

# Prevalence and severity of household food insecurity of First Nations people living in an on-reserve, sub-Arctic community within the Mushkegowuk Territory

Kelly Skinner<sup>1,\*</sup>, Rhona M Hanning<sup>1</sup> and Leonard JS Tsuji<sup>1,2</sup>

<sup>1</sup>School of Public Health and Health Systems, University of Waterloo, 200 University Avenue West, Waterloo, ON N2L 3G1, Canada; <sup>2</sup>Environment and Resources Studies, University of Waterloo, Waterloo, ON, Canada

Submitted 5 October 2012: Final revision received 13 May 2013: Accepted 29 May 2013: First published online 28 June 2013

## Abstract

*Objective:* To measure and describe the prevalence and severity of household food insecurity in a remote on-reserve First Nations community using the Household Food Security Survey Module (HFSSM) and to evaluate the perceived relevance of the HFSSM for this population.

*Design:* Household food security status was determined from the eighteen-item HFSSM following the classifications developed by Health Canada for the Canadian Community Health Survey, Cycle 2·2 Nutrition. One adult from each household in the community was invited to complete the HFSSM and to comment on its relevance as a tool to measure food security for First Nations communities.

*Setting:* Sub-Arctic Ontario, Canada.

*Subjects:* Households ( $n$  64).

*Results:* Seventy per cent of households were food insecure, 17% severely and 53% moderately. The prevalence of food insecurity in households with children was 76%. Among respondents from homes rated as having severe food insecurity, all (100%) reported worrying that food would run out, times when food didn't last and there wasn't money to buy more, and times when they couldn't afford to eat balanced meals. The majority of respondents felt the HFSSM did not capture an accurate picture of food security for their situation. Aspects missing from the HFSSM included the high cost of market food and the incorporation of traditional food practices.

*Conclusions:* A high prevalence of household food insecurity was reported in this community. On-reserve remote First Nations communities may be more susceptible to food insecurity than off-reserve Aboriginal populations. Initiatives that promote food security for this vulnerable population are needed.

## Keywords

Canada  
First Nations  
Household food insecurity  
Nutrition surveys  
Population surveillance  
Vulnerable populations

Food insecurity has been described as an urgent and pervasive public health issue for Aboriginal people (First Nations (FN), Métis and Inuit) in Canada<sup>(1–7)</sup>. However, national health surveys have generally excluded the large portion of the Aboriginal population living on-reserve, resulting in limited data on food security in these individuals and FN communities<sup>(2,8)</sup>.

Results of the 2001/2002 Canadian Community Health Survey (CCHS), Cycle 1·1<sup>(9)</sup> showed that food insecurity was closely tied to northern geography, as people living in the territories appeared especially vulnerable. Thus, geographically, communities that are remote and isolated may be particularly susceptible to high levels of food insecurity<sup>(10)</sup>. Over half of the population of Nunavut (56%) reported household food insecurity and rates in the Northwest Territories (28%) and the Yukon (21%) were

also well above the national level of 14·7%<sup>(9)</sup>. The CCHS, Cycle 1·1 may have underestimated the prevalence of food insecurity in the territories and Canada because it did not cover Aboriginal people living on-reserve<sup>(9)</sup>. The CCHS, Cycle 2·2 Nutrition conducted in 2004<sup>(11)</sup> did not include individuals who lived in the territories or on-reserve and found the prevalence of food insecurity in off-reserve Aboriginal households to be 33·3% compared with 8·8% in non-Aboriginal households. Recent data from the Inuit Health Survey found the prevalence of household food insecurity from thirty-six Arctic communities to be 43% to 69% depending on region<sup>(4)</sup>, with nearly 70% of Inuit pre-schoolers residing in households rated as food insecure<sup>(1)</sup>. Results from the First Nations Regional Health Survey Phase 2 (2008/2010; RHS)<sup>(12)</sup> found that over half (54·2%) of all households were food insecure.

\*Corresponding author: Email kskinner@uwaterloo.ca

National surveys have consistently found that in addition to Aboriginal people living off-reserve, certain sub-populations are at much higher risk of food insecurity and include people living on low incomes, social assistance recipients and female lone parents<sup>(9,11,13)</sup>. As Aboriginal people are identified as one of these groups and are often over-represented in the other categories, they may face multiple risk factors for food insecurity<sup>(5,6,14)</sup>. Scales for measuring food insecurity have not been validated in Canadian Aboriginal populations and there is a need for valid, reliable, relevant and feasible instruments to examine and measure food-related issues among northern Aboriginal people<sup>(2,3,5)</sup>.

Food insecurity in remote FN communities is exacerbated by many factors: high incidence of poverty, environmental contamination of traditional food sources, climate change affecting hunting and fishing practices<sup>(15–19)</sup>, loss of traditional food practices and access to land, unreliable food supplies, and high cost and reduced availability and quality of healthy market foods<sup>(2,3,15,20)</sup>. The objectives of the present study were: (i) to measure the prevalence and severity of household food security in a remote, on-reserve, sub-Arctic FN community in Ontario, Canada using the Household Food Security Survey Module (HFSSM); (ii) to determine whether specific socio-demographic characteristics were associated with food security status; and (iii) to evaluate the perceived relevance of the HFSSM as a tool for assessing food insecurity of on-reserve FN households with participants completing the HFSSM. The present paper provides a current analysis of food insecurity in a remote FN community and adds to our previous community-level data. The results provide baseline data for the community as it works towards improved food security. The findings are particularly important in light of recent FN data from the RHS<sup>(12)</sup> using an abridged version of the HFSSM and forthcoming data expected to emerge from the First Nations Food, Nutrition, and Environment Study (FNFNES)<sup>(21)</sup>.

## Methods

### Setting

The present study was part of a larger project on food security in the community of Fort Albany, Ontario, carried out from the summer of 2009 until the late autumn of 2011. As described previously<sup>(22,23)</sup>, Fort Albany is an on-reserve, geographically remote (52°15' N; 81°35' W), sub-Arctic FN community along the Albany River on the west coast of James Bay and is home to approximately 850 Cree people. The community is only accessible by airplane year-round and is connected to neighbouring communities by a snow/ice road for approximately 6–8 weeks in the winter and by boat or barge during the ice-free season. The community has one grocery store, which is the major supplier of food, and two small

convenience stores. Community members participate in traditional hunting and fishing activities; however, availability and consumption of traditional foods from these endeavours are seasonal, vary in abundance from year to year and are limited by individual means (e.g. financial constraints for travel to hunting sites)<sup>(23,24)</sup>. Prior formative research in Fort Albany identified food insecurity as an important barrier to healthy eating for youth living in the community<sup>(23,25)</sup>. A community advisory committee of community members from local stakeholder organizations (*n* 6) was established prior to the study.

### Recruitment and data collection

The eighteen-item HFSSM<sup>(11)</sup> was used to assess the prevalence and severity of food insecurity. Prior to data collection, the HFSSM was reviewed by the community advisory committee during group meetings to identify any need for clarification of the instructions or content for the participants. A local community research assistant was hired and trained to collect survey data. The assistant was a Band member, had stature in the community and had lived there for more than 25 years. The community assistant was specifically trained to administer the HFSSM according to the guidelines outlined by Bickel *et al.*<sup>(26)</sup>. The authors were in regular contact with the community research assistant either in person or by telephone to discuss progress on data collection and to answer any questions that might come up related to the data collection. Surveys were periodically returned to the authors in batches as they were finished and were checked for completeness. The community assistant spoke Cree, which was helpful in the event that any of the survey respondents requested Cree translation. A map displaying each building in the community was used to identify eligible households. Households excluded from the study were those who were not able to be contacted following three attempts, those outside reserve property (off-reserve), as well as those designated as non-local school teachers'/staff and nurses' residences and visitor's housing. The map was also used by the community assistant as a recording tool to keep track of the homes that had been approached and those that had completed or refused to participate in the survey. One adult over the age of 18 years from each of the on-reserve FN homes in Fort Albany was approached in person by the community research assistant to participate in the study. Participants were provided with an information/recruitment letter when they were approached. The study was explained to them, the confidentiality of their participation and data assured, and they were invited to participate at a time and place convenient for them. Verbal informed consent was obtained from all participants, being culturally appropriate for the Western James Bay region for this type of project<sup>(25,27)</sup>. The verbal consent was formally recorded. The HFSSM was administered in accordance with the guide for using this tool<sup>(26)</sup>. Demographic characteristics

of the respondent and household as well as reasons for non-participation were also collected. Non-participants were asked to choose from five possible reasons for refusal, including: no interest in the survey, no time to participate, does not like research, does not like the questions or the option to specify another reason.

Following completion of the HFSSM questionnaire, each respondent was invited to comment on the relevance of the HFSSM as a tool to measure food security for FN communities and what could be added to improve its relevance to the FN on-reserve context. Based on input from our advisory committee for the larger project, two simple qualitative questions were developed to ask participants to provide feedback on the HFSSM. The questions were: (i) 'Does this survey measure food security for First Nations communities?' and (ii) 'Are there any aspects of food security for First Nations people that are missing from this survey?'. Participants were provided with a definition of food security to assist them if they were unfamiliar with the terminology. Responses to these questions were recorded in verbatim handwritten notes made by the research assistant.

### Data analysis

Categorizing and determining the food security status of households in Fort Albany followed the procedures outlined by Health Canada<sup>(11)</sup> for the analysis of the HFSSM from the 2004 CCHS. This allowed for direct comparisons with the prevalence of food insecurity in non-Aboriginal and off-reserve Aboriginal Canadians. Health Canada used three categories to describe the food security situation experienced by adults, children and households overall: (i) food secure; (ii) food insecure – moderate; and (iii) food insecure – severe. The food security status of an entire household (adults and children) was determined by the number of food-insecure conditions reported; more specifically, by the number of questions in the HFSSM that the respondent answered affirmatively on behalf of the household. Since the response options varied depending on the question, a response was considered affirmative if the respondent indicated: (i) 'yes'; (ii) 'often' or 'sometimes'; or (iii) 'almost every month' or 'some months but not every month'. To be considered 'food secure', no items, or only one item, in the adult or child scale was affirmed.

Initially, data were analysed separately for adults (using the ten adult-reference items in the HFSSM) and children (if present, using the eight child-referenced items in the HFSSM) in the household. Food security status of the entire household was then derived from the food security status of adults and of children (if present) in the household. For households without children, adult food security status equated to household food security status. The household was considered food secure if both adults and children in the household were categorized as food secure. However, if either adults or children, or both

adults and children were categorized as moderately food insecure (with neither severely food insecure), the household was considered moderately food insecure. If either adults or children were categorized as severely food insecure, then the household was considered severely food insecure<sup>(11)</sup>.

Considering the food security status separately for adults and children is an approach now used by Canada (although it is not the US standard method) because research has indicated that the relationship between the food security status of adults and children in the same households is highly contingent on the ages of the children<sup>(28)</sup>. In addition to following the current analytic approach used by Health Canada, another reason to calculate food security status this way was that this was the method used in the analysis of the baseline surveys from three isolated northern communities for the Canadian Food Mail Program Pilot Projects<sup>(29–31)</sup>.

Differences in selected sociodemographic characteristics for food-secure and food-insecure households were assessed using the  $\chi^2$  statistic. Further analysis was conducted using multiple logistic regression models. Data were analysed using the statistical software package Predictive Analytics SoftWare (PASW) version 18. Statistical tests were considered significant when *P* values were <0.05. Thematic data analysis was carried out to evaluate and interpret the comments made by participants for the two qualitative questions.

Permission to conduct the study was obtained from Fort Albany First Nation (the locally elected government). The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving participants were approved by the Office of Research Ethics at the University of Waterloo.

### Results

Of the seventy-six eligible households contacted from June 2009 to January 2011, sixty-six individuals/households agreed to participate in the study, resulting in a response rate of 86.8%. Two individuals chose to provide demographic information but did not complete all HFSSM questions and thus were excluded from the analysis. Non-participants (*n* 10) were asked their reason for refusal and all said they were not interested in the survey.

Table 1 shows the sociodemographic characteristics for respondents and households. More than one-third of respondents had elementary school as their highest level of education and nearly one-third had social assistance as their main source of income. Of those households with children (*n* 50, 78.1%), nearly one-third had three or more children under the age of 18 years. Almost half of households had two families living under the same roof with an average of 4.5 people living in each home. Many homes were multi-generational with extended family or

**Table 1** Sociodemographic characteristics of respondents and households (n 64) in Fort Albany, an on-reserve First Nations community, sub-Arctic Ontario, Canada, 2009–2011

Sociodemographic variable	Value	
	<i>n</i>	%
<b>Respondent</b>		
<b>Sex</b>		
Male	34	53.0
Female	30	47.0
<b>Highest level of education</b>		
Elementary graduate or less	22	34.4
Secondary graduate or some secondary	24	37.5
Post-secondary graduate or some post-secondary	18	28.1
<b>Main income source</b>		
Salary/wages	44	68.8
Social assistance or other*	20	31.2
<b>Household</b>		
<b>Household type</b>		
Couple with children	41	64.1
Couple, no children†	10	15.6
Lone parent‡	9	14.1
Other§	4	6.2
<b>Children aged &lt;18 years living in household</b>		
None	14	21.9
1 or 2	31	48.4
3+	19	29.7
<b>Number of families   living in household</b>		
1	33	51.6
2	31	48.4
	<b>Mean</b>	<b>Range</b>
Age (years)	43.6	26–63
Number of people living in household	4.5	1–10
Number of children aged <18 years in household¶	2.6	1–8

\*Respondents could choose other sources of income, including worker's compensation/employment insurance, pension/senior's benefits or any other source (e.g. alimony, child tax benefits, etc.); however, all respondents without a main income source from salary/wages chose social assistance.

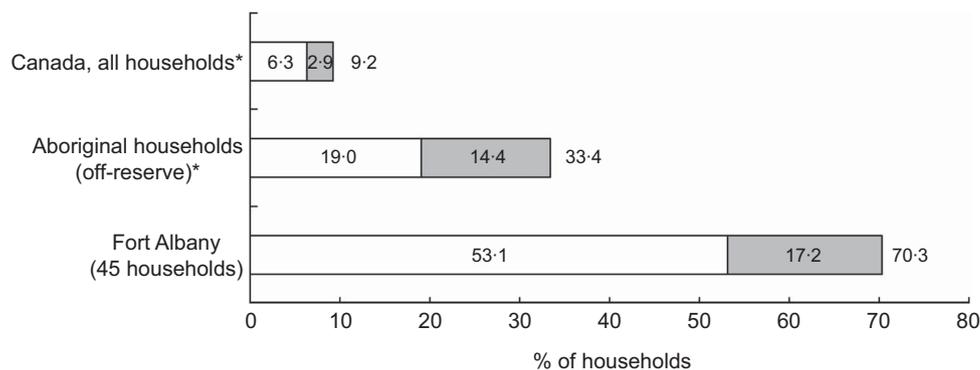
†Includes couples living alone or those with children aged >18 years.

‡Includes lone parents living with at least one child aged <18 years.

§Includes unattached individuals not living with any children aged <18 years.

||A 'family' was defined according to the Statistics Canada definition for Census Family<sup>(48)</sup>.

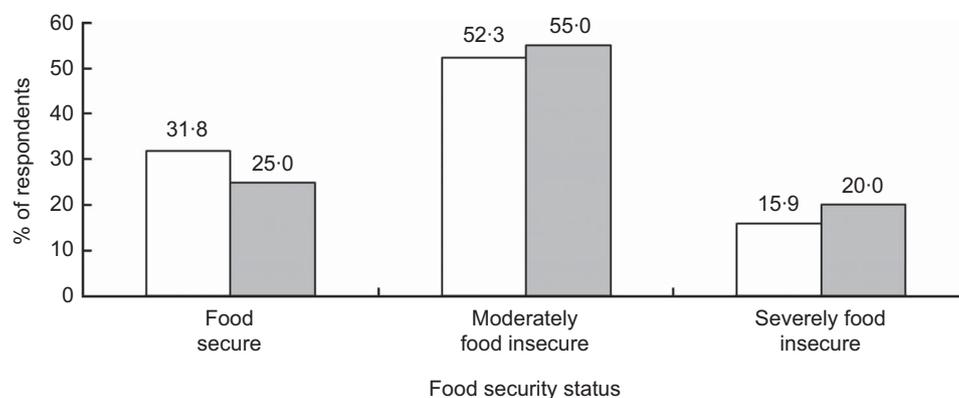
¶Of those households with children.



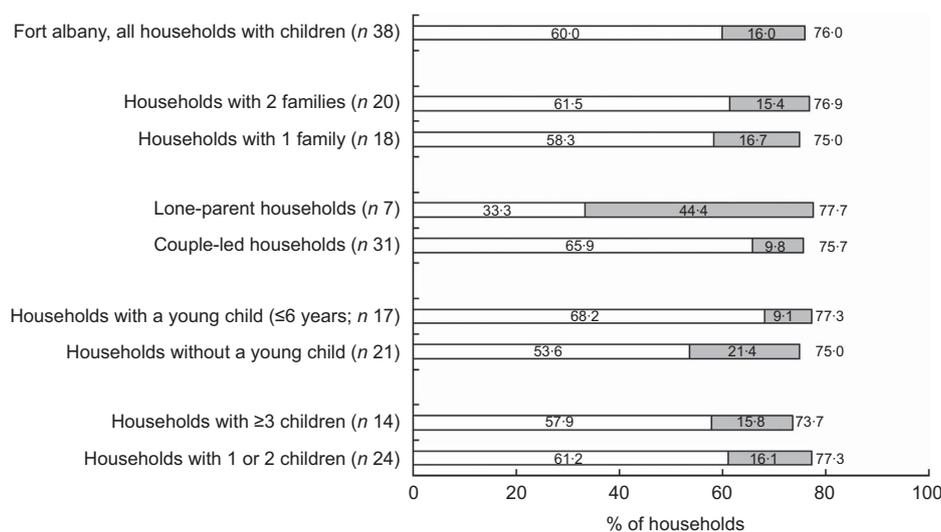
**Fig. 1** Household food security status (□, moderately food insecure; ■, severely food insecure) from the Canadian Community Health Survey, Cycle 2:2 Nutrition (2004) and in Fort Albany, an on-reserve First Nations community, sub-Arctic Ontario, Canada, 2009–2011. \*Source: Health Canada (2007)<sup>(11)</sup>

multiple families living together, leading to overcrowding. The prevalence of food insecurity among Fort Albany households was 70.3%, with 53.1% moderately food insecure and 17.2% severely food insecure, more than double the prevalence of food insecurity in off-reserve Aboriginal households in Canada (see Fig. 1).

There were no statistically significant differences between food-secure and food-insecure households for any of the selected sociodemographic characteristics in the present study from analyses using either the  $\chi^2$  statistic or logistic regression. When social assistance was their main source of income, 75.0% of households experienced



**Fig. 2** Food security status of households by main income source (□, salary/wages; ■, social assistance) of the respondent (*n* 64) in Fort Albany, an on-reserve First Nations community, sub-Arctic Ontario, Canada, 2009–2011



**Fig. 3** Percentage of food insecure (□, moderately food insecure; ■, severely food insecure) households with children by selected characteristics (*n* 38) in Fort Albany, an on-reserve First Nations community, sub-Arctic Ontario, Canada, 2009–2011

food insecurity compared with 68.2% of households with a salary or wage earner ( $P=0.58$ , Fig. 2). The overall prevalence of food insecurity appeared higher in households with children (thirty-eight of fifty households, 76.0%) than in those without children (seven of fourteen households, 50.0%), but was not significant. For food insecurity in households with children, households with two families compared with one family ( $P=0.51$ ), lone-parent households compared with couple-led households ( $P=0.58$ ), those with at least one young child aged ≤6 years compared with those having no young children ( $P=0.89$ ) and those with three or more children compared with those with two children or fewer ( $P=0.51$ ) are depicted in Fig. 3; however, comparisons were not significantly different.

Among respondents from homes rated as having severe food insecurity, all eleven (100.0%) gave affirmative responses (i.e. often, sometimes or yes) to the first three questions regarding worry that food would run out, times

when food didn't last and there wasn't money to buy more and times when they couldn't afford to eat balanced meals (Table 2) and nearly all respondents (91.2%, 88.2% and 91.2%, respectively) from moderately food-insecure homes also responded affirmatively to these questions. Among all Fort Albany respondents, 10.9% affirmatively answered the question 'In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?', with nearly two-thirds (63.6%) of respondents from severely food-insecure homes answering this question affirmatively.

Forty-one of the sixty-six participants chose to respond to the two qualitative questions. The most common reason participants did not want to participate in the open-ended questions was respondent fatigue. Of those forty-one respondents, 73% indicated that the HFSSM did not measure food security for FN communities. Moreover, respondents felt the HFSSM did not incorporate some of the determinants of food insecurity specific to northern

**Table 2** Prevalence of affirmative responses to questions about food insecurity: Fort Albany (an on-reserve First Nations community, sub-Arctic Ontario, Canada, 2009–2011), International Polar Year Inuit Health Survey and Canadian Community Health Survey (CCHS), Cycle 2·2 data

Questions*† 'In the past 12 months...'	Number and/or prevalence of affirmative responses									
	Fort Albany								International Polar Year Inuit Health Survey <sup>(4)</sup>	CCHS, Cycle 2·2 <sup>(11)</sup>
	Food-secure households (n 19)		Moderately food-insecure households (n 34)		Severely food-insecure households (n 11)		All respondents (n 64)		All respondents (n 2595)	All respondents (n 33 346)‡
	n	%	n	%	n	%	n	%	%	%
<b>Adult</b>										
1. You and other household members worried that food would run out before you got money to buy more	3	15·8	31	91·2	11	100·0	45	70·3	61·1	10·0
2. The food that you and other household members bought just didn't last, and there wasn't any money to get more	0	–	30	88·2	11	100·0	41	64·1	59·7	7·7
3. You and other household members couldn't afford to eat balanced meals‡	1	5·3	31	91·2	11	100·0	43	67·2	50·0	8·4
4. You or other adults in your household ever cut size of meals or skipped meals	0	–	1	2·9	8	72·7	9	14·1	31·2	4·3
5. How often did this happen?	0	–	1	2·9	8	72·7	9	14·1	–	3·3
6. You (personally) ever ate less than you felt you should	0	–	6	17·6	8	72·7	14	21·9	32·4	4·6
7. You (personally) were ever hungry but did not eat	0	–	1	2·9	6	54·5	7	10·9	24·5	2·6
8. You (personally) lost weight	0	–	1	2·9	7	63·6	6	9·4	18·2	1·6
9. You or other adults in your household ever did not eat for whole day	0	–	0	–	7	63·6	7	10·9	17·6	0·9
10. How often did this happen?	0	–	1	2·9	6	54·5	7	10·9	–	0·8
<b>Child</b>										
11. You or other adults in your household relied on only a few kinds of low-cost food to feed the children	0	–	27	79·4	9	81·8	36	56·3	57·5	2·8
12. You or other adults in your household couldn't feed children a balanced meal‡	0	–	23	67·6	7	63·6	30	46·9	48·5	1·9
13. The children were not eating enough	0	–	14	41·2	6	54·5	20	31·3	40·4	0·8
14. You or other adults in your household ever cut the size of any of the children's meals	0	–	3	8·8	6	54·5	9	14·1	21·9	0·2
15. Were any of the children ever hungry?	0	–	1	2·9	6	54·5	7	10·9	23·1	0·2
16. Did any of the children ever skip meals?	0	–	1	2·9	6	54·5	7	10·9	19·3	0·1§
17. How often did this happen?	0	–	1	2·9	6	54·5	7	10·9	–	0·1§
18. Did any of the children ever not eat for a whole day?	0	–	0	–	4	36·4	4	6·3	13·1	

\*The wording of each question as presented to the respondent included explicit reference to resource limitation (e.g. '...because there wasn't enough money for food').

†'Yes', 'Often true' and 'Sometimes true' were considered affirmative responses, with the exception of questions 5, 10 and 17, where 'Almost every month' and 'Some months but not every month' were considered affirmative responses. Data from the International Polar Year Inuit Health Study were not included for questions 5, 10 and 17 because it also included '1–2 months' as an affirmative response.

‡For these questions, the term 'balanced meal' was changed to 'healthy meal' for the International Polar Year Inuit Health Survey.

§Statistics Canada suggests that these data be interpreted with caution.

||These data were suppressed due to a cell size <30.

FN households that were important to understand context, such as the extremely high cost of market food, the high cost of living and the reduced availability of healthy foods. In the words of one participant: 'Living in the north ... we don't always get the right foods, meaning vegetables, fruits, and dairy products within our store. Food expense is a very high cost when shopping at our local stores. The meats are not very selective here because we don't know when the shipments arrive ... by the time we know most of the meat is outdated. So, I think that we are limited here' (interview #34). They also felt that traditional foods should be incorporated into measures of food security for northern FN populations as these foods are essential to capturing a more comprehensive picture of northern food security. They spoke about the poor accessibility of traditional foods, especially for households without an active hunter or those households without relatives who were able to share wild meat. They also discussed their experiences with climate change and its effect on hunting yields and remarked that hunting is often very expensive and does not ensure food. One participant remarked: 'Wild food is missing [from the survey]. Many people still use wild food to survive here and it costs less [than food bought at the store] ... but it's still expensive to hunt, you pay for food, gas, a tent, ammunition...' (interview #39).

## Discussion

High levels of food insecurity for Canadian Aboriginal people have been reported by a number of studies; however, until recently there have been very few data for FN populations living in on-reserve communities. Results from the present study showed a high prevalence of food insecurity overall for on-reserve Fort Albany FN households (70.3%), more than double the prevalence for off-reserve Aboriginal Canadian households (33.4%) and more than seven times the rate of food insecurity for Canadian households (9.2%) using the same survey questions and scoring system<sup>(11)</sup>. The prevalence of food insecurity in Fort Albany was similar to that in the region from the Inuit Health Survey with the highest prevalence of food insecurity (Nunavut, 68.8%), although a larger proportion of households in Nunavut were severely (34.1%) rather than moderately (34.6%) food insecure compared with Fort Albany (17.2% severely and 53.1% moderately food insecure)<sup>(4)</sup>. Similarly to Fort Albany, communities in Nunavut are geographically isolated and face significant challenges in accessing adequate, safe and nutritious food<sup>(32)</sup>. The rate of child food insecurity reported in Nunavut was 56.5%<sup>(4)</sup>. A study in northern Manitoba found that 58% of households with children experienced food insecurity<sup>(33)</sup>. Hence, there is an extremely high rate (76.0%) of food insecurity in Fort Albany households with children. The most severe state

of food insecurity – hunger – was reported by more than one in ten Fort Albany respondents.

Willows and colleagues<sup>(6)</sup> found the prevalence of sociodemographic risk factors for household food insecurity to be higher for off-reserve Aboriginal Canadians than non-Aboriginal households. These risk factors included households with three or more children, lone-parent households, households with lower educational attainment, and households having income from sources other than wages or salaries<sup>(6)</sup>. The current study did not find statistically significant differences for selected sociodemographic characteristics between food-secure and food-insecure households. Community-specific data are important to the Fort Albany community, reflected in the high degree of participation in the present study. Nevertheless, the numbers do not support the power needed to identify associations and confirm that findings seen in broader samples have relevance also to this community. There are a few other possible reasons why the sociodemographic variables examined did not appear to be associated with food security status. The overall prevalence of food insecurity was very high and it is possible that the problem is so pervasive at a system level that varying sociodemographic characteristics do not make a difference for food security at the individual or household level. Also, the HFSSM is an income-based measure that does not capture the very limited access to food in remote northern communities, nor does the HFSSM incorporate the contextual factors of food systems for FN populations.

Although the present study lacked the power for subgroup analysis, the directions of the findings seemed to agree with results from the CCHS, Cycle 2.2 (2004)<sup>(11)</sup> and the Inuit Health Survey<sup>(4,34)</sup>. Results from the Inuit Health Survey specifically point to interrelated themes between inadequate nutrition, food insecurity and poor housing conditions<sup>(35)</sup>. Data from the RHS<sup>(12)</sup> indicate an association between food security and a healthy diet; the majority (61.1%) of FN adults who were food secure reported always or almost always eating a nutritious diet while the majority of those who were food insecure rarely or never did. The causes of food insecurity in Fort Albany are complex and likely the result of a myriad of interconnected factors. These factors may include the following: nearly half of the homes in Fort Albany having two families living in the same dwelling (current study); grocery store food prices that could be two to three times higher than in southern urban cities<sup>(20)</sup>; concerns about environmental contaminants and game meat consumption in children and youth<sup>(36)</sup>; and a lack of road access. Thompson and colleagues<sup>(33)</sup> found that communities in northern Manitoba without road access had higher levels of food insecurity than those that did.

Although the results of the current study represent data from only one community, the response rate was very high (86.8%) and the use of the full eighteen-item HFSSM allowed for comparison with existing data from other

recent food security studies. The RHS used only nine of the eighteen food security questions from the HFSSM<sup>(12)</sup>. Data on food security from the FNFNES, which used the full eighteen-item HFSSM questions, are only beginning to be released from Western Canada, with timelines for regional reports from Ontario data to be released in 2014<sup>(21)</sup>.

Food security research in the Canadian Arctic appears to be expanding<sup>(37–39)</sup>, with many recent publications from the International Polar Year Inuit Health Survey<sup>(1,4,34,35)</sup> and other food security studies<sup>(40–42)</sup>, while research with on-reserve FN populations is lacking<sup>(2)</sup> and only beginning to be conducted and reported. Collecting data with isolated communities is not without merit as each reserve has unique characteristics and many want local information to direct local policies and programmes<sup>(43–45)</sup>.

While the eighteen-item HFSSM is currently the best available tool for measuring income-based food insecurity at the household level, the limitations for its use with Canadian Aboriginal populations must be acknowledged. The HFSSM has not been validated in Canadian Aboriginal populations and it has been recommended that food security assessment tools for this population need to consider languages, cultural perceptions, unique life experiences and traditional food attributes<sup>(3,5,46,47)</sup>. Respondents from the present study indicated that the HFSSM could be more relevant to northern FN populations if it included questions pertaining to traditional food as well as addressing the high costs and poor accessibility of both market and traditional foods in northern communities.

Recommendations for further research include collecting in-depth information on the experience of food insecurity for remote FN populations. This information, along with data from the current study, could be used to create a food security measurement tool that is better able to capture the context of northern food systems and to address relevant food security issues in on-reserve FN households and communities.

## Conclusions

A very high prevalence of food insecurity was reported in Fort Albany households with even higher levels of food insecurity among those households with children. On-reserve remote FN communities may be more susceptible to food insecurity than off-reserve Aboriginal populations and require special attention towards initiatives that promote food security. Traditional food attributes should be incorporated into food security measurement tools for FN populations.

## Acknowledgements

*Sources of funding:* This study was funded by the Canadian Institutes of Health Research, the Social Sciences and

Humanities Research Council and the Canadian Foundation for Dietetic Research. The lead author was supported by a Doctoral Research Award from the Canadian Institutes of Health Research. *Conflicts of interest:* The authors have no conflicts of interest. *Authors' contributions:* K.S. developed the study design, conducted the statistical analyses and wrote the manuscript drafts; R.M.H. and L.J.S.T. guided the study design and provided input on manuscript drafts. *Acknowledgements:* The authors are grateful to all of the participants, the Fort Albany First Nation and the local community research assistant who collected the survey data.

## References

1. Egeland GM, Pace A, Cao Z *et al.* (2010) Food insecurity among Inuit pre-schoolers: Nunavut Inuit Child Health Survey, 2007–2008. *CMAJ* **182**, 243–248.
2. Power E (2007) *Food Security for First Nations and Inuit in Canada – Background Paper*. Ottawa: First Nations and Inuit Health Branch, Health Canada.
3. Power E (2008) Conceptualizing food security for Aboriginal people in Canada. *Can J Public Health* **99**, 95–97.
4. Rosol R, Huet C, Wood M *et al.* (2011) Prevalence of affirmative responses to questions of food insecurity: International Polar Year Inuit Health Survey, 2007–2008. *Int J Circumpolar Health* **70**, 488–497.
5. Willows ND (2005) Determinants of healthy eating in aboriginal peoples in Canada. *Can J Public Health* **96**, Suppl. 3, S32–S36.
6. Willows ND, Veugelers P, Raine K *et al.* (2008) Prevalence and sociodemographic risk factors related to household food security in Aboriginal peoples in Canada. *Public Health Nutr* **12**, 1150–1156.
7. Willows ND, Veugelers P, Raine K *et al.* (2011) Associations between household food insecurity and health outcomes in the Aboriginal population (excluding reserves). *Health Rep* **22**, 15–20.
8. McAmmond D (2000) *Food and Nutrition Surveillance in Canada: An Environmental Scan*. Ottawa: Health Canada; available at [http://www.hc-sc.gc.ca/fn-an/surveill/environmental\\_scan\\_e.html](http://www.hc-sc.gc.ca/fn-an/surveill/environmental_scan_e.html)
9. Ledrou I & Gervais J (2005) Food insecurity. *Health Rep* **16**, 47–51.
10. Agriculture and Agri-Food Canada (2006) *Canada's Fourth Progress Report on Food Security*. Ottawa: Government of Canada; available at [http://www.agr.gc.ca/misb/fsec-seca/pdf/report-rapport\\_4\\_e.pdf](http://www.agr.gc.ca/misb/fsec-seca/pdf/report-rapport_4_e.pdf)
11. Health Canada (2007) *Canadian Community Health Survey, Cycle 2.2, Nutrition (2004) – Income-Related Household Food Security in Canada*. Ottawa: Health Canada; available at [http://www.hc-sc.gc.ca/fn-an/alt\\_formats/hpfb-dgpsa/pdf/surveill/income\\_food\\_sec-sec\\_alim\\_e.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/surveill/income_food_sec-sec_alim_e.pdf)
12. The First Nations Information Governance Centre (2012) *First Nations Regional Health Survey (RHS) Phase 2 (2008/10) National Report on Adults, Youth and Children Living in First Nations Communities*. Ottawa: The First Nations Information Governance Centre.
13. Che J & Chen J (2001) Food insecurity in Canadian households. *Health Rep* **12**, 11–22.
14. Rideout K (2005) Canada's food system: does it exclude our most vulnerable people? *SPARC BC* **22**, 8–10.
15. Ford JD (2009) Vulnerability of Inuit food systems to food insecurity as a consequence of climate change: a case study from Igloolik, Nunavut. *Region Environ Change* **9**, 83–100.

16. Furgal C & Seguin J (2006) Climate change, health, and vulnerability in Canadian northern aboriginal communities. *Environ Health Perspect* **114**, 1964–1970.
17. Guyot M, Dickson C, Paci C *et al.* (2006) Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities. *Int J Circumpolar Health* **65**, 403–415.
18. Hori Y, Tam B, Gough WA *et al.* (2012) Use of traditional environmental knowledge to assess the impact of climate change on subsistence fishing in the James Bay Region of Northern Ontario, Canada. *Rural Remote Health* **12**, 1878.
19. Tam B, Gough WA & Tsuji L (2011) The impact of warming on the appearance of furunculosis in the fish of the James Bay region, Quebec, Canada. *Region Environ Change* **11**, 123–132.
20. Gates A, Hanning RM, Gates M *et al.* (2012) Vegetable and fruit intakes of on-reserve First Nations schoolchildren compared to Canadian averages and current recommendations. *Int J Environ Res Public Health* **9**, 1379–1397.
21. First Nations Food, Nutrition and Environment Study (2012) *First Nations Food, Nutrition and Environment Study*. British Columbia: University of British Columbia; available at <http://www.fnfnes.ca/>
22. Skinner K, Hanning RM, Metatawabin J *et al.* (2012) Impact of a school snack program on the dietary intake of grade six to ten First Nations students living in a remote community in northern Ontario, Canada. *Rural Remote Health* **12**, 2122.
23. Skinner K, Hanning RM, Sutherland C *et al.* (2012) Using a SWOT analysis to inform healthy eating and physical activity strategies for a remote First Nations community in Canada. *Am J Health Promot* **26**, e159–e170.
24. Tsuji LJS & Nieboer E (1999) A question of sustainability in Cree harvesting practices: the seasons, technological and cultural changes in the western James Bay region of northern Ontario, Canada. *Can J Native Stud* **19**, 169–192.
25. Skinner K, Hanning RM & Tsuji LJ (2006) Barriers and supports for healthy eating and physical activity for First Nation youths in northern Canada. *Int J Circumpolar Health* **65**, 148–161.
26. Bickel G, Nord M, Price C *et al.* (2000) *Guide to Measuring Household Food Security, Revised 2000*. Alexandria, VA: Food and Nutrition Service, US Department of Agriculture; available at <http://www.fns.usda.gov/fsec/files/fsguide.pdf>
27. Kirby AM, Levesque L, Wabano V *et al.* (2007) Perceived community environment and physical activity involvement in a northern-rural Aboriginal community. *Int J Behav Nutr Phys Act* **4**, 63.
28. Nord M & Bickel G (2002) *Measuring Children's Food Security in US Households, 1995–99. Food Assistance and Nutrition Research Report* no. 25. Washington, DC: Economic Research Service, US Department of Agriculture; available at <http://purl.umn.edu/33801>
29. Indian and Northern Affairs Canada (2003) *Nutrition and Food Security in Kugaaruk, Nunavut*. Ottawa: Minister of Public Works and Government Services Canada; available at <http://dsp-psd.pwgsc.gc.ca/Collection/R2-265-2003E.pdf>
30. Indian and Northern Affairs Canada (2004) *Nutrition and Food Security in Fort Severn, Ontario*. Ottawa: Minister of Public Works and Government Services Canada; available at <http://dsp-psd.pwgsc.gc.ca/Collection/R2-350-2004E.pdf>
31. Indian and Northern Affairs Canada (2004) *Nutrition and Food Security in Kangiqsujuaq, Nunavik*. Ottawa: Minister of Public Works and Government Services Canada; available at [http://epub.sub.uni-hamburg.de/epub/volltexte/2009/1058/pdf/kangrep04\\_e.pdf](http://epub.sub.uni-hamburg.de/epub/volltexte/2009/1058/pdf/kangrep04_e.pdf)
32. Boulton DA (2004) *Hunger in the Arctic: Food (In)Security in Inuit Communities*. Ottawa: National Aboriginal Health Organization; available at [http://www.naho.ca/documents/it/2004\\_Inuit\\_Food\\_Security.pdf](http://www.naho.ca/documents/it/2004_Inuit_Food_Security.pdf)
33. Thompson S & Mailman M (2010) *Lack of Healthy Food in the Midst of Plenty: The Food Security Crisis in Northern Manitoba*. Winnipeg: University of Manitoba; available at [http://home.cc.umanitoba.ca/~thomps04/northern\\_communities.html](http://home.cc.umanitoba.ca/~thomps04/northern_communities.html)
34. Huet C, Rosol R & Egeland GM (2012) The prevalence of food insecurity is high and the diet quality poor in Inuit communities. *J Nutr* **142**, 541–547.
35. Egeland GM, Johnson-Down L, Cao ZR *et al.* (2011) Food insecurity and nutrition transition combine to affect nutrient intakes in Canadian Arctic communities. *J Nutr* **141**, 1746–1753.
36. Hlimi T, Skinner K, Hanning RM *et al.* (2012) Traditional food consumption behaviour and concern with environmental contaminants among Cree schoolchildren of the Mushkegowuk Territory. *Int J Circumpolar Health* **71**, 17344.
37. Chan HM, Fediuk K, Hamilton S *et al.* (2006) Food security in Nunavut, Canada: barriers and recommendations. *Int J Circumpolar Health* **65**, 416–431.
38. Duhaime G & Godmaire A (2002) The conditions of sustainable food security: an integrated conceptual framework. In: *Sustainable Food Security in the Arctic: State of Knowledge*, pp. 15–45 [G Duhaime, editor]. Edmonton: Canadian Circumpolar Institute, University of Alberta, in cooperation with the Groupe d'études inuit et circumpolaires, Laval University.
39. Lambden J, Receveur O, Marshall J *et al.* (2006) Traditional and market food access in Arctic Canada is affected by economic factors. *Int J Circumpolar Health* **65**, 331–340.
40. Beaumier MC & Ford JD (2010) Food insecurity among Inuit women exacerbated by socioeconomic stresses and climate change. *Can J Public Health* **101**, 196–201.
41. Ford JD & Beaumier M (2011) Feeding the family during times of stress: experience and determinants of food insecurity in an Inuit community. *Geogr J* **177**, 44–61.
42. Lardeau M-P, Healey G & Ford J (2011) The use of Photovoice to document and characterize the food security of users of community food programs in Iqaluit, Nunavut. *Rural Remote Health* **11**, 1680.
43. Ho LS, Gittelsohn J, Harris SB *et al.* (2006) Development of an integrated diabetes prevention program with First Nations in Canada. *Health Promot Int* **21**, 88–97.
44. Newbold KB (1997) Aboriginal physician use in Canada: location, orientation and identity. *Health Econ* **6**, 197–207.
45. Vastine A, Gittelsohn J, Ethelbah B *et al.* (2005) Formative research and stakeholder participation in intervention development. *Am J Health Behav* **29**, 57–69.
46. Lambden J, Receveur O & Kuhnlein HV (2007) Traditional food attributes must be included in studies of food security in the Canadian Arctic. *Int J Circumpolar Health* **66**, 308–319.
47. Tarasuk V (2001) *Discussion Paper on Household and Individual Food Insecurity*. Ottawa: Health Canada; available at [http://www.hc-sc.gc.ca/fn-an/nutrition/pol/food\\_sec\\_entire-sec\\_aliments\\_entier\\_e.html](http://www.hc-sc.gc.ca/fn-an/nutrition/pol/food_sec_entire-sec_aliments_entier_e.html)
48. Statistics Canada (2012) *Concept: Census Family*. Ottawa: Statistics Canada; available at <http://www.statcan.gc.ca/concepts/definitions/cfamily-rfamille-eng.htm>