

Electronic Thesis and Dissertation Repository

4-12-2017 12:00 AM

Indigenous Food Insecurity in Canada: An Analysis Using the 2012 Aboriginal Peoples Survey

Melissa Subnath, *The University of Western Ontario*

Supervisor: Dr. Piotr Wilk, *The University of Western Ontario*

A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Epidemiology and Biostatistics

© Melissa Subnath 2017

Follow this and additional works at: <https://ir.lib.uwo.ca/etd>



Part of the [Community Health Commons](#), and the [Epidemiology Commons](#)

Recommended Citation

Subnath, Melissa, "Indigenous Food Insecurity in Canada: An Analysis Using the 2012 Aboriginal Peoples Survey" (2017). *Electronic Thesis and Dissertation Repository*. 4459.

<https://ir.lib.uwo.ca/etd/4459>

This Dissertation/Thesis is brought to you for free and open access by Scholarship@Western. It has been accepted for inclusion in Electronic Thesis and Dissertation Repository by an authorized administrator of Scholarship@Western. For more information, please contact wlsadmin@uwo.ca.

Abstract

Background: Food insecurity in Canada's Indigenous population continues to be an urgent public health issue, as prevalence is much higher for Indigenous Canadians than non-Indigenous Canadians.

Objective: To examine the associations between social determinants of health, Indigenous-specific factors and food insecurity among off-reserve Indigenous adults aged 20 and older in Canada.

Methods: Data from the 2012 Aboriginal Peoples Survey were used in this analysis. A hierarchical logistic regression model was run to examine relationships between social determinants of health, Indigenous-specific factors and food insecurity.

Results: Younger age, Inuit identity, low income, educational attainment less than high school, lack of employment, household crowding, lone-parent households and having family members who attended residential schools were major risk factors for household food insecurity.

Conclusion: Food insecurity policies and initiatives should focus on the most vulnerable groups within the Indigenous population. Future research should address limitations of the current household food security measure.

Keywords

Indigenous health, Aboriginal Peoples Survey, food insecurity

Acknowledgments

I would like to express my deepest gratitude to my supervisor, Dr. Piotr Wilk, for his mentorship and support throughout my career as a graduate student. This thesis and the valuable skills gained during its process would not have been possible without his patience, advice and guidance. I would also like to thank my supervisory committee member, Dr. Evelyn Vingilis, for providing valuable feedback on the design and execution of this analysis.

I owe thanks to the members of the Research Data Centre at Western and the Department of Epidemiology and Statistics for their contributions to this project. This thesis would not have been possible without the encouragement and support of my family and friends. To Ryan, thank you for your endless support over the past year.

This study was supported by the Children's Health Research Institute Quality of Life Graduate Research Fellowship.

Table of Contents

Abstract	i
Acknowledgments.....	ii
Table of Contents	iii
List of Tables	vii
List of Figures	viii
List of Appendices	ix
List of Abbreviations	x
Chapter 1	1
1 Introduction and Objectives	1
1.1 What is Food Insecurity?	1
1.1.1 Implications of Food Insecurity	2
1.2 Indigenous Canadians	2
1.2.1 Indigenous Health	3
1.2.2 Integrated Life Course and Social Determinants Model of Aboriginal Health.....	4
1.3 Food Insecurity in the Canadian Indigenous Population	4
1.4 Study Rationale and Objectives	5
1.5 Thesis Overview	6
Chapter 2.....	7
2 Literature Review.....	7
2.1 Previous Studies on Indigenous Food Insecurity in Canada.....	7
2.1.1 Search Strategy and Study Selection	7
2.1.2 Study Population and Design.....	9
2.1.3 Prevalence of Food Insecurity	10

2.2	Measurement of Food Insecurity	11
2.3	Traditional Foods vs. Market Foods	14
2.4	Food Insecurity and Social Determinants of Health	16
2.4.1	Food Insecurity and Sex.....	16
2.4.2	Food Insecurity and Age.....	17
2.4.3	Food Insecurity and Indigenous Identity	18
2.4.4	Food Insecurity and Residential Schooling	18
2.4.5	Food Insecurity and Hunting	19
2.4.6	Food Insecurity and Income.....	20
2.4.7	Food Insecurity and Education	21
2.4.8	Food Insecurity and Employment.....	21
2.4.9	Food Insecurity and Household Type	22
2.4.10	Food Insecurity and Household Crowding	22
2.5	Gaps in Current Literature	23
Chapter 3	24
3	Methods.....	24
3.1	Data Source.....	24
3.1.1	Content of the APS	24
3.1.2	APS Sampling Design.....	25
3.1.3	Study Population.....	25
3.2	Measurement Instruments.....	26
3.2.1	Food Insecurity	26
3.2.2	Individual Characteristics	27
3.2.3	Indigenous-specific Determinants of Health	28
3.2.4	Social Determinants of Health.....	29
3.3	Statistical Considerations.....	33

3.3.1	Statistical Techniques	33
3.3.2	Sample Weights	33
3.3.3	Bootstrap Weights.....	34
3.3.4	Missing Data	34
3.3.5	Software	34
Chapter 4	35
4	Results	35
4.1	Description of Study Sample	35
4.2	Bivariate Associations	37
4.2.1	Sex and Food Insecurity.....	37
4.2.2	Age and Food Insecurity.....	38
4.2.3	Indigenous Identity and Food Insecurity	39
4.2.4	Residential Schooling and Food Insecurity	39
4.2.5	Hunting/Fishing/Trapping and Food Insecurity.....	40
4.2.6	Income and Food Insecurity.....	41
4.2.7	Education and Food Insecurity	42
4.2.8	Employment Status and Food Insecurity	43
4.2.9	Household Type and Food Insecurity	44
4.2.10	Household Crowding and Food Insecurity	44
4.3	Hierarchical Logistic Regression Model	45
Chapter 5	53
5	Discussion	53
5.1	Key Findings.....	53
5.2	Implications of Study Findings.....	55
5.3	Study Limitations.....	56
5.4	Summary and Conclusions	58

References.....	59
Appendices.....	69
Curriculum Vitae	84

List of Tables

Table 2.2.1: CCHS Classification of Food Security Status	13
Table 3.2.1: Study Variables.....	31
Table 4.2.1: Sex and food insecurity	38
Table 4.2.2: Age and food insecurity.....	38
Table 4.2.3: Indigenous identity and food insecurity	39
Table 4.2.4: Residential school attendance and food insecurity.....	40
Table 4.2.5: Hunting/fishing/trapping and food insecurity.....	41
Table 4.2.6: Income and food insecurity	42
Table 4.2.7: Education and food insecurity	43
Table 4.2.8: Employment and food insecurity.....	43
Table 4.2.9: Household type and food insecurity	44
Table 4.2.10: Household crowding and food insecurity.....	45
Table 4.3.1: Hierarchical Logistic Regression Model	48

List of Figures

Figure 1: PRISMA Flow Diagram of Study Selection 8

List of Appendices

Appendix A: US Household Food Security Survey Module

Appendix B: Summary of previous studies on determinants of food insecurity in Canadian Indigenous populations

List of Abbreviations

APS Aboriginal Peoples Survey

CAPI Computer Assisted Personal Interviews

CATI Computer Assisted Telephone Interviews

CCHS Canadian Community Health Survey

CPS Current Population Survey

CI Confidence Interval

df degrees of freedom

FAO Food and Agriculture Organization

HFSSM Household Food Security Survey Module

ILCSDAH Integrated Life Course and Social Determinants Model of Aboriginal Health

INAC Indian and Northern Affairs Canada

NHS National Household Survey

OR Odds Ratio

PRISMA Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SE Standard Error

USDA United States Department of Agriculture

Chapter 1

1 Introduction and Objectives

This chapter explains the concept of food insecurity, provides background on Canada's Indigenous population, discusses the issue of Indigenous food insecurity, outlines the study objectives and presents an overview of the remainder of the thesis.

1.1 What is Food Insecurity?

The concept of food security emerged during the 1980s and was used as a tool for understanding and addressing food access problems at the household level (Cook, 2002). The definition of food security has evolved over time and continues to be flexible, reflecting changes in the understanding of policy issues. According to the Food and Agriculture Organization (FAO), "*Food security* [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002, p. 28). This widely accepted definition is based on four pillars, access, availability, utilization and stability (FAO, 2005): 1) access refers to both physical and economic access to food, reflecting issues such as income, purchasing power and transportation; 2) food availability refers to having an adequate supply of food through domestic production or imports; 3) utilization of food relates to food safety, sanitation, clean water and adequate diet; and 4) stability takes into account issues such as economic crises and weather variability which may limit an individual's access to safe and nutritious food (FAO Agriculture and Development Economics Division, 2006). *Household food insecurity* exists when individuals within a household do not have sufficient physical, social or economic access to food. Households at risk for food insecurity tend to fall into one of three groups: 1) those which would be vulnerable under any circumstance (e.g. adults with disability or illness); 2) those which would have difficulty adapting to sudden social or economic shocks (e.g. surge in food pricing); and 3) those whose resource endowment is inadequate to provide sufficient income from any available source (FAO, 2003).

1.1.1 Implications of Food Insecurity

Food insecurity is considered a public health concern in Canada. Several studies have found that food insecurity is linked to overweight and obesity in low-income populations (Cook, 2002; Tanumihardjo, 2007). This paradoxical relationship between food insecurity and obesity is due to poor diet quality. Many low-income individuals have adequate caloric intake to meet their daily energy requirements but lack healthy quality foods in their diet, often purchasing low-cost, energy dense foods which contain added sugars and fat (Drewnowski & Specter, 2004; Tanumihardjo, 2007). Obesity is linked to several chronic health problems, including coronary heart disease, high blood pressure, stroke, type 2 diabetes, metabolic syndrome, cancer, osteoarthritis, sleep apnea and reproductive problems (National Heart Lung and Blood Institute, 2012). Food insecurity has also been shown to have negative consequences on children's development. In a study of Inuit children, Pirkle et al. (2014) found that food-insecure children had slower linear growth and that iron-related nutritional deficiencies were more common in food insecure children. Beyond factors related to poor nutrition and food deprivation, food insecurity also poses a threat to social and psychological well-being (Tarasuk, 2001). Thus, reducing household food insecurity should lead to improved outcomes in associated health conditions.

1.2 Indigenous Canadians

Indigenous Canadians, the original inhabitants of Canada, have a rich history which remains important to this day (Indigenous and Northern Affairs Canada, 2014). The Canadian constitution recognizes three groups of Indigenous people: First Nations, Métis and Inuit (Aboriginal Affairs and Northern Development Canada (AANDC), 2011). Each Indigenous group has a unique set of traditions, history, culture and way of life (Statistics Canada, 2011a). According to the 2011 National Household Survey (NHS), approximately 1.4 million people reported having Indigenous identity, 4.3% of the Canadian population (Statistics Canada, 2011a). Among the Indigenous population, 60.8% identified themselves as First Nations, 32.3% identified as Métis, 4.2% identified as Inuit and 2.7% reported multiple or other Indigenous identities (Statistics Canada,

2011a). First Nations, who are registered under the Indian Act (approximately 75% of all First Nations in 2006), are considered “Status Indians” and are entitled to a variety of government programs and services (Statistics Canada, 2011a). First Nations reserves are tracts of land set aside under the Indian Act, including Indian reserves, Indian settlements and land types created by the approval of Self-Government Agreements (Indigenous and Northern Affairs Canada, 2013). According to the 2011 NHS, 37.6% of First Nations people lived on-reserve and 62.4% lived off-reserve (Statistics Canada, 2011a). Of those First Nations people who lived on-reserve, 98.2% had registered Indian status, while 60.8% of the off-reserve First Nations population had registered Indian status (Statistics Canada, 2011a). Compared to First Nations off-reserve, First Nations people who live on-reserve were more likely to live in crowded conditions (27% vs. 7%) and more likely to live in a home in need of major repairs (43% vs. 15%) (Statistics Canada, 2015b). The Canadian Indigenous population is relatively young. Youth aged 24 and younger represent approximately 46.2% of the total Indigenous population, compared to non-Indigenous youth accounting for 29.4% of the total non-Indigenous population (Statistics Canada, 2011a). While 80% of Indigenous people live in Ontario, British Columbia, Alberta, Saskatchewan and Manitoba, Indigenous peoples represent the majority of the population in Nunavut and the Northwest Territories (Statistics Canada, 2011a). These statistics are useful to consider when studying Indigenous populations.

1.2.1 Indigenous Health

Compared to non-Indigenous adults, First Nations, Métis and Inuit adults exhibit poorer health status, partially due to lower socioeconomic status (Garner, 2010). Indigenous peoples in Canada experience higher rates of heart disease, diabetes, tuberculosis, HIV/AIDS and other diseases (J. Reading, 2009). First Nations, Métis and Inuit people also have higher infant mortality rates, higher suicide rates and lower life expectancy, compared to non-Indigenous Canadians (J. Reading, 2009). These poor health outcomes have been linked to poverty, lack of adequate housing and low socioeconomic status, however, it is thought that socio-economic disadvantage in the Indigenous population is the result of both direct and indirect effects of the historic policies of colonization (First Nations Centre, 2005; King, 2006; J. Reading, 2009).

1.2.2 Integrated Life Course and Social Determinants Model of Aboriginal Health

Proposed by C. L. Reading and Wien (2009), the Integrated Life Course and Social Determinants Model of Aboriginal Health (ILCSDAH) is a conceptual framework used to understand relationships between social determinants, socio-political contexts, life stages and health dimensions from an Indigenous perspective. The model recognizes three categories of social determinants of health: proximal, intermediate and distal; and four dimensions of health: physical, spiritual, emotional and mental. According to the ILCSDAH, proximal determinants of health are factors which have a direct impact on any dimension of health. They include health behaviours (e.g., poor diet, smoking and misuse of alcohol), the physical environment (e.g., food insecurity, household overcrowding and having a home in need of repairs) and the social environment (e.g., education, employment and income) (C. L. Reading & Wien, 2009). Intermediate determinants of health in the model are thought to have an influence on proximal determinants. They can include factors involving community infrastructure, resources, systems and capacities. Distal determinants of health in the ILCSDAH represent historic, political, social and economic contexts, and as such affect both proximal and intermediate determinants of health (C. L. Reading & Wien, 2009). For example, colonialism, which has been described as the invasion, dispossession and subjugation of a peoples, is thought to have a major impact on Indigenous health due to the inequalities, disadvantage and trauma it created (LaRocque, 2014). Using the ILCSDAH allows researchers to incorporate Indigenous concepts and ideologies into the exploration of pathways that influence Indigenous health.

1.3 Food Insecurity in the Canadian Indigenous Population

Food insecurity in Canada's Indigenous population continues to be an urgent public health issue as prevalence is much higher for Indigenous people than non-Indigenous groups (Power, 2008; Willows, Veugelers, Raine, & Kuhle, 2009). Data from the 2012 Canadian Community Health Survey (CCHS) revealed that 28.2% of off-reserve Indigenous households experienced some form of food insecurity in the past year,

compared to the national average of 12.6% for that year (Tarasuk, Mitchell, & Dachner, 2012). The 2007-2008 International Polar Year Inuit Survey revealed that Inuit in Nunavut had the highest food insecurity rate for any Indigenous population living in a developed country (Council of Canadian Academies, 2014). The information provided by surveys assessing health and socio-demographic characteristics, such as the Aboriginal Peoples Survey (APS), has identified Indigenous identity as a key marker of vulnerability to food insecurity (Kirkpatrick & Tarasuk, 2008). Past research has also shown that Indigenous groups have greater prevalence of sociodemographic risk factors for food insecurity, such as low educational attainment and low income, as well as risk factors related to food access, purchasing and eating behavior (Willows et al., 2009). The lingering effects of colonialism have affected food insecurity in Indigenous populations through issues such as residential schooling, loss of culture, marginalization of Indigenous people, relocation of Indigenous people to remote locations and failure to settle land claims (Martin, 2012; Mathur, Dewar, & DeGagne, 2011; Power, 2008; Wakefield, Fredrickson, & Brown, 2015). There is a need to further investigate how proximal, intermediate and distal social determinants of health influence food insecurity in Indigenous populations.

1.4 Study Rationale and Objectives

This thesis proposes that examining the associations between food insecurity, social determinants of health and Indigenous-specific factors is important as these factors have not been studied together quantitatively in previous research. More specifically, this study assesses the relationships between household food insecurity, demographic variables (sex, age and Indigenous identity), Indigenous-specific factors (residential school attendance and hunting/fishing/trapping) and social determinants of health (income, education, employment status, household crowding and household type). It is unclear whether income-related social determinants of health or cultural and historical factors play a greater role in Indigenous household food insecurity. This study aims to examine the relationships between social determinants of health, Indigenous-specific factors and household food insecurity.

Using cross-sectional data from the 2012 APS, the objectives of this thesis are to 1) estimate the prevalence of food insecurity among off-reserve First Nations, Métis and Inuit adults in Canada (20 years and older) and 2) examine the relationships between household food insecurity, demographic variables, Indigenous-specific factors and social determinants of health.

1.5 Thesis Overview

This thesis continues with a review of the literature in Chapter 2. Section 2.1 describes the methodology of the systematic review process completed. Details from selected studies are provided, including study population, design and reported food insecurity prevalence. In Section 2.2, common methods of measuring and classifying food insecurity are described. Section 2.3 discusses the differences between traditional foods and market foods, including their implications on Indigenous food insecurity. Section 2.4 describes the links between food insecurity and each of the ten determinants of health used in the later analysis. Following this section, gaps in the current literature are identified in Section 2.5. Chapter 3 covers the methodology of this study, beginning with a description of the data source in Section 3.1. This section describes the content, design and study population of the 2012 APS. Section 3.2 describes each variable used in this analysis, explaining how they were measured in the APS and how they were used in analysis. Statistical considerations, including weighting and missing data, are discussed in Section 3.3. Chapter 4 presents results of this study, beginning with a description of the study sample in Section 4.1. This is followed by bivariate results in Section 4.2 and the hierarchical logistic regression model in Section 4.3. Finally, Chapter 5 includes key findings in Section 5.1, implications of study findings for policy in Section 5.2, study limitations in Section 5.3 and a summary of conclusions in Section 5.4.

Chapter 2

2 Literature Review

This section provides a review of the literature on Indigenous food insecurity in Canada. In section 2.1, the methodology of the systematic review process is described and details from selected studies are provided. Section 2.2 describes common methods of measuring and classifying food insecurity. In Section 2.3, the differences between traditional foods and market foods are discussed. Section 2.4 describes the links between food insecurity and social determinants of health. Finally, gaps in the current literature are discussed in Section 2.5.

2.1 Previous Studies on Indigenous Food Insecurity in Canada

2.1.1 Search Strategy and Study Selection

To initiate the current research on Indigenous food insecurity in Canada, a systematic review was conducted. Database searches were conducted in Web of Science, PubMed and PsycINFO on 15 September 2015 to obtain relevant academic journal articles. Search terms used reflected the two domains of interest for this review: Indigenous populations and food insecurity. The following search terms were used in each database: ("food secur*" OR "food secur*" OR "food sovereignty") AND (Aboriginal* OR Métis OR Inuit OR "First Nation*" OR Indigenous OR "Native American" OR "American Indian"). This search strategy returned a total of 159 search hits, all of which were exported to a systematic review software program, EPPI-Reviewer 4 (Version 4.4.3, EPPI-Centre, University of London, UK). Of these 159 citations, 40 duplicates were removed via EPPI-Reviewer 4's duplicate-checking function and manual checking. Studies were included in this review if they focused on Indigenous Canadians, food insecurity and determinants or risk factors for food insecurity, and excluded if they did not meet these criteria. After screening titles and abstracts, 61 articles which did not meet inclusion criteria were excluded. Of the remaining 58 articles, 34 were excluded after a full-text

screen as they did not focus on food insecurity or determinants of food insecurity in Canadian Indigenous populations. This left 24 articles for data extraction. This process is illustrated in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram in Figure 1. Study details from all 24 articles, including location, population, objectives and results are summarized in Appendix B.

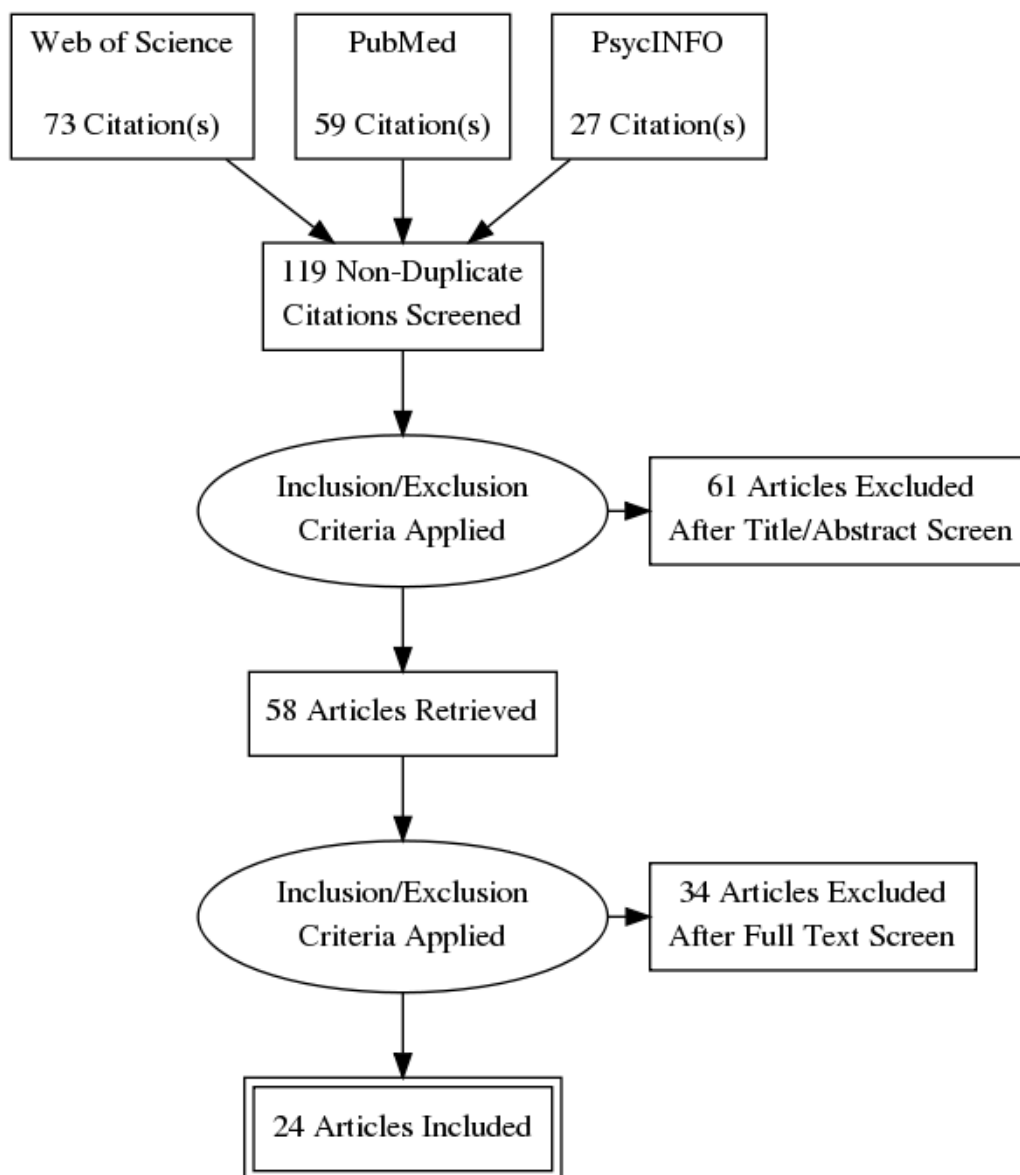


Figure 1: PRISMA Flow Diagram of Study Selection

2.1.2 Study Population and Design

All 24 articles studied Canadian Indigenous populations. Twelve of these studies were conducted in or focused on populations in Nunavut, while the remaining half studied Canada-wide, Ontario, Quebec or Yukon Indigenous communities. The 24 articles retrieved from this review included 21 primary research studies, two commentary articles and one review article.

The review article and two commentary articles obtained from this search examine Indigenous food systems and their susceptibility to food insecurity. In their review of community observation studies and dietary interviews in Inuit communities, Wesche and Chan (2010) discovered that food insecurity was affected by harvesting trends, level of reliance on certain species, availability of other traditional foods and climate change. Ford (2009) provided commentary on Inuit food insecurity and developed a conceptual model which looked at Inuit food systems and their vulnerability to food insecurity due to climate change, using Igloodik and its 2006 conditions as a case study. The model illustrated that the food systems' adaptive capacity (through food sharing, hunting flexibility and store-bought food access) can moderate the impact of negative climate-related conditions on food insecurity (Ford, 2009). Kamal, Linklater, Thompson, Dipple, and the Ithinto Mechisowin Committee (2015) described how a small First Nations community with a food insecurity rate of 100% was able to become more food sovereign after the establishment of a community food program. It indicated that reconnection with the land and access to traditional foods are essential in achieving food security and improving food sovereignty (Kamal et al., 2015).

Of the 21 primary research articles, nine studies obtained from the systematic search used qualitative methods and 13 used quantitative methods (one study by Egeland, Pacey, Cao, and Sobol (2010) used both quantitative and qualitative research methods). The qualitative studies used methods such as semi-structured interviews, focus groups and observation, in addition to some less common methods such as "photovoice" and "story/dialogue method". Genuis, Willows, and Jardine (2014) used a "photovoice" investigation to learn about food insecurity issues from the perspective of First Nations

children. Photovoice provides participants in the study an opportunity to become co-researchers, equipping them with cameras to capture images relating to a specific topic (Wang, 1997). Elliott, Jayatilaka, Brown, Varley, and Corbett (2012) used an adapted version of the “story/dialogue method”, asking their participants to share personal experiences in small groups, followed by discussion with other participants and discussion facilitators. The use of qualitative research within this population helped capture unique elements of food insecurity that could not be captured in traditional questionnaires. Participants in these studies identified barriers to food security, including colonization, high costs of market foods and decline in hunting activity (Chan et al., 2006; Elliott et al., 2012; Ford & Beaumier, 2011; Kerpan, Humbert, & Henry, 2015). The 13 studies which employed quantitative research methods used cross-sectional questionnaires such as the APS and CCHS to measure food insecurity in Indigenous populations. Prevalence rates obtained from these studies are included in Section 2.1.3 and measurement tools used in these studies are discussed in Section 2.2.

2.1.3 Prevalence of Food Insecurity

Canada-wide prevalence of household food insecurity in the off-reserve Indigenous population was 33%, according to the 2004 CCHS, compared to 9% in the non-Indigenous population (Willows et al., 2009). There is a high prevalence of food insecurity in the Canadian Arctic where many Inuit populations are located. Guo et al. (2015) found the rate of household food insecurity in Iqaluit, Nunavut to be 28.7%, which is lower than the rate for smaller Inuit communities in Nunavut but much higher than the rate for the non-Indigenous population. Studies of Inuit communities and communities in Arctic Canada have found food insecurity rates between 43.3 and 70% (Egeland et al., 2010; Ford & Berrang-Ford, 2009; Huet, Rosol, & Egeland, 2012; Ruiz-Castell et al., 2015). One study of an on-reserve First Nations community in Sub-Arctic Ontario estimated a food insecurity rate of 70%, suggesting that on-reserve households may be more vulnerable to food insecurity than off-reserve households (Skinner, Hanning, & Tsuji, 2014). Another study of 51 individuals in subarctic Ontario found that 75.5% of households were food insecure, despite the fact that more than 75% received income from employment (Skinner, Hanning, Desjardins, & Tsuji, 2013). These reports

of high prevalence of Indigenous food insecurity illustrate the urgent need for solutions to this issue.

2.2 Measurement of Food Insecurity

Food insecurity is commonly measured using the 18-item United States Food Security Survey Module, created by the United States Department of Agriculture (USDA) (Marques, Reichenheim, de Moraes, Antunes, & Salles-Costa, 2015). Development of the Household Food Security Survey Module (HFSSM) was based on research on food insecurity faced by low-income American families (Health Canada, 2007). The US Federal Government has been measuring and reporting rates of food insecurity in the United States annually since 1995 (Nord & Bickel, 2002). Data from the 1995 Current Population Survey (CPS) Food Security Survey was used to develop a single household food security scale which identified three categories of food insecurity based on severity (Hamilton et al., 1997a, 1997b; Price, Hamilton, & Cook, 1997). Most recently revised in 2000, the 18-item HFSSM is often assessed and performs well as a measure of income-related food insecurity, showing good validity and reliability (Marques et al., 2015; Ohls, Radbill, & Schirm, 2001; US Department of Agriculture, 2006). Questions within the survey focus on asking respondents about food affordability and eating behaviours which may result from financial limitations, including reducing the size of meals, skipping meals and going a whole day without food. The US HFSSM recommends classifying food security into one of the following four categories: 1) “food secure” (no or minimal evidence of food insecurity); 2) “food insecure without hunger” (concerns about adequacy of food supply in household, but little or no reduction in food intake); 3) “food insecure with hunger (moderate)” (food intake for adults has been reduced and adults often experience hunger); and, 4) “food insecure with hunger (severe)” (households with children have reduced children’s food intake and children are experiencing hunger) (Bickel, Nord, Price, Hamilton, & Cook, 2000, pp. 11-12).

All quantitative studies obtained from the systematic search in Section 2.1.1 used some form of the 18-item United States HFSSM to measure food insecurity. Five of the 13 quantitative studies used the unmodified 18-item HFSSM to measure food security. Four

studies used a version of the HFSSM which was slightly modified by Indian and Northern Affairs Canada (INAC) to increase acceptability among the Inuit population (Indian and Northern Affairs Canada, 2003). In this version of the questionnaire, the term “balanced meals” was replaced with the term “healthy meals” as *healthy* was deemed to be more meaningful than *balanced* in the Indigenous population. Another modification replaced the answer options of “always true”, “sometimes true” and “never true” in the original questionnaire, instead asking respondents if specific events occur “often”, “sometimes” or “never.” This modification “avoided possible questioning of the respondent’s truthfulness in the answers given” (Indian and Northern Affairs Canada, 2003, p. 8). Another study modified only the recall period of the questions, changing the original 12 month recall period to one month (Guo et al., 2015). Of the remaining three studies, one used a version similar to the INAC-modified survey, one employed a version with minor changes and one used four questions adapted from the HFSSM (Ford & Berrang-Ford, 2009; Mercille, Receveur, & Potvin, 2012; Ruiz-Castell et al., 2015). It should be noted that these modifications to the original survey instrument may have changed the intended meaning of the questions and that these modified instruments have not been assessed for reliability and validity. Some studies have suggested evidence of concurrent validity of the 18-item HFSSM in Inuit populations given dietary differences between food secure and food insecure households (Egeland, Williamson-Bathory, Johnson-Down, & Sobol, 2011; Huet et al., 2012). Although the psychometrics of the HFSSM have not been assessed for Canadian Indigenous populations, the instrument is commonly used to measure food insecurity in Canada (Cafiero, Melgar-Quiñonez, Ballard, & Kepple, 2014; Skinner et al., 2014).

In Canada, food security is measured by the CCHS, an annual cross-sectional national population health survey. Beginning in the 2004 cycle, the CCHS adopted the 18-item HFSSM to measure food security. The CCHS classifies food security status as “food secure,” “food insecure, moderate” and “food insecure, severe”, which corresponds with the US HFSSM categories; however there are two minor differences. Compared to the US HFSSM, the CCHS uses a lower threshold for “food insecure” status (two affirmative adult-specific items compared to three in the US method) (Health Canada, 2007). This might result in higher estimates of food insecurity by the CCHS. Another difference is

that the CCHS classifies the food insecurity status of households with children based on two separate measures (adult food security scale and child food security scale), whereas the US method considers all 18 items in one scale (Health Canada, 2007). This might result in lower estimates of food insecurity in the CCHS. The CCHS also removes the term “hunger” from labels as it is uncertain whether or not the survey can adequately assess hunger (Health Canada, 2007). In households without children, household food security status is measured in the same way as adult food security status. In households with children, food insecurity status is based on both the adult and child food security scales, and classified according to the following criteria: (a) “food secure,” if both adults and children are food secure; (b) “moderately food insecure,” if both adults and children, or either adults or children are moderately food insecure and neither was severely food insecure; or (c) “severely food insecure,” if either adults or children are severely food insecure (Health Canada, 2012). CCHS’s classification of food security status is summarized in Table 2.2.1.

Table 2.2.1: CCHS Classification of Food Security Status

Food Security Status	Adult Status (based on the Adult Scale)	Child Status (based on the Child Scale)	Household Status (derived from Adult and Child Status)
Food Secure	no, or one, indication of difficulty with income-related food access 0 or 1 affirmative responses	no, or one, indication of difficulty with income-related food access 0 or 1 affirmative responses	Both adult status and child status are food secure
Food Insecure, Moderate	indication of compromise in quality and/or quantity of food consumed 2 to 5 affirmative responses	indication of compromise in quality and/or quantity of food consumed 2 to 4 affirmative responses	Either adults or children, or both adults and children, in the household are moderately food insecure, and neither is severely food insecure
Food Insecure, Severe	indication of reduced food intake and disrupted eating patterns ≥6 affirmative responses	indication of reduced food intake and disrupted eating patterns ≥5 affirmative responses	Either adults or children in the household are severely food insecure

Note. Reprinted from Determining Food Security Status, by Health Canada, 2012. Retrieved from <http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/insecurit/status-situation-eng.php>

2.3 Traditional Foods vs. Market Foods

Traditional Foods

A common theme across qualitative research on diet in Indigenous populations is that participants report consuming traditional foods, especially wild meats (Skinner et al., 2013). Traditional foods are desired by many Indigenous families as they value the connection between these foods and culture, as well as the nutritional benefits (Kerpan et al., 2015; Lambden, Receveur, & Kuhnlein, 2007). Examples of traditional foods among First Nations peoples' diets include caribou, moose and salmon, and for Inuit people, walrus and ringed seal are considered healthy and superior to Western foods (Laidler, Dialla, & Joamie, 2008; Schuster, Wein, Dickson, & Chan, 2011; Searles, 2008). When traditional foods are consumed, individuals tend to have higher intake of protein, vitamin A, vitamin C and n-3 mono and polyunsaturated fatty acids (Chan et al., 2006; Egeland, Johnson-Down, Cao, Sheikh, & Weiler, 2011). Not only are traditional foods better for nutritional health, they are also linked to cultural expression and holistic health for many Indigenous people (Willows, 2005).

Food sharing between community members and family is commonly reported as a mechanism for dealing with food shortages (Skinner et al., 2013). In a study of ten Inuit extended family networks, Harder and Wenzel (2012) found that sharing of traditional foods and other resources through culturally prescribed ways helps buffer disparities between high and low income families. However, many participants noted that less food sharing occurs today (Chan et al., 2006; Elliott et al., 2012; Ford & Beaumier, 2011). Due to stressed food systems, hunters have started charging for traditional foods, which would have once been shared through traditional networks (Ford & Beaumier, 2011).

Community members in Nunavut identified several barriers to hunting and ultimately obtaining traditional foods including, high hunting costs, lack of hunting skills, lack of time, gun license delays and contamination of foods (Chan et al., 2006; Elliott et al., 2012). They also noted that access to traditional food was becoming more difficult due to results of climate change, such as thinning ice, rising temperatures and changing weather patterns (Beaumier & Ford, 2010). These barriers to food security are influenced by the

greater issues of government policies, environmental concerns, colonialization and assimilation (Elliott et al., 2012).

As money is not as readily shared as traditional foods (Wenzel, Hovelsrud-Broda, & Kishigami, 2000), the decreased accessibility of traditional foods and shift toward more market foods means that more low-income and urban households may not have the same type of supports they once did. In urban areas where more Indigenous people participate in the wage economy, individuals have less time for hunting and gathering traditional foods, and may not have the required skills to acquire food in these manners (Chan et al., 2006; Sharma, 2010). Furthermore, food sharing is practiced less often in larger centres compared to smaller communities, which may be due to greater mobility and less traditional foods available in cities (Guo et al., 2015). Those in cities tend to receive less traditional foods through sharing networks due to disconnection with family or community members and distance (Elliott et al., 2012). These trends in food sharing and traditional food consumption support the claim that a “nutrition transition” to store-bought foods is taking place in Indigenous communities (Guo et al., 2015).

Market Foods

Having access to traditional foods also means that households are not completely vulnerable to factors associated with market foods. Many have criticized the high cost of market foods in the north, as well as poor quality and variety of foods (Chan et al., 2006). In remote communities, market foods are notoriously overpriced due to high transportation costs and other related expenses. For example, Ford and Beaumier (2011) noted that the cost of a basket of food in Igloolik in 2008 was more than twice the price of the same basket in Montreal (\$551 vs. \$238). To cope with limited income, some community members reported buying cheaper dried foods like rice and pasta, as well as reducing portion sizes (Ford & Beaumier, 2011; Skinner et al., 2013). Food insecure households tended to consume less fresh produce, grains and dairy and more high sugar foods (Huet et al., 2012). In their photovoice research involving First Nations children, Genuis et al. (2014) found that many photos depicted high sugar boxed cereals, canned foods and quick preparations items such as macaroni and cheese. Furthermore, even those

who are able to afford the high prices of market foods may be hindered by the lack of produce selection and having to travel long distances to purchase foods (Mercille et al., 2012).

While they face barriers to traditional food access, Indigenous people living in urban settings may have greater variety of market food options and access to more community resources such as food banks than their rural counterparts. Yet those who live in low-income urban neighbourhoods often have poor access to supermarkets and may live in areas deemed as “food deserts,” a term used to describe urban areas with limited access to affordable and healthy foods (Cummins & Macintyre, 2002, 2006; Kerpan et al., 2015). As such, many urban dwellers turn to low-quality foods from food banks, convenience stores and fast food outlets (Kerpan et al., 2015). With the shift in dietary patterns seen in many Indigenous communities, diets include more unhealthy processed foods and reduced intake of several nutrients (Chan et al., 2006; Willows, 2005). Ultimately, these changes may lead to higher rates of obesity and other chronic diseases associated with poor diet.

2.4 Food Insecurity and Social Determinants of Health

2.4.1 Food Insecurity and Sex

Studies of Inuit populations have shown that food insecurity rates are higher among females (Ford & Berrang-Ford, 2009). Gendered roles and expectations may account for some of the disparities between male and female food insecurity. Inuit women have indicated that they are often the last to eat in their households, allowing men and children to eat first (Beaumier & Ford, 2010) and are more likely than men to cut the size of their meals or skip meals (Beaumier & Ford, 2010; Ford & Berrang-Ford, 2009). Low-income, lone mothers compromise their own diet to ensure their children have adequate nutritional intake (McIntyre et al., 2003). It has also been noted that women make most of the food choices for the household but may have inadequate knowledge of store foods, reducing their ability to substitute traditional foods with healthy store-bought options (Beaumier & Ford, 2010). In a study examining women of Atikamekw Nation, Mercille

et al. (2012) found an association between severe food insecurity and low scores on a scale assessing self-efficacy in healthy food preparation using store-bought foods. Studies of Inuit women have also shown that women may have difficulty budgeting food expenses (Beaumier & Ford, 2010). Furthermore, in areas with limited employment opportunities, women are forced to take jobs with low pay, high turnover and low job satisfaction (Ford & Beaumier, 2011). They may also take part-time positions due to family commitments or time off to raise children, thereby reducing their income.

Among Indigenous communities where the food systems include foods derived from hunting, men may be more likely to be food secure due to the fact that hunting is traditionally a male activity and hunters are more likely to be food secure (Ford & Berrang-Ford, 2009). Higher traditional food consumption (including food obtained from hunting) is associated with being food secure and men tend to eat more traditional food than women (Ford & Berrang-Ford, 2009; Kuhnlein, 1995). In some Inuit communities, traditional foods are widely shared through extended networks, more so than purchased store foods would be shared (Ford & Berrang-Ford, 2009). With shortages of these traditional foods, hunters may be more hesitant to share and some women have admitted reluctance to ask for foods, fearing judgement from the community (Beaumier & Ford, 2010).

2.4.2 Food Insecurity and Age

The shift in Indigenous dietary patterns from traditional foods to Western store-bought foods is widely documented. While traditional foods are valued by many Indigenous people, older individuals tend to consume more traditional foods than younger individuals (Kuhnlein, 1995). Younger generations participating in wage economies tend to eat more store-bought convenience foods whereas older generations who hunt and fish eat more traditional foods (Curtis, Kvernmo, & Bjerregaard, 2005). Many young Inuit people lack the skills to live off of the land the way their ancestors did and have become more reliant on store-bought foods. It has been suggested that younger Indigenous people may not have acquired the taste for traditional foods, refusing to eat them even when market foods and money to buy food have run out (Power, 2008). A related trend seen

across the arctic is the lack of young people taking over full-time hunting roles left by older generations (Beaumier & Ford, 2010). The decline in hunting and interest in hunting may be due to the rising costs of fuel and equipment. It has been suggested that these changing dietary patterns and decline in hunting may be why younger Inuit generations are more likely to be food insecure (Chan et al., 2006). This so called 'nutrition transition' prevalent in younger generations also exposes them to the risks associated with a diet higher in fat and refined carbohydrates (Curtis et al., 2005; Sharma, 2010).

2.4.3 Food Insecurity and Indigenous Identity

Indigenous identity plays a role in food insecurity as Métis tend to be better off socio-economically than both First Nations and Inuit, and First Nations tend to have better socioeconomic status than Inuit (C. L. Reading & Wien, 2009). For example, Métis individuals are more likely to be employed than First Nations individuals, and First Nations individuals are more likely to be employed than Inuit individuals (O'Donnell & Wallace, 2015). Inuit populations experience the most economic disadvantage, which is evident from the number of studies included in the literature review that focus on Inuit populations or Nunavut and Arctic Canada and food insecurity. Food insecurity rates for Inuit populations are much higher than rates in other Indigenous populations (i.e., 43-70% in Inuit populations compared to 33% in the general off-reserve Indigenous population) (Egeland et al., 2010; Huet et al., 2012; Willows et al., 2009).

2.4.4 Food Insecurity and Residential Schooling

Residential schools were institutions that operated from the late 1800s to the 1990s which aimed to assimilate Indigenous children into Euro-Canadian culture (Milloy, 1999). Indigenous children in Canada were forced to attend these schools, which resulted in loss of culture, language and family and community ties as they were required to learn Christian religious practices, English or French language and Euro-Canadian culture (Barnes, Josefowitz, & Cole, 2006; C. L. Reading & Wien, 2009). The schools were kept

in standards below acceptable levels to minimize costs, which subjected students to inadequate dietary intake and maintenance chores (Dyck, 1997; Miller, 1996).

As a result of the residential school experience, former attendees often exhibit negative psychological effects such as substance misuse problems (Ross, Dion, Cantinotti, Collin-Vezina, & Paquette, 2015), as well as difficulties in the formal education and employment systems (Chansonneuve, 2005). Previous research has found that Indigenous individuals who attended residential schools were more likely to have lower income, live in crowded households and experience food insecurity (Bougie & Senecal, 2010). Not only have residential schools adversely affected those who attended, but residual effects have also been passed on subsequent generations. Familial residential school attendance has been shown to affect health outcomes, including suicidal behaviours (Hackett, Feeny, & Tompa, 2016). Additionally, Feir (2016) found that children whose mothers had attended a residential school were more likely to have negative school experiences such as suspension and expulsion. It has been suggested that this intergenerational effect is due to lower parental education and reduced household income as a result of residential school attendance (Barnes et al., 2006; Bougie & Senecal, 2010). Furthermore, the loss of traditional knowledge, language and culture can be traced back to residential schools (Elliott et al., 2012). Such loss of knowledge and culture contributes to the lack of traditional food access many communities face. As described in the ILCSDAH, residential schooling is a distal determinant of health, thought to affect both proximal and intermediate determinants of health through the inequalities and disadvantage it created (C. L. Reading & Wien, 2009).

2.4.5 Food Insecurity and Hunting

As stated earlier, traditional foods remain an important source of food for many Indigenous communities that desire independent and self-sufficient access to food (Skinner et al., 2013). Many Inuit communities continue to hunt, fish and trap to provide their families with nutritional food or supplement their incomes (Lang, Price, Pedersen, & Trovato, 2011). Food secure households in Arctic Canada had higher prevalence of having an active hunter in the home (Huet et al., 2012). However, the current trend is a

decline in hunting activity which has been affecting food sharing, affordability and harvesting costs (Beaumier & Ford, 2010). Factors associated with high hunting costs include gas prices, ammunition costs, travel distances to hunt game and obtaining gun licenses (Ford & Beaumier, 2011). Younger hunters tend to lack the skill required to hunt certain species and have less knowledge of climatic conditions that more experienced hunters have (Ford & Beaumier, 2011). Other external factors such climate change, mining, drilling for oil and environmental contaminants have reduced the quality and supply of game to be hunted in many Indigenous communities (Schuster et al., 2011). Effective hunting periods during which animals are available and accessible to hunters have become shorter today, yet another challenge to accessing wild game (Ford & Beaumier, 2011). These changing social and environmental conditions have in turn contributed to the reduced amount of traditional foods available, decreased food sharing and increased price of traditional foods for sale.

2.4.6 Food Insecurity and Income

Income is considered a major predictor of food insecurity. The incorporation of more commercially packaged foods in the Indigenous diet has been attributed to the transition from a hunter-gatherer society to a cash-based society, and suggests that Indigenous food insecurity is mainly due to poverty (Agriculture and Agri-Food Canada, 1998; Wakefield et al., 2015). Some studies have cited income and the price of food as a major barrier to accessing adequate food for the household (Beaumier & Ford, 2010; Chan et al., 2006). First Nations, Inuit and Métis people tend to be economically disadvantaged compared to other Canadians (Task Force on Aboriginal Languages and Cultures Canada, 2005). Data from the 2006 APS and 2007 CCHS show that 42% of Métis adults and more than 50% of First Nations and Inuit adults report earning less than \$20,000 a year, compared to approximately 29% of non-Indigenous Canadians in the same earning bracket (Garner, 2010). With respect to sex, the income gap between males and females has been well documented and statistics show that males earn more than females at the same education level (Statistics Canada, 2009). Furthermore, the high cost of market foods in remote northern regions creates an even greater barrier to food access in some Indigenous communities. It has been suggested that disparities in income may be due to colonial

processes such as residential schooling, the disintegration of communities and devaluation of Indigenous language and culture (Task Force on Aboriginal Languages and Cultures Canada, 2005).

2.4.7 Food Insecurity and Education

There is a strong link between income, education and employment. In Canada, those with post-secondary education tend to earn more than those whose highest level of education is high school, and those who completed high school earn more than those who have not completed this level of education (Statistics Canada, 2009). Indigenous people whose education is below the Bachelor's degree level earn much less income than non-Indigenous people at the same education level (O'Donnell & Wallace, 2015). Factors related to colonialism may account for lower educational attainment, and thus lower income among Indigenous peoples. For example, the majority of residential school attendees did not attain education higher than ninth grade and did not return to school (Kaspar, 2014). Beyond links to economic opportunities and income, those with higher levels of educational attainment are more likely to experience better food security due to higher levels of literacy, ability to access public information and capacity to more efficiently ration one's resources (De Muro & Burchi, 2007). For example, mothers with higher education tend to allocate more resources to the nutrition of their children (De Muro & Burchi, 2007). USDA data have also shown strong links between parental education and food insecurity among children, as more than half of households with food insecurity among children were households in which no adult had completed high school (Nord, 2009).

2.4.8 Food Insecurity and Employment

In 2011, Indigenous people in Canada had an employment rate of 62.5%, which is lower than the rate of 75.8% for non-Indigenous people (Statistics Canada, 2015a).

Unsurprisingly, many studies have found that unemployment is associated with food insecurity (Guo et al., 2015). Differences in availability and accessibility of wage employment may also be reflected in food insecurity status (Schuster et al., 2011). For example, both the food insecurity and unemployment rates are high in Igloolik due to

limited employment opportunities and lack of educational requirements for many jobs (Ford & Beaumier, 2011). As such, many community members may be forced to take low-paying jobs for income. It should also be noted that unlike larger urban centres, traditional communities in the North contain nonwage economies centred around land-based harvesting (Pierce & Dale, 1999). Thus, those who are not employed may participate in nonwage tasks and activities to obtain food and resources.

2.4.9 Food Insecurity and Household Type

The family composition of the household is another factor which has been linked to food insecurity. Lone-parent families, especially those headed by women, are the most vulnerable to food insecurity (Tarasuk et al., 2012). Lone-parent families tend to have significantly lower income than two-parent families and 80% of lone-parent families in Canada are female lone-income families (Statistics Canada, 2011b). In 2014, Statistics Canada reported that lone-parent families had a median income of \$32,600, while two-parent families with children had a median market income of \$98,600 (Statistics Canada, 2016). Furthermore, food management behaviours may differ depending on family composition. For example, studies have shown that mothers may compromise their own diet to ensure their children's nutrition when resources are scarce (Beaumier & Ford, 2010; McIntyre et al., 2003).

2.4.10 Food Insecurity and Household Crowding

Houses may be overcrowded as a result of limited funds, suggesting that these crowded dwellings may be food insecure due to lack of economic resources. However, in places such as Nunavik (located in Arctic Quebec) household crowding is also driven by the lack of housing and the rapidly growing young population (Ruiz-Castell et al., 2015). It has been suggested that household crowding may indirectly affect food insecurity through negative behavioural and social outcomes such as chronic stress responses, anger, depression, withdrawal and reduced social support (Ruiz-Castell et al., 2015). Ruiz-Castell et al. (2015) also found that crowded households were more likely to cut the size of children's meals, one of the more severe measures of food insecurity.

2.5 Gaps in Current Literature

Further research is needed to understand the relationships between social determinants of health, Indigenous-specific factors and food insecurity. While the concept of food insecurity is based on economic access to food, there are other unique factors to be considered for the Canadian Indigenous population. Traditional methods of acquiring food, the lingering effects of colonialism and other cultural factors have an effect on household food insecurity in this population. The literature shows that females often experience higher rates of food insecurity than males, yet it is not known if this association remains after controlling for income-related determinants of health. Similarly, Inuit individuals experience higher rates of food insecurity than off-reserve First Nations and Métis individuals. This disparity may be accounted for by the lower socioeconomic status of Inuit in comparison to other Indigenous groups, but it is unclear if there are other factors at play. Residential school attendance has been identified as a distal determinant of Indigenous food insecurity, which resulted in loss of culture, lower income, lower educational attainment and fewer employment opportunities for former attendees and their families. However, it is not known if residential school attendance primarily affects food insecurity through income-related factors or cultural factors. Furthermore, decline in hunting activity and lack of a hunter in the household have been identified as barriers to food security in the qualitative research, but have not been studied quantitatively. This study assesses the associations between household food insecurity and the following factors: sex, age, Indigenous identity, residential school attendance, hunting/fishing/trapping, household income, highest level of educational attainment, employment status, household type and household crowding.

Chapter 3

3 Methods

This chapter explains the methodology used in this study. Section 3.1 provides a description of the data source, including content and sampling design. Section 3.2 describes the measurement tools and coding of variables used in analysis. Finally, Section 3.3 discusses statistical considerations such as analytical procedures, sample weights, bootstrap weights and missing data.

3.1 Data Source

This study analyzed data from the 2012 APS, a national survey of off-reserve First Nations, Métis and Inuit, aged six years and over. This survey was developed by Statistics Canada, Aboriginal Affairs and Northern Development Canada, Health Canada and Employment and Social Development Canada (Cloutier & Langlet, 2014). The survey data were accessed through the Statistics Canada Research Data Centre at Western University following approval of an application for data access.

3.1.1 Content of the APS

Statistics Canada has conducted the APS since 1991; the 2012 APS represents the fourth cycle of the survey (Budinski & Langlet, 2015). The purpose of the APS is to collect data on the social and economic conditions of First Nations living off reserve, Inuit and Métis aged six and older (Statistics Canada, 2012). The 2012 survey focused on the issues of health, education and employment, while providing indicators of income, housing, mobility and language (Cloutier & Langlet, 2014). As the sample was drawn from the 2011 NHS, the 2012 APS file includes over 100 NHS variables, which reduced response burden for the APS sample (Statistics Canada, 2012).

3.1.2 APS Sampling Design

The APS sample was selected from the 2011 NHS Individuals were selected if they reported Aboriginal ancestry or if they answered “Yes” to any one of the following three questions: “Is this person an Aboriginal person, that is, First Nations (North American Indian), Métis or Inuk (Inuit),” “Is this person a Status Indian (Registered or Treaty Indian as defined by the *Indian Act* of Canada),” and “Is this person a member of First Nation/Indian band?” Individuals who reported Aboriginal ancestry but did not report Aboriginal identity were included as the Aboriginal ancestry-only population. The target population (those with Aboriginal identity) and the Aboriginal ancestry-only population make up the total APS survey population (Cloutier & Langlet, 2014).

More than 50,000 individuals who reported Aboriginal identity or ancestry were selected to participate in the 2012 APS. The sample size of Aboriginal respondents in the 2012 APS was 28,410 (9,740 respondents who reported Aboriginal ancestry, but not identity, were not included in the 2012 APS database) and the final response rate was 76% (Budinski & Langlet, 2015). Computer Assisted Telephone Interviews (CATI) and Computer Assisted Personal Interviews (CAPI) were used to collect data for this survey. CATI was used for individuals who had a telephone number on file and CAPI was used for those who could not be reached by telephone, often those in northern and Inuit communities where very few telephone numbers are available (Cloutier & Langlet, 2014). Proxy interviews were used to collect data from adults who were not able to answer questions for certain reasons, including language barriers, health related reasons or the respondent being away from home during the time the survey was administered (Statistics Canada, 2012).

3.1.3 Study Population

For the purposes of this analysis, the study population was limited to First Nations, Métis and Inuit adults aged 20 and older. Individuals aged 19 and younger were excluded due to this study’s interest in the potential effect of employment status (limited to adults aged 15

and over), highest level of educational attainment (limited to adults 19 and over), and residential school attendance (limited to adults aged 20 and over) on food insecurity.

3.2 Measurement Instruments

The following section describes how the determinants of food insecurity used in this study were measured in the APS and how they were used in analysis. Table 3.2.1 displays all variables used in this study.

3.2.1 Food Insecurity

The APS captures household food insecurity by asking all respondents the following six questions derived from the US HFSSM Six-item Short Form:

1. The food that [you/you and other household members] bought just didn't last, and there wasn't any money to get more. Was that often true, sometimes true, or never true in the past 12 months?
2. [You/You and other household members] couldn't afford to eat balanced meals. In the past 12 months was that often true, sometimes true, or never true?
3. In the past 12 months, did [you/you and other household members] ever cut the size of your meals or skip meals because there wasn't enough money for food?
4. How often did this happen - almost every month, some months but not every month, or in only 1 or 2 months?
5. In the past 12 months, did you [personally] ever eat less than you felt you should because there wasn't enough money to buy food?
6. In the past 12 months, were you [personally] ever hungry but didn't eat because you couldn't afford enough food?

The six-item short form was developed by the National Center for Health Statistics in collaboration with Abt. Associates Inc. (Blumberg, Bialostosky, Hamilton, & Briefel, 1999; Economic Research Service, 2012a). These six items were chosen for this subset as statistical testing showed they would closely approximate the three main categories of the HFSSM measure (i.e. "food secure," "food insecure without hunger," and "food insecure with hunger") with only a minor loss in sensitivity or specificity (Bickel et al., 2000).

This short form is an acceptable substitute for the 18-item form as it has been shown to identify household food insecurity with high specificity and sensitivity in relation to the 18-item form (Blumberg et al., 1999; Economic Research Service, 2012a). To measure internal consistency of the six-item scale, a reliability analysis was conducted. The Cronbach's alpha value for the six items was 0.97 which indicated acceptable reliability (Henson, 2001). The six questions were either answered directly by the respondent or by another member of the respondent's household. Responses to these six questions were used to derive a variable that classify each respondent's level of household food security as high or marginal, low or very low. Specifically, responses of "Often true" and "Sometimes true" for questions 1 and 2, "Almost every month" and "Some months but not every month" for question 4, and "Yes" to questions 3, 5 and 6 are coded as "Yes" responses in the calculation for the derived variable. The total number of "Yes" responses determine the respondent's classified level of household food security; 0 or 1 "Yes" responses are classified "high or marginal food security", 2, 3 or 4 "Yes" responses are classified "low food security" and 5 or 6 "Yes" responses is classified "very low food security". For the purposes of this analysis, the derived "level of food security in household" variable was recoded as a binary variable. The "low food security" and "very low food security" categories have been collapsed into one "food insecure" category and "high or marginal food security" is recoded "food secure."

3.2.2 Individual Characteristics

3.2.2.1 Sex

Interviewers code each respondent's sex as male or female. In the analysis, sex is coded as a binary variable.

3.2.2.2 Age

The APS reports the age of each respondent as of February 1 2012, the 2012 APS reference date. For this analysis, age has been recoded as a categorical variable with the following five groups: 20 to 24, 25 to 34, 35 to 44, 45 to 54 and 55 and older.

3.2.2.3 Indigenous Identity

The APS includes an Identification module in which respondents were asked about their Aboriginal identity. This study uses the derived variable which categorised respondents into five Aboriginal identity groups: First Nations – Status, First Nations – Non Status, Métis, Inuit, and multiple Aboriginal identities.

3.2.3 Indigenous-specific Determinants of Health

3.2.3.1 Residential School Attendance

The APS includes a section that indicates whether respondents or their family members (e.g., grandparents, mother, father, current spouse or partner, brothers or sisters and any other relatives) attended a residential school. The term “residential school” also includes federal industrial schools. This analysis uses the APS derived variable for residential school attendance consisting of the following five categories: only respondent attended, only family members attended, both respondent and family members attended, neither respondent nor family members attended and not stated.

For the purpose of this analysis, the respondents in the “Not stated” category are retained in the analysis due to high proportion of respondents (approximately 28%) who did not indicate whether or not they or their family members attended a residential school. The APS derived variable used for residential school attendance is based on nine survey questions which ask the respondent about residential school attendance among specific types of family members (e.g. spouse/partner, siblings, and cousins). Thus, uncertainty about family members attending a residential or federal industrial school may have resulted in a “not stated” response for the derived residential school variable.

3.2.3.2 Hunting for Own or Family Use

Respondents aged 15 and older were asked if they hunted, fished or trapped in the past year. Those with affirmative responses were then asked to elaborate their responses by selecting all applicable options from the following list: “for pleasure or leisure,” “for

money or to supplement your income,” “for your own use or your family’s use,” “to share with others in the community,” “to share with people in other communities” or “for some other reason (specify)”. Using this data, a variable which indicates a respondent’s reason for hunting, fishing or trapping was created for this analysis. This variable is coded as categorical indicator with the following three categories: “Yes” (respondents who hunted, fished or trapped for their family’s use or for their own use and/or to supplement their income), “No, but hunted/fished/trapped for other reasons” and “No, did not hunt/fish/trap.”

3.2.4 Social Determinants of Health

3.2.4.1 Household Income

Data for household income in the APS is taken from the respondent’s answers in the 2011 NHS. The income reported is the sum of the after-tax incomes of all members of the household. The original values were recoded into four groups, using Statistics Canada after-tax low-income cut-offs for 2012 as a guideline (Statistics Canada, 2015c). The four after-tax household income categories used in this analysis are: less than \$12,000, \$12,000 to \$29,999, \$30,000 to \$49,999 and \$50,000+.

3.2.4.2 Education

The APS includes a section which asks respondents about their level of education. A variable for the highest level of education attained is obtained from questions such as: “Are you currently attending elementary or high school?”, “What is the highest grade of elementary or high school that you ever completed?”, “Did you complete a high school diploma?” and “Have you successfully completed an upgrading or high school equivalency program (such as General Educational Development (GED) or Adult Basic Education (ABE))”? The derived variable for “highest level of education attained” indicates an individual’s highest level of schooling based on the following six categories:

1. Grade 8 or equivalent or lower
2. Some secondary education
3. Secondary school diploma or equivalent

4. Some postsecondary education
5. Postsecondary certificate or diploma below bachelor level
6. Bachelor's degree or university certificate/diploma/degree above Bachelor's level

Only respondents who are not currently attending elementary or high school are grouped into these categories. In this analysis, these six categories have been further collapsed into the following three categories: less than high school (grade 8 or equivalent or lower; or some secondary education), high school (secondary school diploma or equivalent or some postsecondary education) and completed post-secondary (postsecondary certificate or diploma below bachelor level or Bachelor's degree or university certificate/diploma/degree above Bachelor's level).

3.2.4.3 Employment

The 2012 APS includes several questions about employment status. For this analysis, a derived binary variable is used to categorize a respondent's labour force status during the APS reference week (based on the date of the interview). The reference week is the week before the interview took place, beginning on Sunday and ending Saturday. This dichotomous variable was coded as "Employed" if the respondent reported working at a job or business and "Not employed" if she or he was not, whether that was due to being unemployed or not being in the labour force. As such, employment is treated as a binary variable in analysis.

3.2.4.4 Household Type

The APS classifies living arrangements in the household according to the following six categories:

1. Couple with child(ren), where at least one member of the couple is a biological or adoptive parent of the child(ren)
2. Couple without child(ren)
3. Lone parent with child(ren)
4. Other family household, which includes foster parents and child(ren)

5. Non-family household: One person
6. Non-family household: Two or more people

For this analysis, the “Other family household” and “Non-family household: two or more people” are combined into one category labelled “Other household.”

3.2.4.5 Household Crowding

The APS includes a crowding index of the household. This index is calculated by dividing the number of individuals living at the residence (at the time of interview) by the number of rooms in the dwelling to indicate whether or not individuals are living in crowded conditions. A “room” includes any finished room in the home, excluding bathrooms, halls, vestibules, and rooms mainly used for business purposes. This crowding index is divided into three categories: “One person or fewer per room”, “More than one but less than 1.5 persons per room” and “1.5 or more per room.” For this analysis, the three categories have been collapsed into two: “One person or fewer per room” and “More than one person per room.” It should be noted that this variable is not comparable to the National Occupancy Standard for crowding which calculates the crowding index based on number of bedrooms (Statistics Canada, 2012).

Table 3.2.1: Study Variables

Variable	Measurement
Food Insecurity	0 = Food insecure 1 = Food secure
Sex	0 = Female 1 = Male
Age	1 = 20 to 24 2 = 25 to 34 3 = 35 to 44 4 = 45 to 54 5 = 55+

Identity	<p>1 = First Nations – Status</p> <p>2 = First Nations – not Status</p> <p>3 = Métis</p> <p>4 = Inuit</p> <p>5 = Multiple Aboriginal identities</p>
Residential School Attendance	<p>1 = Only respondent</p> <p>2 = Only family members</p> <p>3 = Both respondent and family members</p> <p>4 = Neither respondent nor family members</p> <p>5 = Not Stated</p>
Hunting/Fishing/Trapping	<p>1 = Hunted for own or family use</p> <p>2 = Hunted for other reasons</p> <p>3 = Did not hunt</p>
Income	<p>1 = <12000</p> <p>2 = 12000 to 30000</p> <p>3 = 30000 to 49999</p> <p>4 = 50000+</p>
Highest Level of Education	<p>1 = Less than high school</p> <p>2 = High school</p> <p>3 = Post-secondary</p>
Employment Status	<p>0 = Not employed</p> <p>1 = Employed</p>
Household Type	<p>1 = One person household</p> <p>2 = Lone parent with child(ren)</p> <p>3 = Couple with child(ren)</p> <p>4 = Couple, no children</p> <p>5 = Other</p>
Household Crowding	<p>0 = One person or fewer per room</p> <p>1 = More than 1 person per room</p>

3.3 Statistical Considerations

3.3.1 Statistical Techniques

In this analysis, logistic regression was used to predict household food insecurity using the following predictors: sex, age, Indigenous identity, residential school attendance, hunting/fishing/trapping, household income, highest level of educational attainment, employment status, household type and household crowding. More specifically, a hierarchical logistic regression analysis was conducted to study the relationships between household food insecurity and these covariates. Hierarchical logistic regression is a statistical technique used to study data with a group or clustered structure and a binary outcome variable (Wong & Mason, 1985). Variables are entered in blocks in a given order based on theory. In this analysis, covariates were entered in the following three blocks: 1) demographic variables (sex, age and Indigenous identity), 2) Indigenous-specific variables (residential school attendance and hunting/fishing/trapping), and 3) social determinants of health (household income, education, employment, household type and household crowding). Beta coefficients, standard errors, Wald chi-square values, p values, odds ratios and 95% confidence intervals for odds ratios from the hierarchical logistic regression models are presented in Table 4.3.1. To assess goodness of fit, the intercept-only model was tested against the full model.

3.3.2 Sample Weights

In the APS, each respondent is given a sample weight, also called a person-weight, which is based on survey data from a sample of the population and indicates the number of people the respondent represents (Budinski & Langlet, 2015; Cloutier & Langlet, 2014). Sample weights used in this survey reflect the unequal probability of selection for each respondent and have had several adjustment factors applied (Budinski & Langlet, 2015). All statistics were calculated using standardized sample weights. All reported frequencies were rounded to the nearest 10 and proportions were calculated from these rounded counts.

3.3.3 Bootstrap Weights

The bootstrap method is a resampling method which involves subsampling the initial sample (Centers for Disease Control and Prevention, 2004). Bootstrap weights, which adjust variance estimates and assess the reliability of population estimates were used in logistic regression analysis for this study (Budinski & Langlet, 2015). In the APS, 1000 sets of bootstrap weights were generated using a general two-phase bootstrap method which encompasses the variance associated with sampling design and weight adjustments (Cloutier & Langlet, 2014). Variance estimates for the hierarchical logistic regression models were calculated using the 1000 sets of bootstrap weights provided with the 2012 APS data.

3.3.4 Missing Data

Less than 8% of respondents had missing data points. To handle missing data, listwise deletion was used in this analysis. Using this method, entire observations were not used in analysis if a single value is missing. Listwise deletion is considered an effective method for addressing missing data as it does not introduce bias into the standard error estimates (Allison, 2005).

3.3.5 Software

All procedures, including descriptive statistics and logistic regression models, were run in SAS[®] software version 9.4 (SAS Institute Inc., 2012). Logistic regression models were run using the PROC SURVEYLOGISTIC procedure.

Chapter 4

4 Results

In this chapter, a description of the study sample is presented in Section 4.1, followed by bivariate associations between food insecurity and each of its determinants in Section 4.2. Finally, results from the hierarchical logistic regression models are presented in Section 4.3.

4.1 Description of Study Sample

A sample of 16,410 respondents met the criteria for inclusion in this study. In this sample, 19.2% of respondents resided in food insecure households. Note that all results are weighted according to the protocol described in section 3.3.2. Frequency distributions were calculated for food insecurity, sex, age, Indigenous identity, residential school attendance, hunting activity, household income, education, employment status, household type and household crowding. These descriptive statistics are presented in Table 4.1.

Table 4.1: Study sample

Variable	Category	Frequency	Percentage
Food insecurity	Food insecure	2980	19.2
	Food secure	12570	80.8
	Missing	860	
Sex	Male	7380	45.0
	Female	9030	55.0
Age group	20 to 24	1980	12.1
	25 to 34	3390	20.7
	35 to 44	3520	21.5
	45 to 54	3480	21.2
	55+	4040	24.6

Indigenous identity	First Nations – Status	5250	32.0
	First Nations – Non Status	2990	18.2
	Métis	7260	44.2
	Inuit	790	4.8
	Multiple Aboriginal identities	120	0.7
Residential school attendance	Neither	6130	37.3
	Only respondent	90	0.5
	Only family members	4930	30.0
	Both respondent and family members	750	4.6
	Not stated	4520	27.5
Hunting/fishing/trapping	No	10020	63.3
	Yes, done for own/family use	3280	20.7
	Yes, done for other reasons	2520	15.9
	Missing	590	
Household income	<\$12000	960	5.9
	\$12000 to \$29999	2790	17.0
	\$30000 to \$49999	3600	21.9
	\$50000+	9060	55.2
Highest level of education	Less than high school	3850	24.1
	High school	4890	30.6

	Post-secondary	7250	45.3
	Missing	430	
Employment status	Not employed	5990	37.5
	Employed	9980	62.5
	Missing	450	
Household type	One person household	2520	15.4
	Lone parent with child(ren)	2920	17.8
	Couple with child(ren)	3900	23.8
	Couple, no children	5730	35.0
	Other	1300	7.9
	Missing	40	
Household crowding	1 or fewer per room	14750	94.6
	More than 1 per room	840	5.4
	Missing	820	

Note: Percentages may not total 100 due to rounding errors.

4.2 Bivariate Associations

4.2.1 Sex and Food Insecurity

Table 4.2.1 shows that a significant relationship between sex and food insecurity was found, with a higher proportion of females classified as food insecure compared to males, χ^2 (df = 1, N=15550) = 78.9593, $p < .0001$. Approximately 22% of females lived in food insecure households, compared to 16% of males.

Relationship between Food Insecurity Status and Sex

Table 4.2.1: Sex and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
Male	1120	16.1	5840	83.9
Female	1860	21.7	6720	78.3

4.2.2 Age and Food Insecurity

Table 4.2.2 shows the proportions of food secure and food insecure status by age. There was a significant relationship between age and food insecurity, χ^2 (df = 4, N=15550) = 95.8984, $p < .0001$. The general trend observed is that food insecurity rates were highest in two youngest age groups (i.e., 20 to 34 years old) and decreased in older age.

Relationship between Food Insecurity Status and Age

Table 4.2.2: Age and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
20 to 24	400	21.6	1450	78.3
25 to 34	720	22.7	2450	77.3
35 to 44	680	20.4	2650	79.6
45 to 54	630	18.8	2720	81.2
55+	550	14.2	3310	85.8

Note: 860 observations missing

4.2.3 Indigenous Identity and Food Insecurity

A significant relationship between Indigenous identity and household food insecurity status was found, χ^2 (df = 4, N = 15550) = 345.9425, $p < .0001$. As shown in Table 4.2.3, food insecurity rates were highest in the Inuit population (~43%), and lowest in the Métis population (~15%). Food insecurity rates for the First Nations population lie in the middle with rates of 21% for Status Indians and 18% for non-Status Indians.

Relationship between Food Insecurity Status and Indigenous Identity

Table 4.2.3: Indigenous identity and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
First Nations – Status	1060	21.5	3870	78.5
First Nations – Not Status	530	18.6	2320	81.4
Métis	1060	15.3	5880	84.7
Inuit	310	43.1	410	56.9
Multiple Aboriginal Identities	30	27.3	80	72.7

Note: 860 observations missing

4.2.4 Residential Schooling and Food Insecurity

There was a significant relationship between residential schooling and food insecurity, χ^2 (df = 4, N = 15550) = 250.1629, $p < .0001$. As seen in Table 4.2.4, individuals whose

family members had attended residential schools and who had attended themselves were most likely to live in a food insecure household (27.8%).

Relationship between Food Insecurity Status and Residential School Attendance

Table 4.2.4: Residential school attendance and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
Neither	770	13.0	5170	87.0
Only Respondent	10	12.5	70	87.5
Only Family Members	1110	23.2	3680	76.8
Both Respondent and Family Members	200	27.8	520	72.2
Not Stated	890	22.2	3120	77.8

Note: 860 observations missing

4.2.5 Hunting/Fishing/Trapping and Food Insecurity

There was a significant relationship between hunting and food insecurity, χ^2 (df = 2, N = 15450) = 45.4814, $p < .0001$. However, as seen in Table 4.2.5, proportions of food insecure households did not greatly differ by hunting category. Household food insecurity rates were similar for respondents who hunted for their own or family's use and those who did not hunt at all (~20%).

Relationship between Food Insecurity Status and Hunting/Fishing/Trapping

Table 4.2.5: Hunting/fishing/trapping and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
Does not Hunt/Fish/Trap	1950	20.0	7800	80.0
Hunt/Fish/Trap for Own/Family Use	650	20.1	2580	79.9
Hunt/Fish/Trap for Other Reasons	350	14.2	2110	85.8

Note: 960 observations missing

4.2.6 Income and Food Insecurity

There was a significant association between household income and food insecurity, χ^2 (df = 3, N = 15550) = 990.0886, $p < .0001$. Table 4.2.6 shows the proportion of food secure households vary by household income level. The household food insecurity rate was highest in the lowest income category and the rate of food insecurity decreased with each successive income category.

Relationship between Food Insecurity Status and Income

Table 4.2.6: Income and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
<\$12000	340	38.6	540	61.4
12000 - 29999	880	33.7	1730	66.3
30000- 49999	810	23.8	2590	76.2
50000+	950	11.0	7700	89.0

Note: 860 observations missing

4.2.7 Education and Food Insecurity

There was a significant relationship between education and food insecurity, χ^2 (df = 2, N = 15290) = 422.5031, $p < .0001$. Table 4.2.7 shows the proportions of food secure and insecure households for each level of education. Those whose highest level of education was less than high school were more likely to be in a food insecure household than those who had completed high school or post-secondary.

Relationship between Food Insecurity Status and Education

Table 4.2.7: Education and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
Less Than High School	1090	30.2	2520	69.8
High School	880	18.8	3790	81.2
Post-secondary	950	13.6	6060	86.4

Note: 1120 observations missing

4.2.8 Employment Status and Food Insecurity

There was a significant relationship between employment status and food insecurity, χ^2 (df = 1, N = 15480) = 799.8752, $p < .0001$. As seen in Table 4.2.8, unemployed individuals were more than twice as likely to be in a food insecure household as those who were employed.

Relationship between Food Insecurity Status and Employment Status

Table 4.2.8: Employment and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
Not Employed	1760	30.7	3970	69.3
Employed	1190	12.2	8550	87.8

Note: 930 observations missing

4.2.9 Household Type and Food Insecurity

The relationship between household type and food insecurity was significant, χ^2 (df = 4, N = 15550) = 544.6561, $p < .0001$. Table 4.2.9 shows the proportions of food secure and insecure households by family type. The food insecurity rate was highest in lone-parent families (31%) and lowest in two-parent families with children (11%).

Relationship between Food Insecurity Status and Household Type

Table 4.2.9: Household type and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
One Person	550	23.7	1770	76.3
Lone Parent with Child(ren)	850	31.0	1890	69.0
Couple with Child(ren)	410	11.0	3310	89.0
Couple, no Children	830	15.1	4670	84.9
Other	330	27.0	890	73.0

Note: 900 observations missing

4.2.10 Household Crowding and Food Insecurity

There was a significant relationship between household crowding and food insecurity, χ^2 (df = 1, N = 15480) = 298.2699, $p < .0001$). As seen in Table 4.2.10, the proportion of food insecurity was much greater among respondents residing in crowded homes (i.e.,

more than one person per room) than among respondents living in homes with one or fewer per room.

Relationship between Food Insecurity Status and Household Crowding

Table 4.2.10: Household crowding and food insecurity

	Food Insecure		Food Secure	
	Frequency	Percentage	Frequency	Percentage
1 or Fewer per Room	2630	17.9	12040	82.1
More than 1 per Room	350	42.7	470	57.3

Note: 920 observations missing

4.3 Hierarchical Logistic Regression Model

Using ten predictors of food insecurity, a logistic regression analysis was run to examine their relationships with food insecurity among Indigenous Canadians. These predictors were entered into the regression model hierarchically in three blocks. The first block of predictors consisted of three demographic variables: age, sex and Indigenous identity. The second block contained two Indigenous-specific predictors: residential school attendance (by the respondent and/or their family members) and hunting/fishing/trapping for own use or family use. The third and final block of predictors included household income, education, employment status, household type and household crowding.

Table 4.3.1 presents the results of the hierarchical logistic regression analysis. While sex was a significant predictor of household food insecurity in the first two models, this relationship did not remain statistically significant once income, education, employment, household type and household crowding were accounted for ($p = 0.0526$). In Model 1, the association between age and household food insecurity was statistically significant and

showed that individuals under the age of 55 had higher odds of living in a food insecure household than those 55 years of age and older. These odds increased after the social determinants of health were added in Model 3, with those under the age of 55 having more than twice the odds of household food insecurity than those 55 and older. In Model 1, Inuit had quadruple the odds of household food insecurity relative to Métis (OR = 4.03, 95% CI = 3.4, 4.79). After adjusting for Indigenous-specific variables and social determinants of health, Inuit individuals still had higher odds of household food insecurity compared to Métis (OR = 2.63, 95% CI = 2.1, 3.29). These odds were much higher than those for non-Status First Nations individuals compared to Métis in the final model (OR = 1.27, 95% CI = 1.01, 1.61). There were no statistically significant associations between household food insecurity and Status First Nations individuals or those with multiple Aboriginal identities.

With respect to residential school attendance, individuals who attended residential schools were not more likely to experience food insecurity unless they also had family members who attended residential schools (only family members: OR = 1.55, 95% CI = 1.25, 1.93; both respondent and family members: OR = 1.94, 95% CI = 1.25, 3). Furthermore, those in the “not stated” category for residential school attendance had higher odds of food insecurity than those who had not attended a residential school nor had family members who attended OR = 1.62, 95% CI = 1.3, 2.02). Hunting, fishing or trapping for reasons other than self- or family-use was associated with household food insecurity in Model 2 (OR = 0.68, 95% CI = 0.54, 0.85), and this association was accounted for by the social determinants of health added in Model 3.

This analysis found an association between household income and household food insecurity. Those in the lowest income category (<\$12000) had almost 3.5 times the odds of experiencing household food insecurity than those in the \$50000+ income bracket (OR = 3.45, 95% CI = 2.54, 4.68). Individuals in the \$12000 to \$29999 and \$30000 to \$49999 income categories also had higher odds of household food insecurity than households in the highest income category (\$12000 to \$29999: OR = 2.98, 95% CI = 2.28, 3.89; \$30000 to \$49999: OR = 2.06, 95% CI = 1.65, 2.56). Employment status was a significant predictor of household food insecurity, as individuals who were not employed

had more than 2.5 times higher odds of living in a food insecure household compared to those who were employed (OR = 2.53, 95% CI = 1.61, 2.82). Compared to those whose highest level of education was high school, those who had not finished high school were more likely to live in a food insecure household (OR = 1.53, 95% = 1.23, 1.89). With respect to household type, lone-parent households had more than twice the odds of being food insecure in comparison to two-parent households (OR = 2.13, 95% CI = 1.61, 2.82). Lone-person households and other households were also more likely to be food insecure than two-parent households with children (lone-person households: OR = 1.67, 95% CI = 1.24, 2.24; other households: OR = 2.1, 95% CI = 1.46, 3.0). While 15% of couples without children were categorized as food insecure, there was no significant relationship between household food insecurity and households comprised of couples without children. Households with more than one person per room had almost twice the odds of household food insecurity compared to those with one person or fewer per room (OR = 1.98, 95% CI = 1.47, 2.67). To assess goodness of fit, the intercept-only model was tested against the full model. The test was statistically significant ($\chi^2(26) = 2406.657, p < .0001$), indicating that the predictors in the final model reliably distinguished between those who lived in food secure households and those who lived in food insecure households.

Table 4.3.1: Hierarchical Logistic Regression Model

Model	Variable	Category	β	S.E.	Wald	Pr>ChiSq	OR	95% C.I.
Model 1	Sex	*Male						
		Female	0.3685	0.0778	22.4555	<.0001	1.446	1.241, 1.684
	Age	20 to 24	0.4731	0.1238	14.5989	0.0001	1.605	1.259, 2.046
		25 to 34	0.5301	0.1121	22.3769	<.0001	1.699	1.364, 2.116
		35 to 44	0.3952	0.1243	10.1054	0.0015	1.485	1.164, 1.894
		45 to 54	0.3231	0.1335	5.8548	0.0155	1.381	1.063, 1.795
		*55+						
	Identity	First Nations – Status	0.3869	0.0878	19.397	<.0001	1.472	1.239, 1.749
		First Nations – Non Status	0.2374	0.1114	4.5427	0.0331	1.268	1.019, 1.577
		*Métis						
		Inuit	1.3942	0.0878	252.2898	<.0001	4.032	3.395, 4.789
		Multiple Aboriginal Identities	0.7098	0.3654	3.7734	0.0521	2.034	0.994, 4.162
		Intercept		-2.2493	0.1203	349.5804	<.0001	
Model 2	Sex	*Male						
		Female	0.304	0.0814	13.9336	0.0002	1.355	1.155, 1.59
	Age	20 to 24	0.5075	0.127	15.9639	<.0001	1.661	1.295, 2.131

		25 to 34	0.5495	0.1143	23.1326	<.0001	1.732	1.385, 2.167
		35 to 44	0.3921	0.1269	9.5487	0.002	1.48	1.154, 1.898
		45 to 54	0.3091	0.1344	5.2903	0.0214	1.362	1.047, 1.773
		*55+						
	Identity							
		First Nations – Status	0.2208	0.0953	5.3621	0.0206	1.247	1.034, 1.503
		First Nations – Non Status	0.2173	0.113	3.698	0.0545	1.243	0.996, 1.551
		*Métis						
		Inuit	1.2511	0.1001	156.2381	<.0001	3.494	2.872, 4.251
		Multiple Aboriginal Identities	0.6923	0.4173	2.752	0.0971	1.998	0.882, 4.528
	Residential School Attendance							
		*Neither						
		Only respondent	0.1939	0.333	0.3391	0.5604	1.214	0.632, 2.332
		Only family members	0.5379	0.1048	26.3375	<.0001	1.712	1.394, 2.103
		Both respondent and family members	0.7921	0.1928	16.8813	<.0001	2.208	1.513, 3.222
		Not stated	0.5755	0.1066	29.1672	<.0001	1.778	1.443, 2.191
	Hunting/fishing/trapping							
		*No						
		Yes, done for own/family use	-0.1002	0.098	1.0443	0.3068	0.905	0.747, 1.096
		Yes, done for other reasons	-0.3931	0.1148	11.7377	0.0006	0.675	0.539, 0.845
	Intercept		-2.4512	0.1345	332.1579	<.0001		

Model 3								
	Sex							
		*Male						
		Female	0.1681	0.0867	3.7578	0.0526	1.183	0.998, 1.402
	Age							
		20 to 24	0.7342	0.1488	24.3477	<.0001	2.084	1.557, 2.789
		25 to 34	0.8809	0.1392	40.0724	<.0001	2.413	1.837, 3.17
		35 to 44	0.8781	0.1509	33.8418	<.0001	2.406	1.79, 3.235
		45 to 54	0.8188	0.1582	26.7768	<.0001	2.268	1.663, 3.092
		*55+						
	Identity							
		First Nations – Status	-0.00795	0.1062	0.0056	0.9403	0.992	0.806, 1.222
		First Nations – Non Status	0.2419	0.1207	4.0178	0.045	1.274	1.005, 1.613
		*Métis						
		Inuit	0.9662	0.1152	70.3011	<.0001	2.628	2.097, 3.294
		Multiple Aboriginal Identities	0.4484	0.4673	0.921	0.3372	1.566	0.627, 3.913
	Residential School Attendance							
		*Neither						
		Only respondent	-0.052	0.3588	0.021	0.8847	0.949	0.47, 1.918
		Only family members	0.4394	0.1108	15.7323	<.0001	1.552	1.249, 1.928
		Both respondent and family members	0.6621	0.2231	8.8077	0.003	1.939	1.252, 3.002
		Not stated	0.4816	0.1122	18.4241	<.0001	1.619	1.299, 2.017
	Hunting/fishing/trapping							

		*No						
		Yes, done for own/family use	0.1592	0.1085	2.1546	0.1421	1.173	0.948, 1.45
		Yes, done for other reasons	-0.2033	0.1274	2.5439	0.1107	0.816	0.636, 1.048
	Household Income							
		<12000	1.2372	0.1559	63.0099	<.0001	3.446	2.539, 4.677
		12000 to 29999	1.0919	0.1356	64.795	<.0001	2.98	2.284, 3.887
		30000 to 49999	0.7214	0.1122	41.3067	<.0001	2.057	1.651, 2.564
		*50000+						
	Highest level of education							
		Less than high school	0.4225	0.109	15.0267	0.0001	1.526	1.232, 1.889
		*High school						
		Post-secondary	-0.1601	0.1109	2.0835	0.1489	0.852	0.686, 1.059
	Employment Status							
		Not employed	0.9286	0.0983	89.2198	<.0001	2.531	2.087, 3.069
		*Employed						
	Household Type							
		One person household	0.5111	0.1495	11.6906	0.0006	1.667	1.244, 2.235
		Lone parent with child(ren)	0.7553	0.1431	27.8406	<.0001	2.128	1.608, 2.818
		*Couple with child(ren)						
		Couple, no children	0.2153	0.1416	2.3108	0.1285	1.24	0.94, 1.637
		Other household	0.7396	0.183	16.342	<.0001	2.095	1.464, 2.999
	Household crowding							
		*1 or fewer per room						

	More than 1 per room	0.6848	0.152	20.3068	<.0001	1.983	1.472, 2.671
Intercept		-4.0288	0.1839	479.84	<.0001		

*Reference group

p>0.05

Model 1: N = 15580, $\chi^2(9) = 460.4759$, p<.0001

Model 2: N = 15490, $\chi^2(15) = 650.7636$, p<.0001

Model 3: N = 15200, $\chi^2(26) = 2406.657$, p<.0001

Chapter 5

5 Discussion

This chapter discusses key findings from the analysis (Section 5.1), implications for policy (Section 5.2) and study limitations (Section 5.3). This is followed by a summary of study results and conclusions in Section 5.4.

5.1 Key Findings

This study adds to the body of research focused on the links between Indigenous food insecurity and social determinants of health. The Indigenous household food insecurity rate estimated in this study was 19.2%, higher than the rate of 12.6% for all Canadian households in 2012 (Tarasuk et al., 2012). This result is consistent with previous studies which have found the food insecurity rate in Canadian Indigenous populations to be higher than the national average (Huet et al., 2012; Willows et al., 2009). Given that the association between sex and food insecurity was insignificant in the final model, the disparities in food insecurity between males and females reported in literature may be mainly accounted for income-related factors and less so by the gender-based factors mentioned in the literature (Beaumier & Ford, 2010; Ford & Berrang-Ford, 2009; Kuhnlein, 1995). Considering that the associations between age and household food insecurity persisted after controlling for Indigenous-specific and social determinants of health, changing dietary habits and access to traditional foods may account for some of this disparity. As suggested in the literature, older individuals tend to consume more traditional foods and traditional food consumption is associated with better food security (Curtis et al., 2005). The high rate of food insecurity among Inuit was consistent with previous research on Indigenous food insecurity (Egeland et al., 2010; Ford & Berrang-Ford, 2009; Huet et al., 2012; Ruiz-Castell et al., 2015). While adjusting for social determinants of health accounted for some of the disparity in food insecurity between Inuit and other Indigenous groups, they did not eliminate it. This suggests that other factors specific to Inuit communities, such as high food costs and limited access to

nutritious foods in Canada's northern communities may be responsible for Inuit food insecurity (Beaumier & Ford, 2010; Mercille et al., 2012).

Individuals who attended residential schools were not more likely to experience food insecurity than non-attendees unless they also had family members who attended residential schools. This finding suggests that the intergenerational effects of residential schooling, such as lower parental education and loss of culture, may have a stronger impact on food insecurity than the direct effects of residential schooling (Barnes et al., 2006; Bougie & Senecal, 2010; Elliott et al., 2012). Contrary to the findings in previous research, this study found no association between hunting, fishing or trapping for self- or family-use and being food secure (Ford & Berrang-Ford, 2009; Huet et al., 2012). The initially observed association between hunting/fishing/trapping for other reasons (such as pleasure and sharing with others in the community) and food security was accounted for by income-related factors, possibly due to the high costs associated with hunting and harvesting food (Ford & Beaumier, 2011).

The associations between food insecurity and social determinants of health found in this study are consistent with findings from previous studies. As expected, income was a major predictor of food insecurity, due to the fact that the measurement tool for food insecurity focuses on economic access to food (Beaumier & Ford, 2010; Chan et al., 2006; Tarasuk, 2001). The finding that 11% of Indigenous households earning over \$50000 per year were food insecure may reflect the lack of affordable market foods in northern communities and others barriers to food access, including lack of quality and variety of foods, long travel distances to obtain food and reduced access to traditional foods (Beaumier & Ford, 2010; Chan et al., 2006; Ford & Beaumier, 2011; Mercille et al., 2012).

Consistent with the literature, this analysis also found that those with lower educational attainment were more likely to live in food insecure households (De Muro & Burchi, 2007; Nord, 2009). That lack of employment was a significant predictor of food insecurity is also supported by previous research (Ford & Beaumier, 2011; Guo et al., 2015). This finding suggests that resources obtained from nonwage economies are not

enough to ensure household food security. Consistent with statistics on food insecurity by household composition, lone parent households and households with more than one person per room experienced higher rates of food insecurity (Ruiz-Castell et al., 2015; Tarasuk et al., 2012). The current findings help identify subgroups within the Indigenous population who are most vulnerable to household food insecurity.

5.2 Implications of Study Findings

Past research has revealed that Indigenous Canadians suffer from high rates of socioeconomic disadvantage which contributes to household food insecurity (Garner, 2010). Future policies and interventions should take into account the social and structural factors which have negatively impacted the socioeconomic status of Indigenous Canadians. This includes residential schooling, a distal factor which has affected Indigenous health behaviours, housing conditions, education, employment and income (C. L. Reading & Wien, 2009). As income was a major predictor of household food insecurity, policy changes should focus on reducing the cost of store foods, especially in remote and northern communities where the prices are much higher than the average food costs in Canada. It has been suggested that Indigenous peoples who wish to live off of the land should receive subsidies similar to the support farmers in Canada receive (Task Force on Aboriginal Languages and Cultures Canada, 2005). Given the high food insecurity rate among Inuit, food programs and policies should continue to target this population and northern communities where many Inuit reside. An example of such program is Nutrition North Canada, a government program which aims to reduce the high costs of food in northern communities by providing subsidies for perishable nutritious foods (Government of Canada, 2016). Participants in focus groups have also voiced support for similar programs which subsidize food costs (e.g., Food Mail, a federal program which subsidizes shipping costs of fresh foods) and hunting costs (e.g., the Nunavut Harvester Support Program which helped members obtain hunting and fishing supplies) (Chan et al., 2006). Additional funding for local community hunts and community freezers would also help save money while increasing the amount and quality of foods available.

Given the correlation between employment status and food insecurity, initiatives should focus on investing in skill development and improving access to education. With respect to cultural educational programs, young people who want to live traditional lifestyles should receive the education and financial support required to learn Indigenous languages, hunting/fishing/trapping skills and traditional food preparation (Task Force on Aboriginal Languages and Cultures Canada, 2005). Vulnerable households, such as lone-parent or households with more than one person per room may also benefit from education programs, such as financial management and cooking classes (for both traditional and store bought foods). Such resources could help vulnerable households acquire and prepare healthier meals, while adapting to the shift toward more store-bought foods in diet.

Future studies should aim to gain a comprehensive understanding of the current health status and living conditions of vulnerable groups identified in this study. Another suggestion for future research would be the validation of the 18-item HFSSM and its modified versions in Canadian Indigenous populations to determine how effectively these tools measure food insecurity in this population. In addition, development of a new tool which captures the unique food considerations such as traditional food access and food affordability would better assess food insecurity issues in this population.

5.3 Study Limitations

Although this study provides important findings on food insecurity among a large national sample of off-reserve Indigenous adults within Canada, certain subgroups were excluded from the 2012 APS. The study sample does not include Indigenous people who live on-reserve or in certain communities in Yukon and Northwest Territories (Cloutier & Langlet, 2014). Homeless individuals and those who live in collective dwellings such as prisons, nursing homes and hospitals are also excluded from the study sample (Centre for Education Statistics, 2015). Thus, the findings from this study are not generalizable to First Nations, Métis and Inuit excluded from the APS target population. Another limitation of this study is that all data from the APS survey are self-reported or proxy-reported. As such, they are subject to reporting biases and may not be completely

accurate (Donaldson & Grant-Vallone, 2002). However, the use of self-reported data allows for inclusion of a larger sample (i.e., 16410 respondents in this study).

One limitation of the food security scale is that respondents are asked about the household situations over the 12 months prior to the interview, though the situation may have changed at the time of the survey. In addition, the cross-sectional nature of the survey makes it difficult to capture transitory or seasonal food insecurity, as well as the duration and frequency of food insecurity. Additionally, the food security scale used in the APS survey does not capture all four pillars of food insecurity: access, availability, utilization and stability. As the HFSSM focuses on economic access to food, it does not capture availability of food through “socially acceptable” channels, sources of available food supply, food safety and nutritional status (Bickel et al., 2000). Thus, the quality and limited variety of market foods, a commonly cited issue in northern communities, is not accounted for in the survey. It has also been argued that the conceptualization of food insecurity does not include Indigenous-specific considerations such as harvesting, sharing and consumption of traditional foods (Power, 2008). The food security scale used in this study was designed to ask respondents about their ability to afford store foods, and thus, it does not take into account access to traditional foods. In addition, interdependence between households with respect to sharing of foods or resources is not taken into account, a factor which may be essential to the food security of low-income families or households without a hunter (Harder & Wenzel, 2012). Despite these limitations, the HFSSM is still commonly used and recognized as the best available instrument for assessing household food security (Tarasuk, 2001).

It should also be noted that the 18-item HFSSM and its modified versions used in the quantitative studies discussed in Sections 2.1 and 2.2, as well as the six-item Food Security Module in the APS used in this analysis have not been validated in Canadian Indigenous populations (Power, 2008; Skinner et al., 2014; Willows, 2005). Furthermore, modifications made to increase acceptability of the HFSSM in Indigenous populations may have changed interpretation of the scale. As such, these food security scales may not be valid or reliable for measurement of food insecurity in Indigenous populations. While the six-item APS Food Security Scale allows for valuable comparison of the prevalence

and severity of food insecurity between Indigenous and non-Indigenous populations, such scales may need to be modified for relevance and cultural acceptability in Indigenous populations (Lawn & Harvey, 2003; Skinner et al., 2014). These limitations should be addressed in future quantitative studies of Indigenous food insecurity.

5.4 Summary and Conclusions

This study aimed to examine the associations between social determinants of health, Indigenous-specific factors and household food insecurity, as these factors have not been studied together in previous quantitative research. Results from this analysis suggest that low income, Inuit identity, younger age, lone-parent households, household crowding, educational attainment less than high school and lack of employment are major risk factors for household food insecurity. As such, food security initiatives should focus on these vulnerable groups within the Indigenous population. Furthermore, policies should go beyond addressing issues at the individual level and acknowledge the social and structural factors which have negatively impacted Indigenous socioeconomic status, such as the intergenerational effect of residential schooling. Future research on food insecurity should aim to address the limitations of the current household food security survey module by validating use of the survey in Indigenous populations and developing a more culturally appropriate measurement tool.

References

- Aboriginal Affairs and Northern Development Canada (AANDC). (2011). Aboriginal Peoples and Communities. Retrieved from <http://www.aadnc-aandc.gc.ca/eng/1314977281262/1314977321448>
- Agriculture and Agri-Food Canada. (1998). *Canada's action plan for food security*. http://www.agr.gc.ca/misb/fsec-seca/pdf/action_e.pdf
- Allison, P. D. (2005). *Missing Data*. Thousand Oaks, CA: Sage.
- Barnes, R., Josefowitz, N., & Cole, E. (2006). Residential Schools: Impact on Aboriginal Students' Academic and Cognitive Development. *Canadian Journal of School Psychology, 21*(1-2), 18-32. doi:10.1177/0829573506298751
- Beaumier, M. C., & Ford, J. D. (2010). Food Insecurity among Inuit Women Exacerbated by Socio-economic Stresses and Climate Change. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique, 101*(3), 196-201.
- Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide to Measuring Household Food Security, Revised 2000*.
- Blumberg, S. J., Bialostosky, K., Hamilton, W. L., & Briefel, R. R. (1999). The effectiveness of a short form of the Household Food Security Scale. *American Journal of Public Health, 89*(8), 1231-1234.
- Bougie, E., & Senecal, S. (2010). Registered Indian Children's School Success and Intergenerational Effects of Residential Schooling in Canada. *The International Indigenous Policy Journal, 1*(1), 5. doi:10.18584/iipj.2010.1.1.5
- Budinski, R., & Langlet, E. (2015). *Aboriginal Peoples Survey 2012: User's Guide to the Public Use Microdata File (PUMF)*.
- Cafiero, C., Melgar-Quiñonez, H. R., Ballard, T. J., & Kepple, A. W. (2014). Validity and reliability of food security measures. *Annals of the New York Academy of Sciences, 1331*(1), 230-248. doi:10.1111/nyas.12594
- Centers for Disease Control and Prevention. (2004). Estimation of the Variance Using Bootstrap Weights Retrieved from ftp://ftp.cdc.gov/pub/health_statistics/nchs/Bootstrap/JCUSH/sas/Bootdoc_eng.pdf
- Centre for Education Statistics. (2015). *Statistics Canada's education-related data sources with Aboriginal identifiers*. http://www.cmec.ca/Publications/Lists/Publications/Attachments/361/Aboriginal-identifiers_EN.pdf

- Chan, H. M., Fediuk, K., Hamilton, S., Rostas, L., Caughey, A., Kuhnlein, H., . . . Loring, E. (2006). Food security in Nunavut, Canada: Barriers and recommendations. *International Journal of Circumpolar Health*, 65(5), 416-431.
- Chansonneuve, D. (2005). *Reclaiming connections: understanding residential school trauma among Aboriginal people*. Ottawa: Aboriginal Healing Foundation.
- Cloutier, E., & Langlet, E. (2014). *Aboriginal Peoples Survey, 2012: Concepts and Methods Guide*.
- Cook, J. T. (2002). Clinical implications of household food security: definitions, monitoring, and policy. *Nutrition in clinical care : an official publication of Tufts University*, 5(4), 152-167. doi:10.1046/j.1523-5408.2002.00505.x
- Council of Canadian Academies. (2014). *Aboriginal Food Security in Northern Canada: An Assessment of the State of Knowledge*. Ottawa, ON: The Expert Panel on the State of Knowledge of Food Security in Northern Canada, Council of Canadian Academies.
- Cummins, S., & Macintyre, S. (2002). "Food Deserts": Evidence And Assumption In Health Policy Making. *BMJ: British Medical Journal*, 325(7361), 436-438. doi:10.1136/bmj.325.7361.436
- Cummins, S., & Macintyre, S. (2006). Food environments and obesity - Neighbourhood or nation? *International Journal of Epidemiology*, 35(1), 100-104. doi:10.1093/ije/dyi276
- Curtis, T., Kvernmo, S., & Bjerregaard, P. (2005). Changing living conditions, life style and health. *International Journal of Circumpolar Health*, 64(5), 442-450.
- De Muro, P., & Burchi, F. (2007). *Education for Rural People and Food Security: A Cross Country Analysis* (D. o. Economics, Trans.). Rome: University Roma Tre.
- Donaldson, S. I., & Grant-Vallone, E. J. (2002). Understanding Self-Report Bias in Organizational Behavior Research. *Journal of Business and Psychology*, 17(2), 245-260. doi:10.1023/A:1019637632584
- Drewnowski, A., & Specter, S. E. (2004). Poverty and obesity: The role of energy density and energy costs. *American Journal of Clinical Nutrition*, 79(1), 6-16.
- Dyck, N. (1997). *Differing visions: administering Indian residential schooling in Prince Albert, 1867-1995*. Halifax, N.S: Fernwood.
- Economic Research Service. (2012a). *U.S. Household Food Security Survey Module: Six-Item Short Form*.
http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/short2012.pdf

- Economic Research Service. (2012b). *U.S. HOUSEHOLD FOOD SECURITY SURVEY MODULE: THREE-STAGE DESIGN, WITH SCREENERS*.
<http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#household>
- Egeland, G. M., Johnson-Down, L., Cao, Z. R. R., Sheikh, N., & Weiler, H. (2011). Food Insecurity and Nutrition Transition Combine to Affect Nutrient Intakes in Canadian Arctic Communities. *Journal of Nutrition*, *141*(9), 1746-1753. doi:10.3945/jn.111.139006
- Egeland, G. M., Pacey, A., Cao, Z., & Sobol, I. (2010). Food insecurity among Inuit preschoolers: Nunavut Inuit Child Health Survey, 2007-2008. *CMAJ*, *182*, 243-248.
- Egeland, G. M., Williamson-Bathory, L., Johnson-Down, L., & Sobol, I. (2011). Traditional food and monetary access to market-food: correlates of food insecurity among Inuit preschoolers. *International Journal of Circumpolar Health*, *70*(4), 373-383.
- Elliott, B., Jayatilaka, D., Brown, C., Varley, L., & Corbett, K. K. (2012). "We are not being heard": Aboriginal perspectives on traditional foods access and food security. *J Environ Public Health*, *2012*, 130945. doi:10.1155/2012/130945
- FAO. (2002). *The State of Food Insecurity in the World 2001*. Rome.
- FAO. (2003). *Trade Reforms and Food Security: Conceptualizing the Linkages*. Rome.
- FAO. (2005). Voluntary Guidelines to support the progressive realization of the right to adequate food in the context of national food security. Rome.
- FAO Agriculture and Development Economics Division. (2006). *Food Security*.
- Feir, D. L. (2016). The Intergenerational Effects of Residential Schools on Children's Educational Experiences in Ontario and Canada's Western Provinces. *International Indigenous Policy Journal*, *7*(3). doi:10.18584/iipj.2016.7.3.5
- First Nations Centre. (2005). *First Nations Regional Longitudinal Health Survey (RHS) 2002/2003: Results for Adults, Youth and Children Living in First Nations Communities*. Ottawa, ON: First Nations Centre at the National Aboriginal Health Organization.
- Ford, J. D. (2009). Vulnerability of Inuit food systems to food insecurity as a consequence of climate change: a case study from Igloolik, Nunavut. *Regional Environmental Change*, *9*(2), 83-100. doi:10.1007/s10113-008-0060-x
- Ford, J. D., & Beaumier, M. (2011). Feeding the family during times of stress: experience and determinants of food insecurity in an Inuit community. *Geographical Journal*, *177*, 44-61. doi:10.1111/j.1475-4959.2010.00374.x

- Ford, J. D., & Berrang-Ford, L. (2009). Food security in Igloolik, Nunavut: an exploratory study. *Polar Record*, 45(234), 225-236.
doi:10.1017/s0032247408008048
- Garner, R. (2010). The health of First Nations living off-reserve, Inuit, and Métis adults in Canada: the impact of socio-economic status on inequalities in health. *Canadian Research Index*.
- Genuis, S. K., Willows, N., & Jardine, C. (2014). Through the lens of our cameras: Children's lived experience with food security in a Canadian indigenous community. *Child: Care, Health and Development*.
doi:http://dx.doi.org/10.1111/cch.12182
- Government of Canada. (2016). Nutrition North Canada. Retrieved from <http://www.nutritionnorthcanada.gc.ca/eng/1415385762263/1415385790537>
- Guo, Y., Berrang-Ford, L., Ford, J., Lardeau, M. P., Edge, V., Patterson, K., & Harper, S. L. (2015). Seasonal prevalence and determinants of food insecurity in Iqaluit, Nunavut. *International Journal of Circumpolar Health*, 74.
doi:10.3402/ijch.v74.27284
- Hackett, C., Feeny, D., & Tompa, E. (2016). Canada's residential school system: measuring the intergenerational impact of familial attendance on health and mental health outcomes. *J Epidemiol Community Health*. doi:10.1136/jech-2016-207380
- Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo Jr, E. A., Olson, C. M., & Wehler, C. A. (1997a). *Household food security in the United States in 1995: Summary Report of the Food Security Measurement Project*. Alexandria, VA: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, U.S. Department of Agriculture.
- Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo Jr, E. A., Olson, C. M., & Wehler, C. A. (1997b). *Household food security in the United States in 1995: Technical Report of the Food Security Measurement Project*. Alexandria, VA Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, U.S. Department of Agriculture.
- Harder, M. T., & Wenzel, G. W. (2012). Inuit Subsistence, Social Economy and Food Security in Clyde River, Nunavut. *Arctic*, 65(3), 305-318.
- Health Canada. (2007). *Canadian Community Health Survey Cycle 2.2, Nutrition (2004)*. Ottawa.
- Health Canada. (2012). Determining Food Security Status. *Food and Nutrition*. Retrieved from <http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/insecurit/status-situation-eng.php>

- Henson, R. K. (2001). Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Measurement and Evaluation in Counseling and Development*, 34(3), 177-189.
- Huet, C., Rosol, R., & Egeland, G. M. (2012). The Prevalence of Food Insecurity Is High and the Diet Quality Poor in Inuit Communities. *Journal of Nutrition*, 142(3), 541-547. doi:10.3945/jn.111.149278
- Indian and Northern Affairs Canada. (2003). *Nutrition and food security in Kugaaruk, Nunavit: baseline survey for the Food Mail Pilot Project*. Ottawa, ON: Minister of Public Works and Government Services Canada.
- Indigenous and Northern Affairs Canada. (2013). Aboriginal Demographics from the 2011 National Household Survey. Retrieved from <https://www.aadnc-aandc.gc.ca/eng/1370438978311/1370439050610>
- Indigenous and Northern Affairs Canada. (2014). Aboriginal History in Canada. *Aboriginal arts, culture & heritage*. Retrieved from <https://www.aadnc-aandc.gc.ca/eng/1100100013778/1100100013779>
- Kamal, A. G., Linklater, R., Thompson, S., Dipple, J., & the Ithinto Mechisowin Committee. (2015). A Recipe for Change: Reclamation of Indigenous Food Sovereignty in O-Pipon-Na-Piwin Cree Nation for Decolonization, Resource Sharing, and Cultural Restoration. *Globalizations*, 12, 559-575. doi:10.1080/14747731.2015.1039761
- Kaspar, V. (2014). The Lifetime Effect of Residential School Attendance on Indigenous Health Status. *American Journal of Public Health*, 104(11), 2184-2190. doi:10.2105/AJPH.2013.301479
- Kerpan, S. T., Humbert, M. L., & Henry, C. J. (2015). Determinants of diet for urban aboriginal youth: implications for health promotion. *Health Promot Pract*, 16(3), 392-400. doi:10.1177/1524839914557862
- King, D. (2006). *A Brief Report of The Federal Government of Canada's Residential School System for Inuit*. Ottawa, ON: Aboriginal Healing Foundation.
- Kirkpatrick, S. I., & Tarasuk, V. (2008). Food Insecurity in Canada: Considerations for Monitoring. *Canadian Journal of Public Health / Revue Canadienne de Sante'e Publique*, 99(4), 324-327.
- Kuhnlein, H. V. (1995). Benefits and risks of traditional food for Indigenous Peoples: focus on dietary intakes of Arctic men. *Canadian Journal of Physiology and Pharmacology*, 73(6), 765-771. doi:10.1139/y95-102
- Laidler, G. J., Dialla, A., & Joamie, E. (2008). Human geographies of sea ice: freeze/thaw processes around Pangnirtung, Nunavut, Canada. *Polar Record*, 44(231), 335-361. doi:10.1017/s003224740800750x

- Lambden, J., Receveur, O., & Kuhnlein, H. V. (2007). Traditional food attributes must be included in studies of food security in the Canadian Arctic. *International Journal of Circumpolar Health*, 66(4), 308-319.
- Lang, C., Price, J. A., Pedersen, A., & Trovato, F. (2011). Indigenous People: Economic Conditions. Retrieved from <http://www.thecanadianencyclopedia.ca/en/article/aboriginal-people-economic-conditions/>
- LaRocque, E. (2014). Colonization and Racism. *Aboriginal Perspectives*. Retrieved from <http://www3.nfb.ca/enclasse/doclens/visau/index.php?mode=theme&language=english&theme=30662&film=&excerpt=&submode=about&expmode=2>
- Lawn, J., & Harvey, D. (2003). *Nutrition and Food Security in Kugaaruk, Nunavut: Baseline Survey for the Food Mail Pilot Project*. Ottawa, ON: Aboriginal Affairs and Northern Development Canada.
- Marques, E. S., Reichenheim, M. E., de Moraes, C. L., Antunes, M. M. L., & Salles-Costa, R. (2015). Household food insecurity: a systematic review of the measuring instruments used in epidemiological studies. *Public Health Nutrition*, 18(5), 877-892. doi:10.1017/s1368980014001050
- Martin, D. (2012). *Nutrition transition and the public-health crisis: Aboriginal perspectives on food and eating*. (M. Koc, J. Sumner, & A. Winson Eds.). Don Mills, ON: Oxford University Press.
- Mathur, A., Dewar, J., & DeGagne, M. (2011). *Cultivating Canada: Reconciliation through the lens of cultural diversity*. Ottawa, ON.
- McIntyre, L., Glanville, N. T., Raine, K. D., Dayle, J. B., Anderson, B., & Battaglia, N. (2003). Do low-income lone mothers compromise their nutrition to feed their children? *CMAJ*, 168(6), 686-691.
- Mercille, G., Receveur, O., & Potvin, L. (2012). Household Food Insecurity and Canadian Aboriginal Women's Self-efficacy in Food Preparation. *Canadian Journal of Dietetic Practice and Research*, 73(3), 134-140. doi:10.3148/73.3.2012.134
- Miller, J. R. (1996). *Shingwauk's vision: a history of native residential schools*. Buffalo;Toronto;: University of Toronto Press.
- Milloy, J. S. (1999). *A National Crime: The Canadian Government and the Residential School System, 1879 to 1986*.
- National Heart Lung and Blood Institute. (2012). What Are the Health Risks of Overweight and Obesity? Retrieved from <https://www.nhlbi.nih.gov/health/health-topics/topics/obe/risks>

- Nord, M. (2009). *Food insecurity in households with children: prevalence, severity, and household characteristics*.
- Nord, M., & Bickel, G. W. (2002). *Measuring children's food security in U.S. households, 1995-99* (Vol. no. 25.). Washington, DC U.S. Dept. of Agriculture, Economic Research Service.
- O'Donnell, V., & Wallace, S. (2015). *First Nations, Métis and Inuit Women*.
<http://www.statcan.gc.ca/pub/89-503-x/2010001/article/11442-eng.htm#a22>
- Ohls, J., Radbill, L., & Schirm, A. (2001). *Household Food Security in the United States, 1995–1997: Technical Issues and Statistical Report*. Alexandria, VA: USDA/Food and Nutrition Service.
- Pierce, J. T., & Dale, A. (1999). *Communities, development, and sustainability across Canada* (Vol. 4). Vancouver: UBC Press.
- Pirkle, C. M., Lucas, M., Dallaire, R., Ayotte, P., Jacobson, J. L., Jacobson, S. W., . . . Muckle, G. (2014). Food insecurity and nutritional biomarkers in relation to stature in Inuit children from Nunavik. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique*, 105(4), E233-E238.
- Power, E. M. (2008). Conceptualizing food security for aboriginal people in Canada. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique*, 99(2), 95-97.
- Price, C., Hamilton, W. L., & Cook, J. T. (1997). *Household Food Security in the United States: Guide to Implementing the Core Food Security Module*. Alexandria, VA: Office of Analysis, Nutrition, and Evaluation, Food and Nutrition Service, U.S. Department of Agriculture.
- Reading, C. L., & Wien, F. (2009). *Health Inequalities and Social Determinants of Aboriginal Peoples' Health*.
- Reading, J. (2009). *The Crisis of Chronic Disease among Aboriginal Peoples: A Challenge for Public Health, Population Health and Social Policy*. Victoria, BC: Centre for Aboriginal Health Research.
- Ross, A., Dion, J., Cantinotti, M., Collin-Vezina, D., & Paquette, L. (2015). Impact of residential schooling and of child abuse on substance use problem in Indigenous Peoples. *ADDICTIVE BEHAVIORS*, 51, 184-192.
 doi:10.1016/j.addbeh.2015.07.014
- Ruiz-Castell, M., Muckle, G., Dewailly, É., Jacobson, J. L., Jacobson, S. W., Ayotte, P., & Riva, M. (2015). Household crowding and food insecurity among Inuit families with school-aged children in the Canadian Arctic. *American Journal of Public Health*, 105(3), e122-e132. doi:<http://dx.doi.org/10.2105/AJPH.2014.302290>

- SAS Institute Inc. (2012). *SAS statistical software: Version 9.4*. Cary, NC: SAS Institute Inc.
- Schuster, R. C., Wein, E. E., Dickson, C., & Chan, H. M. (2011). Importance of traditional foods for the food security of two First Nations communities in the Yukon, Canada. *International Journal of Circumpolar Health*, 70(3), 286-300.
- Searles, E. (2008). INUIT IDENTITY IN THE CANADIAN ARCTIC. *Ethnology*, 47(4), 239-255.
- Sharma, S. (2010). Assessing diet and lifestyle in the Canadian Arctic Inuit and Inuvialuit to inform a nutrition and physical activity intervention programme: Nutrition transition in Arctic Canada. *Journal of Human Nutrition and Dietetics*, 23, 5-17. doi:10.1111/j.1365-277X.2010.01093.x
- Skinner, K., Hanning, R. M., Desjardins, E., & Tsuji, L. J. S. (2013). Giving voice to food insecurity in a remote indigenous community in subarctic Ontario, Canada: traditional ways, ways to cope, ways forward. *Bmc Public Health*, 13. doi:10.1186/1471-2458-13-427
- Skinner, K., Hanning, R. M., & Tsuji, L. J. S. (2014). Prevalence and severity of household food insecurity of First Nations people living in an on- reserve, sub-Arctic community within the Mushkegowuk Territory. *Public Health Nutrition*, 17(1), 31-39. doi:10.1017/s1368980013001705
- Statistics Canada. (2009). Average income by highest level of education attained, school/work status and gender. *School to work transitions*. Retrieved from <http://www.statcan.gc.ca/pub/81-595-m/2009075/tbl/tbl7-eng.htm>
- Statistics Canada. (2011a). Aboriginal Peoples in Canada: First Nations People, Métis and Inuit. *National Household Survey, 2011*. Retrieved from <https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-011-x/99-011-x2011001-eng.cfm>
- Statistics Canada. (2011b). Portrait of Families and Living Arrangements in Canada. *Families, households and marital status, 2011 Census of Population*. Retrieved from <http://www12.statcan.gc.ca/census-recensement/2011/as-sa/98-312-x/98-312-x2011001-eng.cfm>
- Statistics Canada. (2012, 2012). Aboriginal Peoples Survey (APS). Retrieved from <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3250&lang=en&db=imdb&adm=8&dis=2>
- Statistics Canada. (2015a). Employment Rates. *Employment*. Retrieved from <http://www.statcan.gc.ca/pub/89-645-x/2015001/employment-emploi-eng.htm>
- Statistics Canada. (2015b). Housing Conditions. Retrieved from <http://www.statcan.gc.ca/pub/89-645-x/2015001/housing-logement-eng.htm>

- Statistics Canada. (2015c). Low income cut-offs (1992 base) after tax. *Income Research Paper Series*. Retrieved from <http://www.statcan.gc.ca/pub/75f0002m/2013002/tbl/tbl01-eng.htm>
- Statistics Canada. (2016). Canadian Income Survey, 2014.
- Tanumihardjo, S. A. (2007). Poverty, obesity, and malnutrition: an international perspective recognizing the paradox. *J Am Diet Assoc*, 107(11), 1966-1972. doi:10.1016/j.jada.2007.08.007
- Tarasuk, V. (2001). *Discussion Paper on Household and Individual Food Insecurity*. Ottawa: http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/nutrition/food_sec_entire-sec_aliments_entier-eng.pdf
- Tarasuk, V., Mitchell, A., & Dachner, N. (2012). *Household food insecurity in Canada, 2012*. Toronto: <http://nutritionalsciences.lamp.utoronto.ca/>
- Task Force on Aboriginal Languages and Cultures Canada. (2005). *Towards a new beginning: a foundational report for a strategy to revitalize First Nation, Inuit and Métis languages and cultures*. Ottawa: Dept. of Canadian Heritage, Aboriginal Affairs Branch, Aboriginal Languages Directorate.
- US Department of Agriculture. (2006). *Food Insecurity and Hunger in the United States: An Assessment of the Measure*. Washington, DC: The National Academies Press.
- Wakefield, S., Fredrickson, K. R., & Brown, T. (2015). Food security and health in Canada: Imaginaries, exclusions and possibilities. *Canadian Geographer-Geographe Canadien*, 59(1), 82-92. doi:10.1111/cag.12139
- Wang, C., Burris, M.A. (1997). Photovoice: concept, methodology, and use for participatory needs assessment. *Health Education & Behavior Modification*, 24(3), 369-387.
- Wenzel, G. W., Hovelsrud-Broda, G., & Kishigami, N. (2000). *The social economy of sharing: Resource allocation and modern hunter-gatherers*. Osaka: National Museum of Ethnology.
- Wesche, S. D., & Chan, H. M. (2010). Adapting to the Impacts of Climate Change on Food Security among Inuit in the Western Canadian Arctic. *Ecohealth*, 7(3), 361-373. doi:10.1007/s10393-010-0344-8
- Willows, N. (2005). Determinants of Healthy Eating in Aboriginal Peoples in Canada: The Current State of Knowledge and Research Gaps. *Canadian Journal of Public Health*, 96, S32-36, S36-41.
- Willows, N., Veugelers, P., Raine, K., & Kuhle, S. (2009). Prevalence and sociodemographic risk factors related to household food security in Aboriginal

peoples in Canada. *Public Health Nutrition*, 12(8), 1150-1156.
doi:10.1017/s1368980008004345

Wong, G. Y., & Mason, W. M. (1985). The Hierarchical Logistic Regression Model for Multilevel Analysis. *Journal of the American Statistical Association*, 80(391), 513-524.

Appendices

Appendix A: US Household Food Security Survey Module

Appendix B: Summary of previous studies on determinants of food insecurity in Canadian Indigenous populations

Appendix A: US Household Food Security Survey Module

Questionnaire transition into module--administer to all households:

These next questions are about the food eaten in your household in the last 12 months, since (current month) of last year, and whether you were able to afford the food you need.

General food sufficiency question/screener: Questions 1, 1a, 1b (OPTIONAL: These questions are NOT used in calculating the food-security/hunger scale.)

Question 1 may be used as a screener: (a) in conjunction with income as a *preliminary* screen to reduce respondent burden for *higher income households only*; and/or (b) in conjunction with the 1st stage internal screen to make that screen "more open"--i.e., provide another route through it.

1. [IF ONE PERSON IN HOUSEHOLD, USE "I" IN PARENTHETICALS, OTHERWISE, USE "WE."]

Which of these statements best describes the food eaten in your household in the last 12 months: --enough of the kinds of food (I/we) want to eat; --enough, but not always the kinds of food (I/we) want; --sometimes not enough to eat; or, --often not enough to eat?

[1] Enough of the kinds of food we want to eat [SKIP 1a and 1b]

[2] Enough but not always the kinds of food we want [SKIP 1a; ask 1b]

[3] Sometimes not enough to eat [Ask 1a; SKIP 1b]

[4] Often not enough [Ask 1a; SKIP 1b]

[] DK or Refused (SKIP 1a and 1b)

1a. [IF OPTION 3 OR 4 SELECTED, ASK] Here are some reasons why people don't always have enough to eat. For each one, please tell me if that is a reason why YOU don't always have enough to eat. [READ LIST. MARK ALL THAT APPLY.]

YES NO DK

Not enough money for food

Not enough time for shopping or cooking

Too hard to get to the store

On a diet

No working stove available

Not able to cook or eat because of health problems

1b. [IF OPTION 2 SELECTED, ASK] Here are some reasons why people don't always have the quality or variety of food they want. For each one, please tell me if that is a reason why YOU don't always have the kinds of food you want to eat. [READ LIST.

MARK ALL THAT

APPLY.]

YES NO DK

Not enough money for food

Kinds of food (I/we) want not available

Not enough time for shopping or cooking

Too hard to get to the store

On a special diet

BEGIN FOOD-SECURITY CORE MODULE (i.e., SCALE ITEMS)

Stage 1: Questions 2-6 --ask all households:

[IF SINGLE ADULT IN HOUSEHOLD, USE "I," "MY," AND "YOU" IN PARENTHESES; OTHERWISE, USE "WE," "OUR," AND "YOUR HOUSEHOLD;"]

[IF UNKNOWN OR AMBIGUOUS, USE PLURAL FORMS.]

2. Now I'm going to read you several statements that people have made about their food situation.

For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months, that is, since last (name of current month). The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

3. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

4. "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q5 - 6; OTHERWISE SKIP TO 1st -Level Screen.]

5. "(I/we) relied on only a few kinds of low-cost food to feed (my/our) child/the children because (I was/we were) running out of money to buy food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

6. "(I/We) couldn't feed (my/our) child/the children) a balanced meal, because (I/we) couldn't afford that." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

1st-level Screen (screener for Stage 2): If AFFIRMATIVE RESPONSE to ANY ONE of Questions 2-6 (i.e., "often true" or "sometimes true") OR response [3] or [4] to Question 1 (if administered), then continue to Stage 2; otherwise, skip to end. Stage 2: Questions 7-11 --ask households passing the 1st -level Screen: (estimated 40% of hh's < 185% Poverty; 5.5% of hh's > 185% Poverty; 19% of all households). [IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q7; OTHERWISE SKIP TO Q8]

7. "(My/Our child was/The children were) not eating enough because (I/we) just couldn't afford enough food." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or R

8. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No (SKIP 8a)
- DK or R (SKIP 8a)

8a. [IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- DK or R

9. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

- Yes
- No
- DK or R

10. In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?

- Yes

- No
 DK or R

11. In the last 12 months, did you lose weight because you didn't have enough money for food?

- Yes
 No
 DK or R

2nd -level Screen (screener for Stage 3): If AFFIRMATIVE RESPONSE to ANY ONE of Questions 7 through 11, then continue to Stage 3; otherwise, skip to end. Stage 3: Questions 12-16 --ask households passing the 2nd -level Screen: (estimated 7-8% of hh's < 185% Poverty; 1-1.5% of hh's > 185% Poverty; 3-4% of all hh's).

12. In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

- Yes
 No (SKIP 12a)
 DK or R (SKIP 12a)

12a. [IF YES ABOVE, ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
 Some months but not every month
 Only 1 or 2 months
 DK or R

[IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK 13-16; OTHERWISE SKIP TO END.]

13. The next questions are about children living in the household who are under 18 years old. In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?

- Yes
 No
 DK or R

14. In the last 12 months, did (CHILD'S NAME/any of the children) ever skip meals because there wasn't enough money for food?

- Yes
 No (SKIP 14a)
 DK or R (SKIP 14a)

14a. [IF YES ABOVE ASK] How often did this happen---almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
 Some months but not every month
 Only 1 or 2 months

DK or R

15. In the last 12 months, (was your child/ were the children) ever hungry but you just couldn't afford more food?

Yes

No

DK or R

16. In the last 12 months, did (your child/any of the children) ever not eat for a whole day because there wasn't enough money for food?

Yes

No

DK or R

END OF FOOD-SECURITY/HUNGER CORE MODULE

Adapted from U.S. Household Food Security Survey Module: Three-Stage Design, With Screeners (Economic Research Service, 2012b).

Appendix B: Summary of previous studies on determinants of food insecurity in Canadian Indigenous populations

Reference	Population	Method	Objective	Results
Type	Location			
Beaumier et al., 2010 Qualitative	Inuit women (n=54) Igloolik, NU	Semi-structured interviews Focus groups Key informant interviews with health professionals	To identify and characterize determinants of food insecurity among Inuit women	Women reported regularly skipping meals and reducing food intake. Food insecurity influenced by food affordability and budgeting, food knowledge, education and preferences, food quality and availability, absence of a full-time hunter in household, cost of harvesting, poverty and addiction.
Chan et al., 2006 Qualitative	(Inuit) Community members aged 17 to 60+ (n=46) Nunavut	Focus groups	To assess community perceptions about the availability and accessibility of food	Barriers include the high costs of hunting and changes in lifestyle/cultural practices.
Egeland, 2010 Quantitative	Inuit preschoolers, aged 3 to 5 (n=388) Nunavut	18-item US Household Food Security Survey Module (INAC modification)	To determine prevalence of food insecurity among Inuit households with preschool children	Results showed that 69.6% of preschoolers lived in households that were food insecure. The weighted prevalence of child-specific food insecurity was 56.1%.

<p>Egeland, 2011</p> <p>Quantitative</p>	<p>Inuit preschoolers, aged 3 to 5 (n=388)</p> <p>Nunavut</p>	<p>18-item US Household Food Security Survey Module (INAC modification)</p>	<p>To evaluate correlates of food insecurity among Inuit preschoolers</p>	<p>Compared to children in food secure homes, children in food insecure homes were more likely to have consumed traditional food, less likely to have consumed any milk, more likely to be in public housing and in need of major repairs, had lower median healthy eating index scores and had higher sugar drink intake.</p>
<p>Elliott et al., 2012</p> <p>Qualitative</p>	<p>15 Aboriginal youth and 6 community elders</p> <p>Vancouver, BC</p>	<p>Narrative Inquiry (Story/Dialogue method)</p>	<p>To assess the challenges and barriers to traditional foods access for in an urban setting</p>	<p>Several factors that limit access to traditional foods are identified, mainly related to government policies, colonization and assimilation and environmental concerns.</p>
<p>Ford2009A</p> <p>Commentary</p>	<p>Igloolik, NU</p>		<p>To examine the vulnerability of Inuit food systems to food insecurity as a consequence of climate change</p>	<p>There is a high level of adaptive capacity with food sharing mechanisms, hunting flexibility and store-food access; however this adaptive capacity has been overwhelmed by high fuel and commodity prices, climate extremes, and underlying community vulnerabilities.</p>

Ford, 2009B Quantitative	Inuit community members (n=50) Igloolik, NU	US Household Food Security Survey Module (version similar to INAC modification)	To examine the prevalence of food insecurity, identify high risk groups and characterize factors related to food security in population	Sixty-four percent of participants reported some degree of food insecurity in past year. Being female and obtaining most food from the store was associated with a high risk of food insecurity, while consumption of traditional foods was associated with increased food security.
Ford et al., 2011 Qualitative	Community members, health professionals and policymakers (n=95) Igloolik, NU	Semi-structured interviews, focus groups and key informant interviews	To characterize the experience of food insecurity and examine conditions that affect access, availability and quality of food	The experience of food insecurity is widespread and transitory. Determinants identified include including food affordability and budgeting, food knowledge and preferences, food quality and availability, environmental stress, declining hunting activity, and the cost of harvesting.
Genuis et al., 2014 Qualitative	Children attending Kipohtakaw Education Centre (n=26) Alexander First Nation, AB	Photovoice	To understand First Nation children's experience with food and their perceptions about food security issues	Children had a dualistic understanding of healthy vs. unhealthy foods; packaged, quick-preparation foods were dominant in children's everyday food experiences; families were critical to children's food-related experiences; few traditional foods were depicted in the photographs; and photos do not tell the whole story.

Guo, 2015 Quantitative	532 households (September 2012) and 523 households (May 2013) Iqaluit, NU	18-item US Household Food Security Survey Module (modified recall period - one month)	To estimate prevalence of food insecurity and associated risk factors in two different seasons	Results showed that 28.7% of households were food insecure in September 2012 and 27.2% were insecure in May 2013. Food insecurity was significantly associated with poor quality housing, reliance on income support, unemployment and younger age of person in charge of food preparation.
Harder et al., 2012 Qualitative	10 <i>ilagiit</i> households Clyde River, NU	Observation and bi-weekly recall interviews	To examine the flow of money and resources in an Inuit extended family to understand the effects on resource sharing and food security	Resource sharing (especially of traditional foods) follows traditional kinship patterns, while individuals maintain control of their own money. These social relations can buffer the disparities between higher and lower-income households.
Huet et al., 2012 Quantitative	Inuit households (n=1901) Arctic Canada	18-item US Household Food Security Survey Module (INAC modification)	To determine prevalence, sociodemographic and dietary correlates of food insecurity	Results showed that 62.6% of households were food insecure. Household crowding, income support, public housing, single adult households and having a home in need of major repairs was significantly associated with food insecurity. The prevalence of having an active hunter in the household was higher in food secure homes.

Kamal, 2015 Commentary	O-Pipon-Na-Piwin Cree Nation, MB		To present a nuanced understanding of Indigenous food systems in Canada	Achieving food sovereignty should include Indigenous values in policies and participation in the economy. The ways in which Ithinto Mechisowin (IMP), a community-based food program, encourages reconnection with land improve access to traditional healthy foods, strengthening Indigenous food sovereignty.
Kerpan et al., 2015 Qualitative	Aboriginal high school students (n=12) A Canadian prairie city	Interviews, informal conversation and observation	To examine the determinants of diet for urban Aboriginal youth	Two themes were identified: Traditions and Sharing (i.e. food sharing networks used to acquire traditional foods and that traditional foods are considered healthy and desired by participants) and The Struggle (i.e. daily challenges; income, location and transportation acting as barriers to healthy eating).
Lambden et al., 2007 Qualitative	Yukon First Nations, Dene/Métis and Inuit women (n=1711) 44 Arctic communities	Open-ended questions	To explore changes to traditional food systems, perceived advantages and health benefits of traditional food and traditional food preferences	Traditional foods were commonly considered natural, fresh, tasty, healthy and nutritious, inexpensive and culturally beneficial. Some participants noted changes in quality and decreased availability of traditional food species.

<p>Mercille et al., 2012</p> <p>Quantitative</p>	<p>Women responsible for household food supplies (n=107)</p> <p>Atikamekw Nation, QC</p>	<p>18-item US Household Food Security Survey Module (minor changes made)</p>	<p>To explore determinants of self-efficacy related to food preparation using store-bought food, as well as to determine whether self-efficacy was associated with household food security</p>	<p>Severe food insecurity was associated with lower healthy food preparation (using store-bought food) scores.</p>
<p>Rosol et al, 2011</p> <p>Quantitative</p>	<p>Inuit adults aged 18+ (n=2595)</p> <p>Inuvialuit Settlement Region (ISR); Nunavut; Nunatsiavut Region)</p>	<p>18-item US Household Food Security Survey Module (INAC modification)</p>	<p>To assess the prevalence of food insecurity by region among Inuit households in the Canadian Arctic</p>	<p>Prevalence of food security was 68.8% in Nunavut, 43.4% in the ISR and 45.7% in Nunatsiavut Region. Of severely insecure households, 88.6% reported skipping meals, 76.9% reported going hungry and 58.2% reported not eating for a whole day. Of moderately food insecure households, 86.5% reported worrying that food would run out and 87.8% reported when the food did not last there was no money to buy more.</p>
<p>Ruiz-Castell et al., 2015</p> <p>Quantitative</p>	<p>292 Inuit primary caregiver-child dyads Nunavik, QC</p>	<p>4 questions adapted from the 18-item Food Security Scale</p>	<p>To examine the relationship between food insecurity and household crowding among Inuit families with school-aged children</p>	<p>Results showed that 62% of Inuit families lived in more crowded households and 27% of families reported reducing the size of children's meals due to lack of money. Crowded households were more likely to reduce the size of children's meals.</p>

<p>Schuster et al., 2011</p> <p>Quantitative</p>	<p>Members of Vuntut Gwitchin households (n=29) and members of Tlingit households (n=33)</p> <p>Old Crow and Teslin, YT</p>	<p>18-item US Household Food Security Survey Module</p>	<p>To evaluate food consumption patterns in the context of food security in two First Nations communities</p>	<p>Frequency of traditional food consumption did not change between 1991-1992 and 2007-2008, however there was a difference in the frequency of certain groups of foods.</p>
<p>Skinner et al., 2013</p> <p>Quantitative and Qualitative</p>	<p>First Nations adults (n=51)</p> <p>Fort Albany First Nation, ON</p>	<p>18-item US Household Food Security Survey Module</p> <p>Semi-directed interviews</p>	<p>To explore the perceptions of food insecurity by First Nations adults in a remote, on-reserve community</p>	<p>Results showed that 75.5% of respondents lived in food insecure households. Many participants reported consuming traditional foods and revealed that food sharing was a common way to adapt to food shortages. Dietary change, rationing and changing food purchasing patterns were also reported as coping strategies.</p>

<p>Skinner et al., 2014</p> <p>Quantitative</p>	<p>First Nation households (n=64)</p> <p>Fort Albany First Nation, ON</p>	<p>18-item US Household Food Security Survey Module</p>	<p>To determine the prevalence and severity of household food security in a remote, on-reserve First Nations community and evaluate the perceived relevance of the HFSSM in this population</p>	<p>Results showed that 70.3% of households were food insecure (53.1% moderately food insecure and 17.2% severely food insecure). All severely food insecure households reported worrying 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 meal. Most respondents felt the HFSSM did not measure food security for First Nations communities and mentioned the high cost of market food and traditional food practices as aspects missing from the survey.</p>
<p>Wesche et al., 2010</p> <p>Review</p>	<p>Inuvialuit Settlement Region (ISR), NU</p>		<p>To examine the impacts of climate change on Inuit diet and nutrition in Inuit communities</p>	<p>Food security is influenced by current harvesting trends, levels of reliance on individual species, opportunities for access to other traditional food species, and exposure to climate change hazards.</p>

<p>Willows et al., 2009</p> <p>Quantitative</p>	<p>All Aboriginal Canada-wide</p>	<p>18-item US Household Food Security Survey Module (part of the CCHS)</p>	<p>To determine if Aboriginal households were at higher risk for food insecurity than non-Aboriginal households, adjusting for sociodemographic factors</p>	<p>33% of Aboriginal households were food insecure, compared with 9% of non-Aboriginal households.</p>
<p>Willows et al., 2011</p> <p>Quantitative</p>	<p>All Aboriginal Canada-wide</p>	<p>18-item US Household Food Security Survey Module (part of the CCHS)</p>	<p>To determine if household food insecurity was a specific correlate of health in the Aboriginal population and to examine the relationship between household food insecurity and self-reported health, well-being and health behaviours among Aboriginal adults</p>	<p>29% of Aboriginal people 18 years of age and older reported living in food-insecure households. Compared to those in food-secure household, individuals in food-insecure households were more likely to report poor general and mental health, life dissatisfaction, high stress, smoking and a very weak sense of community belonging. Adjusting for age, gender and household education, food-insecure households were more likely to have poor general health, high stress, life dissatisfaction and a very weak sense of community belonging.</p>

Curriculum Vitae

Name: Melissa Subnath

**Post-secondary
Education and
Degrees:** Western University
London, Ontario, Canada
2014-2017 MSc

University of Waterloo
Waterloo, Ontario, Canada
2009-2014 BSc

**Honours and
Awards:** Schulich Graduate Scholarship
2014-2015

Children's Health Research Institute Quality of Life Fellowship
Grant 2015-2016

Conference Papers and Publications:

Bloom, K., Tam, J., Subnath, M., Montgomery, L., Lawton, A., & Young, R. (2014, October). *Community-university partnerships for achieving evidence based practice*. Paper presented at the Engagement Scholarship Consortium Conference, Edmonton, AB.

Khayata, K., Koyama, J., Subnath, M., & Tsai, J. (2013). Screening for Executive Functioning in Preschoolers. Knowledge Impact Strategies Consulting Ltd: Waterloo, ON. www.kimpact.ca

Presentations:

Subnath, M., Vingilis, E., & Wilk P. Aboriginal Food Insecurity in Canada: A Systematic Review. Poster Presentation at Paediatric Research Day. (London, Ontario; May 2016).

Subnath, M., Vingilis, E., & Wilk P. Aboriginal Food Insecurity in Canada: A Systematic Review. Poster Presentation at London Health Research Day. (London, Ontario; March 2016).