in relation to children, not mothers. The "person most knowledgeable" (PMK) about the child was asked whether the child had ever been breastfed, and if so the duration of breastfeeding in months. The questionnaire collected a range of other information, including the Indigenous identities of children and their parents and the educational attainment and age of the PMK. Of particular importance, the survey collected information on cultural factors unique to Indigenous Peoples, including residential school attendance. The dataset also includes household characteristics collected as part of the Census, including income.

[1] The data for this study were provided by Statistics Canada through the Research Data Centers program. The conclusions are the authors alone.

[2] Since the 2006 APS, Statistics Canada has sampled Indigenous populations residing off reserve. In addition, surveys by the First Nations Information Governance Centre have collected data from First Nations people of all ages living on reserve and in northern First Nations communities.

Sample

The 2006 APS Child and Youth File sampled 15,660 children aged 6 to 14 years. We limited our analytic sample to the following inclusion criteria: a) children whose biological mother was the PMK, and b) children who were identified by the PMK as Indigenous or had at least one parent who was identified as Indigenous. A total of 10,210 children remained after deleting those whose PMK was not their biological mother, then 9,880 children remained once non-Indigenous children (defined by their own identity or the identity of at least one parent) were removed from the sample. Children whose mothers reported not knowing whether they had been breastfed (n = 20 of 9,980, or 0.2%) or the duration of breastfeeding (n = 70 of 7,230, or 1.0%) were excluded, as were cases with missing values for any of the predictors. In total, 6.5% (n = 650) and 6.7% (n = 480) of cases were excluded from the models for initiation and duration of breastfeeding, respectively. A total of 9,330 observations were used in the initiation analysis and 6,760 in the duration analysis.

Variables

Outcomes. We examined whether a child had been breastfed at all, as a measure of breastfeeding initiation. We used the responses to the question, "Was he/she ever breastfed?" Those who responded "yes" were then asked to state how long the child had been breastfed, in months or years. We dichotomized these numerical responses into "less than six months" or "six months or longer," and we examined breastfeeding duration by estimating the likelihood of a child being breastfed at least six months.

Child's sex. Child's sex, as reported by mothers, was a binary variable with "female" as the reference group.

Child's age. Child's age was represented in the models as a continuous variable with a range of 6 to 14 years.

Child's weight at birth. Mothers reported the weight of the child at birth in grams. This variable was converted to kilograms.

Child's Indigenous identity or status. Mothers were asked if their child belonged to one of three Indigenous identity groups: "First Nations (North American Indian), Métis, or Inuk (Inuit)" and whether or not the child was "Status Indian (Treaty Indian or Registered Indian)" as defined in the Indian Act. Based on these responses, children were classified into five groups: First Nations-Status (reference), First Nations-Non-Status, Métis, Inuit, Multiple Indigenous identity, and Non-Indigenous identity.[3] Due to the way in which the APS sample was chosen using self-identification from the 2006 Census, it was possible for non-Indigenous children or children with non-Indigenous parents to be included in the data. Children with non-Indigenous identities were only included if at least one of their parents identified as Indigenous.

[3] In this variable, we combined the concepts of legal Indian Status under the Indian Act and Indigenous identity. All children in Canada who are registered under the Act are coded as Status First Nations. Children coded as Non-Status First Nations, Inuit, and Métis are not registered under the Act.

Mother's and father's Indigenous identity. Mothers were asked, "Which of the following people in [child's] family have any Aboriginal origin? a) his/her mother and b) his/her father." It was possible for Indigenous identity children to have non-Indigenous parents.

Mother's age at birth. Mother's age at the child's birth was represented as a continuous variable, computed as the difference between mother's age and child's age at the time of survey.

Mother's residential schooling. Mothers were asked if they were "ever a student at a federal residential school or a federal industrial school."[4] This was included as a binary variable, with non-attendance as the reference category.

Mother's education. Mothers were asked whether they had "completed the requirements for a high school diploma or its equivalent." This was included as a binary variable with not having completed high school as the reference.

Low-income economic family. The APS dataset contained an indicator of whether a child lived in a family with income below Statistics Canada's before-tax Low Income Cut Off (LICO), which is adjusted for family size and economic region (Health Canada, 2012b).

Community type. Households were identified as being in urban or rural areas, or in Inuit Nunaat.[5] Due to the small numbers of children, Inuit Nunaat was combined with other rural areas into one category.

Geographic region. Households were categorized into one of six geographical regions of Canada (Atlantic, Quebec, Ontario, Prairies, British Columbia, Territories) as defined by the Census, with Atlantic treated as the referent.

Statistical Analysis

We summarized child and family characteristics and compared them across both outcome measures of breastfeeding initiation (ever breastfed vs. never breastfed) and duration (six months or longer vs. less than six months) using χ^2-tests of independence for categorical measures and *t*-tests of difference between means for continuous measures. We then estimated three sets of models for each outcome. First, we used binary logistic regression models to assess unadjusted relationships between the predictors and the two outcomes. The sample included children as old as 14, and most of the socioeconomic variables reflected characteristics of households or parents at the time of the survey, not at the time that the child would have been breastfed. In the second set of models, we therefore included only predictors that could be safely considered time invariant, and which were not likely to have changed since the child's birth. These were the child's Indigenous identity or Status, the age of the mother at birth of the child, the child's weight at birth, Indigenous identity of the child's mother and father, and mother's residential school attendance. These were included as predictors in multivariate binary logistic regressions. The third set of models included these variables as well as those that were more likely to

[4] Federal residential or industrial schools, much like American Indian boarding schools, refer to the system of Christian boarding schools established to assimilate Indigenous children into Canadian society.
[5] Inuit homelands (Nunavut, Nunavik, Inuvialuit, and Nunatsiavut) are identified as "Inuit Nunaat" in the 2006 APS.

have changed between the infancy of the child and the time of the survey, including household income, mother's education, and geography. The multivariate models included child's age at the time of the survey as a control for the effects of time on recall. The child's weight at birth was included as a rough proxy for the health of the child and the mother at the time of birth, both of which can affect a child's ability to be breastfed. We tested linear and quadratic effects for continuous variables and report the best fitting models.

Sampling and bootstrap weights and the re-sampling procedure recommended by Statistics Canada were used to account for the multi-stage sampling design employed in the survey and to adjust for non-response (Statistics Canada, 2009). We used SAS v.9.4 for analyses (SAS Institute, 2016).

Results

Mothers reported that 72.5% of children had been breastfed. Of these children, 57.9% were reported to have been breastfed for at least six months. Child and family characteristics by breastfeeding outcomes are reported in Table 1a (for categorical measures) and Table 1b (for continuous measures). Unadjusted odds of having been breastfed were significantly higher for non-Status First Nations, Inuit, mixed Indigenous identity, and non-Indigenous identity children (Table 2, Model 1). In the second model, including all time-invariant variables, the adjusted odds of having ever been breastfed were highest for Inuit and mixed identity children (Model 2). The full model, however, reveals that only non-Indigenous identity children were significantly more likely to be breastfed than Status First Nations children, when controlling for all time-variant variables (Model 3).

Children with older mothers were more likely to have been breastfed in Models 1 and 2; however, mother's age was not significant in the fully adjusted model (Model 3). The quadratic effects of mother's age were shown to have a negative effect on breastfeeding initiation in the first two models (Models 1 and 2), meaning that the effect of age lessened at older ages. Children with Indigenous mothers were less likely to have been breastfed than children whose mothers were non-Indigenous (Models 1 and 2), but this effect no longer appeared once controlling for time-variant variables (Model 3). Children with higher birth weights were significantly more likely to have been breastfed in all adjusted and unadjusted models.

Mothers' completion of high school was positively associated with children having ever been breastfed, while living in a low-income economic family was negatively associated with initiation (Table 2). Mothers' residential schooling was not significantly related to breastfeeding initiation in the unadjusted or adjusted models. There was also no difference between children living in rural or urban areas (Models 1 and 3). There were significant regional effects in both Models 1 and 2, with children in the province of British Columbia having much higher odds of having been breastfed than children in the Atlantic region of Canada, and children in the Territories, Ontario, and the Prairie Provinces also having significantly higher odds of initiation (Table 2).

Table 1a. Child and Family Characteristics by Breastfeeding Outcomes—Categorical Variables

		Full Sample	Ever breastfed		Breastfed ≥ 6 months	
		Weighted *N*	%	χ^2 (*p*-value)	%	χ^2 (*p*-value)
Child's sex	Female	4,890	72.8	0.4 (0.539)	57.3	1.0 (0.318)
	Male	4,770	72.2		58.4	
Child's identity	First Nations – Status	2,730	69.2	**35.1 (<0.0001)**	60.3	**37.5 (<0.0001)**
	First Nations – Non-Status	1,400	75.0		58.7	
	Métis	2,630	71.5		57.0	
	Inuit	360	75.0		72.0	
	Mixed	160	81.3		50.0	
	Non-Indigenous	2,360	75.0		54.6	
Mother's Indigenous identity	Indigenous	6,980	71.2	**21.7 (<0.0001)**	58.2	0.9 (0.353)
	Non-Indigenous	2,660	75.9		57.0	
Father's Indigenous identity	Indigenous	5,490	72.1	0.7 (0.401)	58.0	0.0 (0.903)
	Non-Indigenous	4,170	72.9		57.8	
Residential schooling	Mother did not attend	9,270	72.6	2.1 (0.145)	57.5	**9.0 (0.003)**
	Mother attended	390	69.2		66.7	
Mother's education	Did not complete high school	2,430	62.1	**173.4 (<0.0001)**	54.7	**7.6 (0.006)**
	Completed high school	7,230	75.9		58.7	
Family income[a]	Low income	2,520	66.3	**64.8 (<0.0001)**	55.7	2.5 (0.113)
	Not low income	6,110	74.8		57.9	
Community type	Rural	2,700	72.2	0.13 (0.741)	59.4	2.3 (0.130)
	Urban	6,960	72.6		57.4	

Table 1a. Child and Family Characteristics by Breastfeeding Outcomes—Categorical Variables (continued)

		Full Sample	Ever breastfed		Breastfed ≥ 6 months	
		Weighted *N*	%	χ^2 (*p*-value)	%	χ^2 (*p*-value)
Region	Atlantic (*ref.*)	690	62.3	**215.2 (<0.0001)**	48.8	**114.3 (<0.001)**
	Quebec	1,040	63.5		49.2	
	Ontario	2,450	72.2		54.2	
	Prairies	3,590	71.0		57.7	
	British Columbia	1,480	85.8		68.3	
	Territories	410	75.6		69.0	
Total		**9,660**	**72.5**		**57.9**	

Note. Sample sizes are weighted and rounded to the nearest 10. *Ref.* = reference category.
[a] Low income is defined as income below the before-tax Low-Income Cut-Off (LICO). Does not include the territories.
Bold values indicate statistical significance at $\alpha < 0.05$.

Table 1b. Child and Family Characteristics by Breastfeeding Outcomes—Continuous Variables

	Ever breastfed	Never breastfed		Breastfed ≥ 6 months	Breastfed < 6 months	
	Mean (*SD*)		*t* (*p*-value)	Mean (*SD*)		*t* (*p*-value)
Child's age[a] (years)	10.0 (2.53)	10.3 (2.59)	**4.8 (<0.0001)**	10.0 (2.52)	10.0 (2.56)	0.7 (0.489)
Mother's age at birth (years)	26.9 (5.67)	25.8 (5.82)	**-8.5 (<0.0001)**	27.5 (5.69)	26.1 (5.57)	**-10.2 (<0.0001)**
Child's weight at birth (kg)	3.47 (0.59)	3.39 (0.64)	**-6.7 (<0.0001)**	3.51 (0.58)	3.41 (0.61)	**-7.0 (<0.0001)**

Note. [a] Child's age at the time of the survey, in 2006, as reported by the child's person most knowledgeable (PMK).
Bold values indicate statistical significance at $\alpha < 0.05$.

Table 2. Logistic Regression Models Predicting Odds of a Child Ever Having Been Breastfed

		Model 1	Model 2	Model 3
		Odds Ratios (95% CI)		
Child's age[a] (years)		**0.96 (0.94 – 0.98)**	**0.96 (0.94 – 0.99)**	**0.95 (0.93 – 0.98)**
Child's sex	Female (*ref.*)	1.00	1.00	1.00
	Male	0.98 (0.86 – 1.09)	0.97 (0.85 – 1.09)	0.96 (0.84 – 1.10)
Child's identity	First Nations – Status (*ref.*)	1.00	1.00	1.00
	First Nations – Non-Status	**1.30 (1.08 – 1.56)**	1.15 (0.91 – 1.45)	1.12 (0.88 – 1.43)
	Métis	1.12 (0.98 – 1.27)	1.02 (0.86 – 1.21)	0.92 (0.77 – 1.11)
	Inuit	**1.30 (1.03 – 1.64)**	**1.54 (1.13 – 2.10)**	1.40 (0.85 – 2.30)
	Mixed	**2.01 (1.29 – 3.13)**	**1.82 (1.04 – 3.20)**	1.61 (0.89 – 2.94)
	Non-Indigenous	**1.28 (1.09 – 1.50)**	1.20 (0.98 – 1.47)	**1.28 (1.03 – 1.59)**
Child's weight at birth (kg)		**1.29 (1.18 – 1.41)**	**1.33 (1.20 – 1.48)**	**1.26 (1.12 – 1.40)**
Mother's age at birth (years)		**4.98 (2.43 – 10.20)**	**3.84 (1.57 – 9.40)**	2.29 (0.83 – 6.32)
Mother's age at birth-squared (years)		**0.79 (0.70 – 0.90)**	**0.84 (0.71 – 0.98)**	0.91 (0.76 – 1.09)
Mother's Indigenous identity		**0.79 (0.69 – 0.89)**	**0.72 (0.60 – 0.86)**	0.84 (0.70 – 1.00)
Father's Indigenous identity		0.97 (0.87 – 1.08)	0.89 (0.76 – 1.05)	0.95 (0.80 – 1.12)
Residential schooling	Mother did not attend (*ref.*)	1.00	1.00	1.00
	Mother attended	0.87(0.68 – 1.11)	0.84 (0.61 – 1.16)	0.79 (0.54 – 1.17)
Mother's education	No high school completed (*ref.*)	1.00	-	1.00
	High school completed	**1.92 (1.70 – 2.16)**	-	**1.89 (1.60 – 2.24)**
Household income		**0.66 (0.58 – 0.75)**	-	**0.78 (0.66 – 0.92)**

Table 2. Logistic Regression Models Predicting Odds of a Child Ever Having Been Breastfed (continued)

		Model 1	Model 2	Model 3
		Odds Ratios (95% CI)		
Community type	Rural (*ref.*)	1.00	-	1.00
	Urban	1.03 (0.92 – 1.14)	-	0.98 (0.86 – 1.13)
Geographic region	Atlantic (*ref.*)	1.00	-	1.00
	Quebec	1.08 (0.88 – 1.34)	-	0.99 (0.77 – 1.27)
	Ontario	**1.65 (1.34 – 2.04)**	-	**1.57(1.24 – 2.00)**
	Prairies	**1.54 (1.29 – 1.82)**	-	**1.84 (1.49 – 2.28)**
	British Columbia	**3.92(3.11 – 4.95)**	-	**4.25 (3.21 – 5.62)**
	Territories[b]	**2.00(1.54 – 2.59)**	-	-

Note. Ref. = reference category. CI = confidence interval. Model 1: Univariate, unadjusted. Model 2: Multivariate, adjusted, time-invariant variables. Model 3: Multivariate, adjusted, all variables.
[a] Child's age at the time of the survey, in 2006, as reported by child's person most knowledgeable (PMK).
[b] Territories were excluded from models involving income due to missing data.
Bold values indicate statistical significance at $\alpha < 0.05$.

Among children who were breastfed at all, the unadjusted odds ratios reveal that Inuit children were most likely to have been breastfeed for at least six months, while mixed identity or non-Indigenous children were less likely to have done so (Table 3, Model 1). In the fully adjusted model, there was again a significant effect of Inuit identity on breastfeeding duration, whereas Métis children were shown to be significantly less likely than Status First Nations to have been breastfed for six months or longer (Model 3).

Table 3. Logistic Regression Models Predicting Odds of a Child Having Been Breastfed for Over Six Months

		Model 1	Model 2	Model 3
		Odds Ratios (95% CI)		
Child's age[a] (years)		0.99 (0.97 – 1.01)	1.00 (0.97 – 1.03)	0.99 (0.97 – 1.02)
Child's sex	Female (*ref.*)	1.00	1.00	1.00
	Male	1.05 (0.94 – 1.18)	0.98 (0.86 – 1.13)	1.00 (0.87 – 1.15)
Child's identity	First Nations – Status (*ref.*)	1.00	1.00	1.00
	First Nations – Non-Status	0.91 (0.75 – 1.10)	0.96 (0.76 – 1.23)	1.00 (0.78 – 1.28)
	Métis	0.88 (0.76 – 1.01)	0.84 (0.70 – 1.02)	**0.80 (0.66 – 0.98)**
	Inuit	**1.61 (1.24 – 2.10)**	**1.69 (1.21 – 2.36)**	**1.96 (1.14 – 3.36)**
	Mixed	**0.66 (0.46 – 0.96)**	0.68 (0.43 – 1.08)	0.65 (0.40 – 1.04)
	Non-Indigenous	**0.78 (0.66 – 0.92)**	**0.75 (0.60 – 0.94)**	0.82 (0.65 – 1.03)
Child's weight at birth (kg)		**1.37 (1.24 – 1.50)**	**1.34 (1.20 – 1.49)**	**1.33 (1.19 – 1.48)**
Mother's age at birth (years)		1.61 (0.67 – 3.89)	1.44 (0.52 – 4.00)	1.43 (0.49 – 4.21)
Mother's age at birth-squared (years)		0.99 (0.84 – 1.16)	1.02 (0.85 – 1.23)	1.02 (0.84 – 1.24)
Mother's Indigenous identity		1.04 (0.91 – 1.18)	0.89 (0.73 – 1.08)	0.94 (0.76 – 1.15)
Father's Indigenous identity		0.99 (0.88 – 1.12)	0.87 (0.73 – 1.04)	0.87 (0.72 – 1.04)
Residential schooling	Mother did not attend (*ref.*)	1.00	1.00	1.00
	Mother attended	**1.52 (1.14 – 2.03)**	**1.49 (1.04 – 2.12)**	**1.77 (1.14 – 2.75)**
Mother's education	No high school completed (*ref.*)	1.00	-	1.00
	High school completed	1.21 (1.05 – 1.39)	-	1.14 (0.93 – 1.38)

Table 3. Logistic Regression Models Predicting Odds of a Child Having Been Breastfed for Over Six Months (continued)

		Model 1	Model 2	Model 3
		Odds Ratios (95% CI)		
Household income		0.90 (0.78 – 1.04)	-	1.00 (0.84 – 1.19)
Community type	Rural (*ref.*)	1.00	-	1.00
	Urban	0.94 (0.84 – 1.05)	-	0.93 (0.81 – 1.08)
Geographic region	Atlantic (*ref.*)	1.00	-	1.00
	Quebec	**1.03 (0.79 – 1.35)**	-	1.04 (0.75 – 1.43)
	Ontario	**1.26 (1.00 – 1.60)**	-	1.25 (0.94 – 1.66)
	Prairies	**1.45 (1.16 – 1.80)**	-	**1.53 (1.17 – 1.99)**
	British Columbia	**2.28 (1.79 – 2.91)**	-	**2.28 (1.71 – 3.03)**
	Territories[b]	**2.41 (1.80 – 3.22)**	-	-

Note. Ref. = reference category. Model 1: Univariate, unadjusted. Model 2: Multivariate, adjusted, time-invariant variables. Model 3: Multivariate, adjusted, all variables.

[a] Child's age at the time of the survey, in 2006, as reported by child's person most knowledgeable (PMK).

[b] Territories were excluded from models involving income due to missing data.

Bold values indicate statistical significance at $\alpha < 0.05$.

There was no effect of mother's age in the models of breastfeeding duration (Table 3). Likewise, mother's Indigenous identity was shown to have no effect on this outcome (Table 3). Interestingly, children whose mothers had attended residential schools had higher odds of having been breastfed for six months or longer, and this effect persisted across all models (Table 3). Mother's completion of high school was positively associated with breastfeeding for six months or longer (Model 1); however, this effect was insignificant in the fully adjusted model (Model 3). Unlike breastfeeding initiation (Table 2), there was no relationship between having a low income and the likelihood of breastfeeding for at least six months (Models 1 and 3). Finally, regional differences within Canada were similar to those in Table 2, with children in British Columbia being most likely to have been breastfed, followed by children in the Territories (Table 2).

Discussion

The results of our study confirm that breastfeeding initiation and duration are lower among Indigenous children in Canada compared to estimates available for non-Indigenous children. Moreover, we have identified factors associated with breastfeeding initiation and duration among Indigenous children in Canada. Several factors were correlated with reported breastfeeding, such as having an older mother, a parent with higher educational attainment, and maternal history of residential school attendance; while others, such as lower household income and children's Indigenous identity, were correlated with decreased breastfeeding initiation and/or duration in our sample. The predictors we have identified in this study are consistent with existing breastfeeding literature, but also contribute to the larger body of knowledge through offering new insight into breastfeeding within Indigenous-specific contexts—such as Indigenous identity and maternal residential school attendance.

The 2006 APS data show that breastfeeding initiation among Indigenous children living outside of reserves was nearly 20% lower than a previous 2006 estimate for all Canadian children (72.4% vs. 90.3%; Thulier & Mercer, 2009). This confirms the importance of understanding the factors influencing breastfeeding practices for Indigenous women. Rates of initiation were similar for all Indigenous identity groups except for Inuit children, who were more likely to have been breastfed, and to be breastfed for six or more months. Children identified as Métis, mixed identity, or non-Indigenous were in general not different from Status First Nations children in initiation but were significantly less likely to have been breastfed for at least six months. These differences persisted after controlling for geography, household income, and mothers' education.

Consistent with other Canadian studies, mother's completion of high school was a positive correlate of initiation and duration, but more convincingly so for breastfeeding having been initiated at all. The effect of living in low income, however, was somewhat inconsistent with previous Canadian studies. According to the APS data, living in a low-income household was associated with higher likelihood of a child being breastfed, which suggests the inverse of the general relationships in Canada. This warrants future research into the specific facilitators and barriers to breastfeeding initiation and duration among Indigenous mothers in Canada, as well as the perceptions surrounding its benefits. Further research on the knowledge, attitudes, and beliefs influencing breastfeeding behaviours may help to elucidate some of these factors, as has been previously conducted through consultation with Indigenous mothers in an American setting (Eckhardt et al., 2014).

Beyond culture-specific norms and perceptions, consideration of broader socioeconomic determinants (e.g., mother's educational attainment, household income) and family-level influences (e.g., mother's age at child's birth) are important for understanding the population under study. From a sociodemographic perspective, Indigenous women are among the most impoverished groups in Canada —particularly according to measures of educational attainment and income which, for Indigenous populations, are directly linked to one another. Indigenous women possess lower average educational levels and tend to earn less money than their non-Indigenous counterparts in Canada; rates of poverty for Indigenous women have been estimated to be double that of non-Indigenous women (National Collaborating Centre for Aboriginal Health [NCCAH], 2009). Indigenous women in Canada are also at greater likelihood of becoming mothers at young ages, relative to non-Indigenous women. Moreover, early onset of childbearing, especially during teenage years, might decrease mothers' likelihood of

attaining secondary and post-secondary education (Cooke, 2013; Garner, Guimond, & Senécal, 2013). Our findings are consistent with existing literature that describes these sociodemographic factors as influential on breastfeeding practices within a variety of contexts; however, they also highlight Indigenous women as a particularly important population to consider in Canada.

Our analyses demonstrate that geographic location of residence may also play an important role in promoting or hindering healthy breastfeeding practices. Breastfeeding of Indigenous children was more common, and conducted for longer, in Western Canada and in the North, compared with in Eastern Canada and Quebec. This is consistent with patterns among other Canadian mothers (Al-Sahab et al., 2010). The reasons for these regional differences remain unclear, although provincial policies might be influential. The province of British Columbia, in addition to protecting breastfeeding practices under its Human Rights Code, has taken a strong stance in support of breastfeeding promotion (British Columbia Ministry of Health, 2012).

The correlation between mothers' attendance of residential school and breastfeeding had not been previously studied quantitatively. A qualitative study of intergenerational trauma on parenting found that among a group of First Nations women, residential schooling was understood as a barrier to breastfeeding (Eni, Phillips-Beck, & Mehta, 2014). The findings reported here, along with the differences between Indigenous identity groups, point to a need for further investigation of breastfeeding practices in their historical, social, and cultural contexts. Future inquiries may benefit from addressing breastfeeding and intergenerational trauma through a resilience-based lens.

Limitations

The most important limitation is the age of these data. The 2006 APS is the most recent source of national data that can be used to estimate breastfeeding prevalence among Indigenous women living outside of reserve communities, and which includes Indigenous-specific characteristics such as residential schooling. Although the APS was again conducted in 2012, questions on breastfeeding were not included. Nonetheless, these data referred to children born between 1992 and 2006, and more recent data are clearly required.

While the age of the data poses a major limitation to the findings of this study, their significance suggests that a re-introduction of breastfeeding-related questions into subsequent waves of the APS is warranted. In doing so, opportunities for further cross-sectional investigations across time or in combination of multiple waves may be made possible.

On account of the retrospective data collection method used, data were also subject to recall bias and mortality; only children who had survived to 2006 could be included in the sample. Additionally, the survey did not ask whether the child had been exclusively breastfed, limiting comparability to previous studies on the general Canadian population as well as to current breastfeeding recommendations (Bank, 2012; Critch, 2014; Kramer & Kakuma, 2004; WHO, 2003). The data are representative only of the Indigenous population living outside of First Nations reserves—the majority of the Indigenous identity population in Canada—so, an important subset of the population to consider.

Finally, while previous studies have identified differences in breastfeeding initiation and duration between Indigenous groups and mainstream populations, the findings of this study have limited

generalizability beyond that of a Canadian context. However, the knowledge we have generated surrounding Indigenous-specific predictors of breastfeeding behaviour constitutes strong groundwork for future investigators to ask the same questions in relevant cultural settings, namely among other Indigenous-identity groups similarly affected by systemic barriers that produce health inequalities. For example, in the United States, where there are existing breastfeeding support interventions offered through the Indian Health Service (England, 2017), future investigations should seek to address the unique barriers to breastfeeding initiation and duration faced by Indigenous identity groups.

Policy Recommendations

These findings represent the most recent measurements and correlates of breastfeeding initiation and duration among off-reserve Indigenous children in Canada using the 2006 APS. The 2006 version was the last cycle of the APS to include any questions pertaining to breastfeeding initiation or duration because these questions were discontinued in the 2012 APS and have not been included in the 2017 APS. As such, we recommend that questions about breastfeeding initiation and duration become reintroduced in future APS cycles administered by Statistics Canada. Continuing to collect these data on a nationally representative scale is necessary for implementing evidence-informed public health interventions that promote breastfeeding among Indigenous mothers. This recommendation presents a practical, and relatively feasible, option for ongoing monitoring of the discrepancy in rates of breastfeeding initiation and duration between Indigenous and non-Indigenous populations.

Efforts should also be made at a policy level to protect and support breastfeeding as a factor of wellbeing among mothers and their children. Breastfeeding promotion programs and educational campaigns have demonstrated success in some settings; however, broader efforts which target the systemic and structural determinants of breastfeeding initiation and duration may be more effective, albeit more difficult to implement. Interventions should recognize that the factors influencing breastfeeding practices are interconnected and complex, as implied through the life-course perspective. For example, efforts which support reconciliation between Indigenous and non-Indigenous peoples are important for promoting social equity and health among First Nations, Métis, and Inuit populations in Canada; future research should seek to address how reconciliation may indirectly influence healthy behaviours such as breastfeeding.

Conclusions

Despite the emphasis placed on breastfeeding in primary obstetric care settings in Canada, and in promotion of maternal and child health, breastfeeding is considerably lower among Indigenous children than among the general population. This may be related to socioeconomic determinants, but further research aimed at understanding the specific barriers to breastfeeding faced by Indigenous women is needed, especially in consideration of the health inequities they may be uniquely subjected to. The results suggest a need for intervention strategies designed specifically for Indigenous women—giving special consideration to those who are younger, have not completed high school, are of lower socioeconomic status, and live in Eastern Canada—with emphasis on promoting and supporting breastfeeding continuation for at least six months. We also argue that the broader factors associated with social equity among First Nations, Métis, and Inuit people in Canada should be considered, as they may be important for protecting traditional breastfeeding practices among Indigenous women.

While the APS data presented here were collected in 2006, they have not been previously examined with respect to breastfeeding, and we are not aware of another analysis of the predictors of breastfeeding initiation and duration specifically of Indigenous children. Although there have been a number of important regional initiatives to promote breastfeeding (British Columbia Ministry of Health, 2017; England, 2017; Eni et al., 2014), it seems unlikely that there have been major changes in the underlying factors that are related to breastfeeding behaviour among Indigenous women, including the subpopulations most at risk of not initiating breastfeeding or continuing to breastfeed. Nonetheless, we hope that future sources of data allow further research to investigate the policy, sociocultural, or other population-level determinants that influence breastfeeding practices among Indigenous women in Canada and elsewhere.

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