

ANXIETY ABOUT FOOD SUPPLY IN CREE WOMEN WITH INFANTS IN QUEBEC

Noreen D. Willows¹, Rose Iserhoff², Lily Napash², Lucie Leclerc², Tanya Verrall³

¹Department of Agricultural, Food and Nutritional Science, University of Alberta

²Cree Board of Health and Social Services of James Bay, Quebec

³School of Dietetics and Human Nutrition, McGill University

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ABSTRACT

Objectives. The objectives were to document the prevalence of maternal anxiety about food supply in Cree women who had 9-month-old infants, and to understand maternal and infant characteristics associated with anxiety.

Study Design. The design was descriptive and combined both cross-sectional and retrospective analyses.

Methods. The study took place in nine Cree communities in northern Quebec. Data on maternal characteristics in pregnancy (age, parity, anemia, smoking status) and infant characteristics (gestational age, birth weight, weight and hemoglobin concentration at 9 months old) were obtained from medical records. At 9 months postpartum, mothers were asked about infant feeding practices, the health of their infant, and the question, "Do you ever worry you don't have enough money to buy your children food to eat?" Affirmative responses were considered evidence for anxiety about food supply. Pricing data was collected for commercial baby food, formula, milk and water in the communities and, for comparison, in the large urban city of Montreal.

Results. 245 woman-infant pairs participated. One-fifth (20.8%) of mothers were anxious about food supply. The prevalences of anxiety in women who had anemia, or smoked, during pregnancy, or who bottle-fed their 9-month-old infants, were 44.4%, 27.5% and 24.0%, respectively. The corresponding prevalences of anxiety in women who did not have anemia, who did not smoke, or who breastfed without bottle-feeding at 9-months postpartum, were 19.0%, 13.6% and 6.7%. The adjusted ORs for anxiety were 3.10 (95% CI, 1.11-8.65), 2.12 (95% CI, 1.05-4.29) and 3.87 (95% CI, 1.12-13.36) for anemia, smoking and bottle-feeding, respectively. Prevalences of anemia and infection were comparable between infants of mothers who did and did not express anxiety. However, infants whose mothers had anemia during pregnancy had higher prevalences of anemia (44.0% vs. 24.6%, $p = 0.04$) and infection (77.8% vs. 50.2%, $p = 0.03$) at 9 months old.

Conclusion. Women who had anxiety about food supply for their children had characteristics that distinguished them from women who did not have anxiety. Anxiety was associated with anemia and smoking during pregnancy, and with bottle-feeding at 9 months postpartum. (*Int J Circumpolar Health* 2005;64(1):55-64.)

Key Words: Food security, breastfeeding, First Nations, nutrition, Canada, aboriginal

INTRODUCTION

Food insecurity is "the limited, inadequate, or insecure access of individuals and households to sufficient, safe, nutritious, personally acceptable food both in quality and quantity to meet their dietary requirements for a healthy and productive life." It includes the fear of not being able to provide or obtain food, and in severe cases, hunger due to food shortages (1). Food insecurity covers issues related to the nature, quality, and security of the food supply as well as issues of food access related to income and food cost. At the household level, measures of food insecurity are repleteness of household stores, quality and safety of available foods, and anxiety about food supplies and food sources (2).

Food insecurity is endured by the poor and has been associated with suboptimal dietary intakes and compromised health and well-being (1,3-6). In Canada, aboriginal peoples (First Nations, Métis and Inuit) appear to have a disproportionately high share of food insecurity (7-10). Among aboriginal respondents who participated in the National Population Health Survey in 1998/1999, the prevalence of food insecurity was 27.0% (8). Many aboriginal households are headed by lone females (11) so that aboriginal women and their children may be particularly vulnerable to food insecurity. Aboriginal people living in remote communities may experience all or most aspects of food insecurity due to limited economic opportunities, the high cost of market food, and limited food choice (7,10,12,13). Inuit women in remote regions express concern about

not having enough money to purchase food to feed their families despite efforts by the Federal government to subsidize nutritious food costs in isolated communities (7). Despite evidence that food insecurity is commonplace in aboriginal communities, little is known about the characteristics of individuals who have food insecurity.

The Cree of Eeyou Ischee in the subarctic region of northern Quebec number 14,000 persons and live in nine communities that range in size from approximately 700 – 3500 persons. Three communities are rural, four are located on the east coast of James Bay, and two are remote (one which lacks year-round road access, the other which has gravel road access). The unemployment rate in Cree under 40 years of age is about one and a half times greater than Quebec as a whole, and a lesser proportion of employed persons work in full-year, full-time jobs (14). Anemia is a health issue in Cree infants (15,16), most likely contributed to by inadequate intake of iron (17). In the largest of the Cree communities, a high proportion of infants are dependent on commercial infant food for their usual dietary intake (unpublished data, Verrall T.). Both iron-enriched infant cereals and iron-fortified formulas are expensive to purchase given that market food must be trucked long distances or flown into communities.

In this study, we documented the prevalence of anxiety about food supply in Cree mothers with infants, and examined maternal and infant characteristics associated with maternal anxiety about being unable to provide food for children. We also documented the price of infant foods and the cost to bot-

tle-feed an infant in Cree communities compared to Montreal, which is a large urban city in the province of Quebec.

METHODS

Data were obtained as part of a study that took place August 1998 - February 2000 to understand risk factors for anemia (haemoglobin <110 g/L) in 9-month-old infants (15,16). When infants were screened for anemia, the guardian who was typically the mother, was asked if the infant was breast or bottle-fed, and if the infant had experienced an infection (a cold, otitis, fever, diarrhea) in the preceding two weeks. To understand the prevalence of anxiety about food supply, the question was asked in English or Cree, "Do you ever worry you don't have enough money to buy your children food to eat?" Maternal characteristics during pregnancy with the infant (age, parity, anemia in the first trimester, smoking status) were obtained from medical charts. Infant data obtained from medical charts were gestational age, birth weight, and weight and hemoglobin concentration at 9 months old. Informed consent was obtained and ethics approval received from McGill University and the Quebec Minister of Health. The Executive Director of the Cree Board of Health and Social Services of James Bay approved the study.

A pricing survey was completed the spring and summer of 2002 of cow's milk, infant formula, bottled water and commercially prepared infant food in Cree communities. The city of Montreal, which is the largest city in the province of Quebec, was

used as a comparison for pricing. Women in Quebec receiving employment-assistance benefits must purchase formula in a pharmacy to obtain a subsidy. For this reason, in Montreal pricing took place in a large popular supermarket and a pharmacy. In each Cree community, all retail outlets selling groceries were surveyed. For each surveyed food item, the lowest price among outlets for each product was used as the price to purchase that product. The price of refrigerated fluid milk and ultra-high temperature (UHT) processed fluid milk that does not require refrigeration was obtained. Cree infants who drink pasteurized cow's milk consume predominantly UHT milk (16). Due to concerns for local water safety, taste and appearance, Cree families may prepare formula using bottled water. Four litres of bottled water was priced as this size was available in all communities and was the most economical choice. The price for the most common brands of iron-fortified and soy formula was obtained, but given variability in brands of homogenized milk and bottled water, it was not possible to compare prices for a single brand.

Descriptive statistics were reported as percentages or as the mean and standard deviation, and comparisons among means were made using the t-test. The chi-square statistic was used for categorical variables. Binomial logistic regression was used to determine if maternal or infant characteristics were associated with maternal anxiety about food supply. Potential confounding among variables was controlled using a multivariate logistic regression model with backward elimination. Results were reported as odds ratios (ORs) and 95% confidence intervals (CIs).

RESULTS

Of the 314 infants eligible for anemia screening at 9-months postpartum, 245 guardians answered questions on infant health and feeding practices and were the focus of study. Maternal characteristics in pregnancy of mothers included in the study were as follows: 22.2% had parity ≥ 3 , 7.7% had anemia, and 54.4% smoked cigarettes. At 2-months old, 36.1% of infants were fed bottled milk or formulas to the exclusion of breast milk, 20.3% were given both the breast and bottle, and 43.6% were breastfed to the exclusion of cow's milk or formula. At 9 months old, 66.2% of infants were fed bottled milk or formulas to the exclusion of breast milk, 15.9% were given both the breast

and bottle, and 18.4% were breastfed to the exclusion of cow's milk or formula. Of infants who were bottle-fed at 9 months old (full or partial), 92.0% were given formula (91% of formula being iron-fortified) and 16.0% were given cow's milk. (The percentage exceeds 100 because some infants were given both formula and cow's milk.) One-quarter (25.0%) of infants had anemia and 52.5% were reported at the time of anemia screening to have had a recent infection. If a mother had been anemic in pregnancy, her infant had a higher prevalence of anemia (44.0% vs. 24.6%, $p = 0.04$) and infection (77.8% vs. 50.2%, $p = 0.03$) at 9 months old. There was no association between infant health at 9-months postpartum and maternal smoking in pregnancy.

Table I.

A comparison of maternal and infant characteristics between women who did and did not express anxiety about food supply for their children

	Maternal anxiety about food supply	N	Mean \pm SD	P
Maternal characteristics in pregnancy				
Age	Yes	51	23.3 \pm 4.3	0.22
	No	193	24.4 \pm 5.6	
	Total	244	24.2 \pm 5.4	
Hemoglobin concentration	Yes	49	122.2 \pm 11.7	0.15
	No	185	124.5 \pm 9.5	
	Total	234	124.0 \pm 10.0	
Parity	Yes	51	1.9 \pm 1.6	0.02
	No	193	1.3 \pm 1.4	
	Total	244	1.4 \pm 1.5	
Infant characteristics				
Gestational age at birth (weeks)	Yes	50	39.0 \pm 1.5	0.89
	No	192	39.0 \pm 1.5	
	Total	242	39.0 \pm 1.5	
Birth weight (kg)	Yes	51	3.7 \pm 0.6	0.61
	No	194	3.8 \pm 0.6	
	Total	245	3.8 \pm 0.6	
Weight at 9 months old (kg)	Yes	48	10.0 \pm 1.3	0.18
	No	186	10.3 \pm 1.3	
	Total	234	10.2 \pm 1.3	
Hemoglobin at 9 months old (g/L)	Yes	46	116.4 \pm 9.7	0.68
	No	178	115.7 \pm 10.0	
	Total	224	115.9 \pm 9.7	

One-fifth (20.8%) of mothers stated they worried about not having enough money to buy food for their children, and were therefore considered to have anxiety about food supply. There was no association between anxiety about food supply and breast or bottle-feeding at 2-months postpartum. Table I shows maternal and infant characteristics of mothers who did and did not have anxiety. Parity was significantly higher in those with anxiety as compared to those without anxiety. Table II shows the distribution of maternal and infant characteristics presented as categorical variables when maternal anxiety about food supply was present or absent. Factors statistically associated with anxiety were maternal

smoking in pregnancy, maternal anemia in pregnancy, and bottle-feeding at 9-months postpartum. After adjusting for potential confounding in multivariate analysis, the adjusted ORs for anxiety were 3.87 (95% CI, 1.12-13.36), 3.10 (95% CI, 1.11-8.65) and 2.12 (95% CI, 1.05-4.29) for bottle-feeding, anemia and smoking, respectively. The prevalence of anxiety in women who had anemia in pregnancy, smoked in pregnancy or bottle-fed their 9-month-old infant was 44.4%, 27.5% and 24.0%, respectively. The corresponding prevalence of anxiety in women without anemia, who did not smoke, or who breastfed their infant (to the exclusion of bottle-feeding) was 19.0%, 13.6% and 6.7%.

Table II.

Distribution of maternal and infant characteristics between mothers who did and did not express anxiety about food supply for their children

Characteristics	Anxiety about food supply			Unadjusted OR (95% CI)
	Number of Subjects	Yes Number (%)	No of subjects	
Maternal				
<i>Parity</i>				
2 or less	186	36 (19.4)	150 (80.6)	1.00
3 or more	53	15 (28.3)	38 (71.7)	1.64 (0.82-3.31)
<i>Anemia during first trimester</i>				
No	216	41 (19.0)	175 (81.0)	1.00
Yes	18	8 (44.4)	10 (55.6)	3.42 (1.27-9.19)*
<i>Smoking during pregnancy</i>				
No	110	15 (13.6)	95 (86.4)	1.00
Yes	131	36 (27.5)	95 (72.5)	2.40 (1.23-4.67)*
<i>Infant bottle-feeding at 9 months postpartum</i>				
No	45	3 (6.7)	42 (93.3)	1.00
Yes	200	48 (24.0)	152 (76.0)	4.42 (1.31-14.90)*
Infant (9 months old)				
<i>Anemia</i>				
No	168	36 (21.4)	132 (78.6)	1.00
Yes	56	10 (17.9)	46 (82.1)	0.80 (0.37-1.73)
<i>Infection</i>				
No	113	24 (21.2)	89 (78.8)	1.00
Yes	125	27 (21.6)	98 (78.4)	1.02 (0.55-1.90)

*95% CI do not include "1"; therefore the ORs are statistically significant.

Milk, bottled water, formula, infant cereals, and commercial baby food were all more expensive in Cree communities than in Montreal and were most expensive in remote Cree communities (Table III). The average cost of

purchasing these items was 1.2 – 2.4 times higher in Cree communities than in Montreal. Table IV shows the daily cost of infant bottle-feeding based on the mean volume of formula and/or cow’s milk reported to be consumed

Table III.

The cost of infant food and bottled water in Cree communities in Quebec and in Montreal¹

	Montreal	Cree communities			
		Average ⁶	Rural	Coastal	Remote
Ultra-high temperature (UHT)-treated fluid milk (2% milk fat, 1 L)	1.50	1.86	1.86	1.68	2.22
Fluid milk (3.25% milk fat, 2 L)	2.65	3.77	3.42	3.54	4.75
Bottled water (4 L)	0.99	2.40	1.70	2.48	3.32
Iron-fortified formula (Similac Advance, ready-to-serve, 235 mL) ²	2.29	3.20	2.63	3.14	3.88
Iron-fortified formula (Similac Advance, powder, 370 g) ²	11.19	14.52	13.62	14.03	16.39
Iron-fortified formula (Similac Advance, concentrate, 385 mL) ²	2.54	4.29	3.91	4.13	5.19
Soy formula (Enfalac Prosobee Concentrate, 385 mL) ³	3.19	4.76	NA ⁵	4.71	4.89
Infant cereal (Heinz, 227 g) ⁴	2.49	3.91	3.61	3.94	4.32
Jarred baby food (Heinz, 128 ml) ⁴	0.61	1.03	0.89	1.03	1.23

¹Priced in Canadian dollars, spring and summer, 2002

²Ross Laboratories

³Mead Johnson

⁴H.J. Heinz Company

⁵Not available in surveyed store

⁶Average price of all nine Cree communities

Table IV.

The daily cost of bottle-feeding a 9-month-old infant with formula, or cows milk, in urban and rural Quebec and in Cree communities in Quebec^{1,2}

	Montreal	Cree communities			
		Average ³	Rural	Coastal	Remote
UHT-treated fluid milk	1.41	1.75	1.75	1.60	2.09
Iron-fortified formula (ready-to-serve)	9.16	12.80	10.52	12.56	15.52
Iron-fortified formula (concentrate)					
Made with tap water	3.10	5.23	4.77	5.04	6.33
Made with bottled water	3.22	5.50	4.97	5.33	6.72
Iron-fortified formula (powder)					
Made with tap water	3.69	4.76	4.47	4.60	5.37
Made with bottled water	3.90	5.31	4.86	5.17	6.13

¹Priced in Canadian dollars, spring and summer 2002

²Based on a mean daily intake of bottled milk or formula of 940 mL

³Average price of all nine Cree communities

by infants who were not breastfed (940 ± 265 mL) at 9 months old. Ready-to-serve formula was the most expensive artificial milk to use for bottle-feeding and cow's milk the least expensive. In remote Cree communities, the cost of bottle-feeding an infant for one month (31 days) was \$481.12 for ready-to-serve formula, \$208.32 for concentrated formula prepared with bottled water, \$190.03 for powdered formula prepared with bottled water, \$69.21 for homogenized milk and \$64.69 for UHT milk.

DISCUSSION

In Canada, there is little information about factors associated with food insecurity in aboriginal communities despite evidence that food insecurity may be highly prevalent in women and their children. In the present study, one-fifth of Cree mothers in northern Quebec with young infants had anxiety about food supply for their children and might therefore be considered food insecure. Although several scales for measuring food insecurity exist for use in the general Canadian population (18), these scales have not been validated as measures of food insecurity in aboriginal populations. Testing of commonly used food insecurity questions is needed in aboriginal communities to adapt questions to accommodate First Nations, Métis and Inuit languages and cultural perceptions (1). The question that was asked of mothers in the present study related to anxiety about having insufficient money to buy food for children; anxiety is experienced at all levels of food insecurity (i.e., food insecure without hunger

through to food insecure with severe hunger) (1). If maternal anxiety about food supply was indeed a reflection of food insecurity, it is not clear how anxiety manifested itself in respondents, where respondents fell on the food-related anxiety continuum, or if the anxiety was transitory or chronic. These questions need to be addressed in future studies. The face validity of the question that was used is imputed by the association of maternal anxiety about food supply with anemia in the first trimester, smoking in pregnancy and infant bottle feeding. Given the cross-sectional nature of the study, it is impossible to draw causal inferences about the nature of the relationship among variables.

The association between infant bottle feeding and anxiety about food supply at 9-months postpartum might be explained by the high price of formula in Cree communities. In Canada, economically and educationally disadvantaged women are most likely to bottle-feed despite the high cost of infant formula (19). We did not determine how many participating women were on social assistance, however, many Cree communities have limited opportunity for economic employment (14). In Quebec, women who are collecting employment insurance are entitled to a breastfeeding benefit or financial assistance for the purchase of infant formula. A nursing allowance provides mothers \$55 a month until the child is one-year of age, which amounts to \$660.00 if she breastfeeds the entire period. If a woman bottle-feeds her baby, she is partially subsidized for formula for infants under 9 months old. In towns and cities, formula is purchased in pharmacies and the subsidy is paid directly to the pharmacist. In Cree communities, due to

the absence of pharmacies, families must pay for the total cost of formula and then submit the receipts to the provincial government for reimbursement, thus, formula feeding may impose a significant financial burden.

In Canada, in 1995, 16% of women smoked in pregnancy (20). In contrast, more than half of Cree women smoked in pregnancy. The prevalence of anxiety about food supply was double in women who smoked compared to non-smokers (27.5% vs. 13.6%). It is not known if smoking in pregnancy reflected continued smoking post-pregnancy, however, rates of smoking during and following pregnancy are high in northern aboriginal communities (7). Low-income individuals are most likely to smoke before, during and after pregnancy compared to individuals from higher socioeconomic groups (21), perhaps as a means of coping with stress.

The prevalence of anemia in pregnancy was three times higher in women who had anxiety about food supply as compared to women who did not (16.3% vs 5.4%). Anemia at the onset of pregnancy can indicate a diet of marginal quality (22). Food insecure women have been documented to have nutritional inadequacies, including suboptimal intake of dietary iron (23). In low-income households with children, mothers often compromise their own food intake to prevent children going hungry (1,24,25), and therefore, in many settings, preschool children are often spared from food deprivation unless the situation is dire (1,24,25). For these reasons, maternal health may be particularly sensitive to household food security status. About one-half of infants had a recent infec-

tion and one-quarter had anemia. Infant anemia and infection prevalence was not associated with maternal anxiety about food supply. Poor diet quality is a contributing factor to infant anemia in this population (15-17); many mothers who had anxiety were bottle-feeding with iron-fortified formula, which may have prevented iron deficiency in some infants (16). Infants of mothers who had been anemic in pregnancy were more likely to be anemic themselves and to have had an infection. This finding suggests strongly that improving women's access to nutritious foods is needed prior to, during, and following pregnancy.

Food cost in remote regions of Canada is high due to transport costs and the spoilage of perishable foods (12,13). The present study focused uniquely on the cost of infant food, milk, infant formula and bottled water used to prepare formula and found all to be much more expensive to purchase in Cree communities than in a large city. The price disparity of these products between northern and southern communities indicates that joint initiatives among federal, provincial and local governments are required for more equitable pricing of foods considered essential for maternal and child health. In many remote communities in Canada that do not have year-round access by surface transportation, a federal government Food Mail Program is in place, with the aim to improve food security by subsidizing the cost of foods prepared specifically for infants and perishable foods including milk (26). Cree communities are not eligible for this program and may benefit from having it or another form of food subsidy in place.

CONCLUSION

Food security is a complex nutritional problem intertwined with social, political and economic issues and for this reason, comprehensive community-based solutions are required, as well as government action. Based on the results of our study, prenatal and well-baby programs in Cree communities in Quebec need to promote iron intake in pregnant women and their infants, reduce maternal smoking rates, and encourage and facilitate women to breastfeed. Further study of how to characterize food insecurity in aboriginal communities, and the root causes of food insecurity is required.

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Noreen D. Willows
 Department of Agricultural,
 Food and Nutritional Science
 4-10 Agriculture/Forestry Centre
 University of Alberta, Edmonton, Alberta
 Canada T6G 2P5
 Email: noreen.willows@ualberta.ca