

Food and Nutrition Security in Newcomer Manitoba Youth

by

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A Thesis submitted to the Faculty of Graduate Studies of  
The University of Manitoba

In partial fulfilment of the requirements of the degree of

MASTER OF SCIENCE

Department of Food and Human Nutritional Sciences  
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Winnipeg

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## Abstract

Food and nutrition insecurity are public health issues in Canada that greatly impact health and well-being. Food security is a necessary condition for an adequate diet but is not enough on its own to ensure optimal growth and development. Nutrition security is an additional and necessary condition. While evidence suggests that newcomer youth may have extra vulnerability to food and nutrition insecurity, population growth continues to be supported through immigration without clear strategies to protect the right to food. This study used an observational cross-sectional design to collect survey data from 1,347 grade nine Manitoba students. Using the WEB-Q online survey, students responded to a 24-hour diet recall and questions related to experiences of food insecurity, eating behaviours, and self-reported health. Food security status was determined through responses to the Child Food Security Survey Module. The 24-hour recall was used to assess diet quality through a derived Healthy Eating Index – Canada score and adherence to dietary recommendations. Descriptive statistical analyses were performed. Further analyses compared differences between newcomer and other study participants. Eighteen percent of newcomer participants were food insecure. Regardless of food security or newcomer status, very few participants had a ‘good’ overall diet quality. Participants were particularly poor at meeting recommendations for vegetables and fruit, fibre, calcium, and vitamin D. More males met recommendations for milk and alternatives, and iron intake. Females consumed more servings of whole fruit, and dark green and orange vegetables. There were no differences found between newcomer status for overall diet quality. However, a smaller proportion of newcomer youth met recommendations for vegetables and fruit, calcium, and iron. Further, a greater proportion of newcomer youth changed their eating behaviours to gain or lose weight. There were no differences found for self-reported health variables by either food security or newcomer status. However, a greater proportion of newcomer females than males reported not getting enough sleep and lower self-rated health. Findings suggest nutrition insecurity is not limited to food insecure newcomers. If the observed diet patterns continue, high rates of chronic disease in newcomer youth will follow and may persist in adulthood.

## **Acknowledgements**

First, thank you to my advisor, Dr. Joyce Slater, for your mentoring, for your trust, and for the much-needed reality checks. I simply cannot express my gratitude for you! Thank you to my advisory committee, Dr. Riediger, Dr. Urquia, and Dr. Mignone. I am grateful for your expertise and the time you committed to support my learning. To the FANS team and lab-mates, Bhanu, Nikki, and Aynslie, thank you for talking (and typing) through my many questions, for your encouragement, and for your friendship.

Thank you to all the grade nine youth who took part in the FANS study survey. You generously shared information about your everyday life that is the backbone of this research project.

I would like to acknowledge financial support from the University of Manitoba Graduate Fellowship and research funding from the Canadian Institutes of Health Research.

Finally, thank you to Mark, Eve, Erin, and Lily for your questions, your patience, your support, and most especially, for your presence at the family dinner table.

## **Dedication**

*This thesis is dedicated to my two grandmothers, Margaret and Susie, who both passed on during my master's studies. You contributed deeply to my food journey in different and beautiful ways. Grandma Susie, through learning to bake your donuts and infamous buns, and in simmering your delicious soups, I also learned the connection and comfort that comes from preparing and sharing our family foods. Grandma Margaret, your interest in health rubbed off early in life for me, but it took until I had my own family to pursue it as a career. You were an expert in how food supports our bodies before it was trendy. Always wise and ever-learning, you are a true model and aspiration for me.*

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Citation:

Alexiuk, T. (2021). Food and nutrition security in newcomer Manitoba youth. *Journal of the Home Economics Institute of Australia*, 26(2), 23–29.

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# CHAPTER 1

## INTRODUCTION

### Overview

Food and nutrition insecurity are public health issues in Canada that have significant impacts on health, social, and education outcomes (Tarasuk & Mitchell, 2020). Despite this, little or no progress has been made to remedy the situation. There is evidence that youth, and particularly newcomer youth, have extra vulnerability to food and nutrition insecurity (Tarraf et al., 2017). And, as the government of Canada continues to support population growth in an ageing country, along with fulfillment of humanitarian promises for refugees and vulnerable persons through immigration, the newcomer population continues to grow (Citizenship and Immigration Canada, 2018). Immigration is the leading contributor to population growth in Canada, and Manitoba in particular, is expected to experience even greater increases in the proportion of newcomers living in the province than the Canadian average (Statistics Canada, 2017). It is projected that by 2036, 29-40% of the Winnipeg population will be newcomers to Canada (Statistics Canada, 2017b).

Several definitions have been suggested to describe food security. For this study, the Food and Agriculture Organization of the United Nations (2006) definition was used, in that, “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. In response to the 1998 World Food Summit, the government of Canada recognized that, “poverty reduction, social justice and sustainable food systems”, are critical components to achieve food security in a Canadian context (Government of Canada, 1998). Despite this acknowledgement, Canada received a condemning report in 2012 by United Nations Special Rapporteur on Food Security (Human Rights Council, 2012). The report noted that while Canada provides suitable civil and political rights, the protection of the right to food is inadequate. Canada is a partner in international organizations that require the protection of the right to food by its inhabitants but neither the Canadian Human Rights Act nor the 1982 Canadian Charter of Rights and Freedoms specifically address this (Human Rights Council, 2012). The report further indicated that there is no national framework or clear division of responsibility by levels of government to support the right to food. And while some strategies to target certain segments of the population exist, no province has implemented a coordinated strategy that spans related sectors including poverty reduction, protection of and access to agricultural land, local food production, food systems management, and food and nutrition

security policies (Human Rights Council, 2012). The report noted that hunger in Canada is growing, along with the number of households that require food aid to meet basic needs (Human Rights Council, 2012). Since this report, the national response has not shown significant improvement. Research by PROOF, a body that conducts food insecurity policy research in Canada, noted that despite regular monitoring of household food insecurity through national surveys, alarming rates of food insecurity continue, along with increasing reliance by households on private and charity-based food aid (Tarasuk & Mitchell, 2020).

Further to food security, *nutrition security* refers to diet patterns that include adequate “variety, diversity, nutrient content, and safety to meet the needs and food preferences for an active and healthy life” (El Bilali et al., 2019). While food security is a necessary condition for nutrition security to exist, it does not guarantee nutrition security on its own. Developed countries have high rates of nutrition-related chronic disease and the trend is also being seen in the wealthier segments of lower income countries (Moubarac, 2017; Popkin, 2012). Despite having adequate access to food, many people in Canada across income levels and other sociodemographic groups consume poor quality diets and have eating behaviours that contribute to inadequate intake of both micro- and macronutrients to support health (Garriguet, 2007; Lane et al., 2019a; Slater & Yeudall, 2015; Vatanparast et al., 2019).

Food insecurity and inadequate nutrition often go hand in hand, and both are vital to health and well-being. These insecurities have profound physical and mental impacts across the age spectrum and are particularly concerning for youth to ensure optimal growth and development and to form healthy patterns that continue into adulthood. The high rates of nutrition-related chronic disease and their increased occurrence in youth in recent years, along with the extra vulnerability that newcomer youth may face, illustrate the need to address the intersecting issues of food and nutrition insecurity in this population.

### **Study Scope**

This research project is part of the larger multi-year study entitled *FANS: Food and Nutrition Security for Manitoba Youth* that will describe the conditions of food and nutrition insecurity for youth in urban, rural, and northern regions of Manitoba. This portion of the research project focuses on conditions of food and nutrition security and self-reported health measures through the analysis of survey data for a sub-cohort of newcomer youth compared with the general youth study cohort.

### **Research Questions**

1. What is the food security status of newcomer Manitoba youth?
2. How does food security status of newcomer Manitoba youth compare to other study participants?
3. What factors are associated with food insecurity in newcomer Manitoba youth?
4. What is the dietary intake of newcomer Manitoba youth and do intakes meet dietary guidelines?
5. What are the eating behaviours of newcomer Manitoba youth?
6. What is the self-reported health of newcomer Manitoba youth?
7. How do diets, eating behaviours, and health compare to the other study participants?

### **Research Significance**

The intersection of food and nutrition insecurity is understudied, with very little research available related to the newcomer youth population in Canada. This study was conducted at a time of government commitment to increased immigration. It is also a time characterized by high rates of food insecurity. Poor diets are common among youth and food environments often do not support healthy diet choices and patterns. This study will fill several research gaps by contributing empirical information, patterns, and relationships to food and nutrition security research and can be used to inform policies, planning, and program development. Specifically, the study will report on the proportions of newcomer youth with food and nutrition insecurity, including diet adequacy and eating behaviours, and how they compare to non-newcomer youth. This research further contributes to an understanding of associations between food insecurity in newcomer youth and factors related to diets, eating behaviours, and nutrition-related health that is largely missing from the Canadian literature.

Food insecurity is commonly reported at a household level through survey responses by an adult in the household. This study will provide a measure of food insecurity as reported directly from the perspective of adolescents in the province.

In consultation with community partner Newcomers Employment and Education Development Services Inc. (N.E.E.D.S.) and other newcomer-serving stakeholders, findings from this research project will be disseminated to other stakeholders, such as community and settlement services organizations, and school administration and teachers, for the development of program and policy interventions designed for newcomer youth.

### **Thesis Structure**

This thesis is structured as a paper-based manuscript and contains the following chapters:

**Chapter 2** presents a critical review of the literature on food and nutrition insecurity, including associated factors and impacts for newcomer youth, and outlines the theoretical framework used for the study.

**Chapter 3** provides the methodology used for the study.

**Chapter 4** presents the manuscript titled, “Relationship between food security and nutrition security in newcomer Manitoba youth”.

**Chapter 5** presents the manuscript titled, “Diet patterns and self-reported health of newcomer Manitoba youth and comparisons with non-newcomer youth”.

**Chapter 6** provides an overall discussion of the main research findings, limitations, implications, and future research.

## CHAPTER 2

### LITERATURE REVIEW

#### **Newcomer Definition**

Statistics Canada defines an immigrant as a landed immigrant or a permanent resident of Canada (Statistics Canada, 2016). These individuals have formally been granted the right to permanently reside in Canada. Non-permanent residents who have a work or study permit, or who are refugee claimants are excluded from the immigrant classification (Statistics Canada, 2016). There is no generally agreed upon classification of recent versus non-recent newcomers in the Canadian research. When reporting newcomer status as a demographic descriptor, studies have reported various ranges by length of stay in Canada, most commonly including newcomers who arrived within 10 years, or no distinction at all between recent and non-recent newcomers. A recent immigrant is further defined by Statistics Canada as a person who was granted permanent resident status within five years prior to a census year (Statistics Canada, 2017). For this research study, the term newcomer is used to refer to any person in Canada who identifies that they were born outside of the country and moved to Canada within seven years of their last birthday.

#### **Food In/security**

In Canada, the discourse on household food *insecurity* is largely income-focused and has been defined separately from food security as, “inadequate or insecure access to food due to financial constraints” (Tarasuk & Mitchell, 2020). Food insecurity has been measured in Canada since 2005 through the Canadian Community Health Survey (CCHS). The CCHS includes the Household Food Security Survey Module, an 18-question module, that measures the conditions of food insecurity from Canadian respondents aged 12 years and older in French or English (Tarasuk & Mitchell, 2020). Excluded from the survey are members of the Canadian Forces, those living in institutions and on First Nations reserves, and individuals experiencing homelessness. Survey responses are used to determine levels of food insecurity with households categorized as food secure or marginally, moderately, or severely food insecure. Households classified as marginally food insecure experienced some level of concern about food access in the past 12 months. Those with moderate food insecurity experienced compromised quality and/or quantity of food in the last 12 months, and those with severe food insecurity may have reduced food intake, in some cases going full days without food in the past 12 months (Tarasuk & Mitchell, 2020).



The monitoring of food insecurity in Canada through the CCHS shows that food insecurity is a significant problem that affects over one million children (Tarasuk & Mitchell, 2020). Results from 2017-18 indicated higher rates than any year previously reported, where over 14% of Manitoba households experienced food insecurity and over 21% of children in the province were living in food insecure households (Tarasuk & Mitchell, 2020). CCHS data showed that 17% of households whose respondent identified as living in Canada for five years or less experienced food insecurity (Tarasuk & Mitchell, 2020). And while analysis by PROOF indicates that immigration on its own was not a risk factor for food insecurity, newcomers to Canada are over-represented in many of the known risk factors (Tarasuk & Mitchell, 2020). Since the CCHS does not distinguish refugees from others who identify as newcomers to Canada, it remains unclear whether refugees experience food insecurity differently than other newcomers (Tarasuk & Mitchell, 2020). In addition, as the survey captured responses only for those who spoke English or French, newcomer households who primarily speak other languages may not be included in the reported prevalence of food insecurity (Lane et al., 2019b). Results from two studies that administered surveys in the languages spoken by respondents confer under-reporting may have occurred. A Manitoba study used the same questions from the CCHS but administered the survey in the first language of newcomer participants. This study, while not representative, reported that 63% of the newcomer participants who lived in the north end of Winnipeg were food insecure (Henderson et al., 2017). The second reported that 50% of newcomer families in an urban Saskatchewan study experienced food insecurity (Lane et al., 2019b). The authors of the Saskatchewan study reported that interviewers had a relationship with newcomer families that may have contributed to increased levels of trust for participants to share struggles more freely than through telephone survey methods used by CCHS (Lane et al., 2019b). It has also been suggested that the voluntary nature of the CCHS may not capture representative responses from newcomers and that when parents act as a proxy for their children in responding to food insecurity questionnaires, rates for children are underestimated (Henderson et al., 2017; Landry et al., 2019).

Several factors have been identified as contributing to increased risk of food insecurity, including households with children under age 18, reliance on social assistance, having low-waged or unstable employment, households with a lone-parent (especially households with a female lone-parent), renting versus owning housing, and having a lower level of education (Tarasuk & Mitchell, 2020). Many of these factors disproportionately affect newcomers to

Canada. Beyond sufficient and nutritionally adequate food, newcomers may experience the additional and unique factor of cultural food insecurity.

### **Cultural Food Security**

#### *Enculturation and acculturation*

Enculturation refers to the acquisition of behaviours, values, and beliefs of one's culture (Yoon et al., 2020). With relocation to a new host country the degree to which a person retains these cultural attributes from their home country varies (Sanou et al., 2014). Food practices are one aspect of enculturation that can hold important cultural meaning. One example, expressed by an adult newcomer in a Vancouver study, was the importance of retaining the custom of eating roti at least once a day, which held strong nourishing powers to fill hunger and provide satiety (Chapman et al., 2011). In contrast, acculturation occurs when a newcomer encounters a secondary culture in their new home country and results in the adoption of new practices, values, and beliefs as length of stay continues (Sanou et al., 2014; Yoon et al., 2020). Acculturation in a new country occurs at different rates with some changes taking place over many years or even spanning generations (Yoon et al., 2020). For example, acculturation of behaviours such as adopting a new language, social relationships, and food practices often occur in the first few years after arrival, while changes in values and identities may take longer (Yoon et al., 2020). While immigration often results in the loss of familiar cultural practices, further contributing to anxiety and feelings of isolation, being able to maintain familiar food practices can provide a source of nostalgia, comfort, and community connections (Moffat et al., 2017).

#### *Dietary acculturation*

Acculturation is a broad term that encompasses the adoption of any cultural aspect of the new country. Dietary acculturation is more specific and refers to the adoption of dominant food practices and diets in a new country (Sanou et al., 2014). This may occur as newcomers lose access to their familiar foods and food practices impacting their diet and contributing to cultural food insecurity (Moffat et al., 2017). As dietary acculturation takes place in Canada, familiar foods may be replaced by a standard western diet, which is characterized by the dominance of convenience and ultra-processed foods that are high in fat, sugar, and salt (Popovic-Lipovac & Strasser, 2015). It has been argued that the shift to a standard western diet by newcomers can, in part, be attributed to the association between food insecurity and the reliance on diets that are energy-dense and higher in refined grains, added sugars, and fats (Moffat et al., 2017). It has also been reported that despite the strong attachment and longing for familiar foods, newcomers who are food insecure face limitations to eat their preferred foods, which then encourages the acceleration of dietary transition to a western diet (Blanchet, Nana, Sanou, Batal, & Giroux,

2018; Henderson et al., 2017; Rodriguez, Dean, Kirkpatrick, Berbary, & Scott, 2016). Newcomer parents indicated that members within families sometimes consumed different diets, i.e. adults continued eating familiar foods but purchased or prepared foods more commonly used in Canada for their children (typically convenience foods), especially for lunches packed for consumption at school (Henderson & Slater, 2019). For newcomer children, dietary acculturation usually resulted in consuming more highly-processed foods and reduced diet quality (Henderson & Slater, 2019). Factors that have been identified as contributing to cultural food insecurity also logically play a role in facilitating dietary acculturation for newcomers.

#### *Food environment factors*

An inadequate food environment exacerbates the struggles for those who cannot afford an adequate diet (Rodriguez et al., 2016). While cultural and familiar foods may be available, especially in larger urban centres, they can remain inaccessible to many newcomers because of high cost, distance to stores with suitable foods, and time constraints (Moffat et al., 2017). Newcomer families with low income have reported that they often cannot afford to purchase the more expensive nutritious foods they would like. Respondents shared that in order to balance their income with other basic needs, they purchased poorer quality produce at lower cost or made use of food banks (Rodriguez et al., 2016). Some newcomers reported that certain luxury items from their home country, like meat, is less expensive in Canada and led them to consume more meat (Henderson et al., 2017), accelerating their transition to a western diet.

For some newcomers, grocery stores were geographically accessible, but these stores did not stock their preferred foods, such as fresh foods versus frozen or canned. In addition, climate and land zoning policies limit the ability of newcomers to access foods through temporary fresh food markets or to grow their own garden foods (Henderson et al., 2017; Rodriguez et al., 2016). In contrast to limited access of nutritious fresh foods, the food environment in Canada has wide availability of ultra-processed foods in the market, making these foods an easy option (Henderson et al., 2017)

Shopping for food in the large Canadian grocery stores is different than the experience in the home countries of many newcomers who may be accustomed to getting foods directly from farms, their own gardens, or from fresh food markets. Not only are the food stores different, many newcomers expressed difficulty in reading food labels on packages in Canada (Moffat et al., 2017). For those who cannot interpret food labels, it is challenging to make nutritious choices or to prepare unfamiliar foods.

### *Sociocultural factors*

Newcomer adults often maintain a strong attachment to cooking familiar foods but experience pressure, especially from their children, to adopt the unhealthy eating patterns widely consumed by the dominant population (Rodriguez et al., 2016). Many newcomers have limited knowledge of Canadian food practices before arrival and often must learn to cook with new ingredients and unfamiliar kitchen appliances (Moffat et al., 2017; Rodriguez et al., 2016). When pressured by children to provide Canadian foods like pizza and fried chicken, newcomers who did not know how to prepare them reported purchasing the packaged, ultra-processed versions and some newcomer parents did not understand that regular consumption of such foods contribute to poor health (Henderson et al., 2017; Moffat et al., 2017). Newcomers can be additionally challenged in using the nutritious foods that are accessible when they do not have the knowledge and resources to prepare them (Moffat et al., 2017).

The food preferences of newcomers can also contribute to a loss of cultural food security. Newcomers expressed dissatisfaction with the quality of preferred foods, lack of enjoyment of their new diet, and the added expense of culturally appropriate foods, such as halal meats (Girard & Sercia, 2013; Moffat et al., 2017). Families who made use of food banks reported that foods offered often were not appropriate. And while some families refused to make use of food banks due to the lack of appropriate or poor quality foods, other families were unaware of eligibility or did not feel they were “needy” enough (Moffat et al., 2017).

Despite newcomers reporting confidence in their food skills and nutrition knowledge, many also expressed time constraints due to employment, finding suitable housing upon arrival, and attending language or settlement classes (Blanchet et al., 2018; Girard & Sercia, 2013; Henderson et al., 2017). These time constraints led to taking shortcuts in food preparation that included reliance on convenience and ultra-processed foods (Blanchet et al., 2018; Henderson et al., 2017).

### *Children and youth*

Pressure from children was a common theme from research that asked newcomer parents about dietary adaptation in Canada. While parents play a role in shaping the diet preferences and food consumption in newcomer families, children also influence their parents (Blanchet et al., 2018). Children and youth have extra vulnerability through peer and social pressures, personal preferences, and the school food environment they face that leads to the desire to consume the widely available ultra-processed foods (Henderson et al., 2017).

Whether the shift to a western diet is accelerated by the experience of food insecurity or not, the result of diet transition is typically to a diet pattern of reduced quality and susceptibility to nutrition insecurity.

### **Nutrition In/security**

Using the Health Canada Surveillance Tool Tier System, 2015 CCHS diet recall data was analyzed for over 13,000 adults (aged 19 and older) who lived in Canada (Hack et al., 2020). Results of the study found that while minimal improvements in diet quality occurred since the 2004 CCHS cycle, diet quality remained low. Adults across sex and age groups did not meet recommendations for food groups and approximately one quarter of daily caloric intake was from “other” foods or foods not recommended (Hack et al., 2020). The study authors also noted that sodium intake was high overall, even for those most compliant with dietary reference intake recommendations (Hack et al., 2020). Finally, it was reported that as diet quality decreased, intake of potassium, vitamin D, calcium, and iron also decreased (Hack et al., 2020).

The last population-based analysis of *overall* diet quality for children and youth in Canada was part of the 2004 CCHS cycle, which is out of date. However, analysis of the more recent 2015 cycle that evaluated dietary intakes based on nutrients of concern, showed that youth have diets high in saturated fats, sugars, and sodium (Hack et al., 2021). Despite a lack of available recent comprehensive national analysis of diets for children and youth, there are a few smaller provincial/regional studies that reported on diet quality. Students in a 2016 pilot study of 132 Manitoba youth displayed poor nutritional quality. Ninety percent of the study participants did not meet recommended intake of vegetables and fruit, and reported inadequate intakes of fibre, calcium, and vitamin D (Slater & Colatruglio, 2016). The youth did not meet minimum recommendations for any of the food groups and most did not eat breakfast daily, yet reported consuming “other” foods such as soft drinks, candy, and salty snacks every day, which likely contributed to the excess sugar and sodium consumption reported (Slater & Colatruglio, 2016). A separate 2019 study in Saskatchewan that assessed the diet intake of 300 newcomer children ages 3-13 reported similar results. About 80% and 90% of newcomer children in their study were at risk for inadequate calcium and vitamin D intake, respectively (Lane et al., 2019a). On average, the children ate only two servings of vegetables and fruit per day, and just three percent met fibre intake recommendations (Lane et al., 2019a). A third study in Alberta analyzed the diet intake of 2,731 grade five students in 2014 and reported that only 26% of children in the study consumed adequate vegetables and fruit, and fewer (8%) children met Canada Food Guide (2007) recommendations for all food groups (Bukambu et al., 2020). Another study used the

2015 CCHS data to report specifically on snack patterns by Canadians but did not analyze overall diet quality. The authors found that most youth aged 13-18 years consumed two or three snacks a day, and 26% of daily energy intake in this age group came from snacking (Vatanparast et al., 2019). In addition, these snacks contributed 34% of sugars consumed per day and over three quarters of the grains consumed during snacks did not come from whole grains (Vatanparast et al., 2019). A further study described the food behaviours of children (grades 5-8) and youth (grades 9-12) in the three provinces Ontario, Quebec, and PEI. This study reported that the older group of adolescents were more likely to skip breakfast, to eat fewer meals with a family member, and to eat at fast food restaurants or other food stores (Lillico et al., 2014). Results from these studies all confer that children and youth in Canada are not consuming nutritionally adequate diets and are often engaging in eating behaviours associated with reduced diet quality.

Similar to food insecurity, the factors that contribute to nutrition insecurity are complex and inter-related ranging from the food environment itself to family and individual factors. Income-based reports on food insecurity show that food preparation skills, cooking ability, and adapting recipes to reduce salt, sugar, and fat of adults are similar in both those who are food secure and food insecure (PROOF, 2017). Despite this, those without the necessary food skills to plan, purchase, and prepare foods may be at risk for nutrition insecurity since eating meals prepared at home is associated with better diet quality (Watts et al., 2017).

#### *Food environment factors*

Ultra-processed foods are food products that have been manufactured from substances derived from food plus additional industrial ingredients, containing few recognizable food ingredients. The result is convenient and highly palatable food substances, such as fast food, sugary drinks, confectioneries, reconstituted meat products, ready-to-heat or -eat selections, and packaged sweet or salty snacks. Ultra-processed foods are widely available in the food system. They are designed to be attractive and are aggressively marketed, especially targeted at children and youth (Moubarac, 2017). Consumption of ultra-processed foods results in the displacement of other foods in the diet (Moubarac, 2017).

Moubarac (2017) analyzed 2015 youth and adult CCHS data to describe consumption of ultra-processed foods in Canada. According to this analysis, intake was similar across income groups and highest in children and youth, where 54% of energy intake in the 14-18 year age group came from ultra-processed foods (Moubarac, 2017). Diets high in these manufactured foods are not nutritionally adequate. Ultra-processed foods tend to be more energy dense, contain

more sugar and sodium, and less fibre, protein, and micro-nutrients than minimally processed foods (Moubarac, 2017).

A small study in Vancouver similarly reported that consumption of fast foods, snacks, and sugary drinks increased in adolescence and pointed to evidence that eating away from home is associated with poorer diet quality (Watts et al., 2017). In interviews with adolescents aged 11-16 who were seeking treatment for obesity, it was reported that those who purchased more snacks from school vending machines or food stores had lower diet quality scores (Watts et al., 2017). This study also noted that half of Canadian children and adolescents consumed foods prepared outside the home on any given day, while consuming lunches brought from home was associated with higher intake of vegetables and fruit (Watts et al., 2017). It is not surprising that eating foods prepared outside the home is a factor for nutrition insecurity, given that generally, foods available for purchase at or near school/work have limited options for fruit, vegetables, and whole grains (Slater & Yeudall, 2015). And of the thousands of new food products that enter the North American food market each year, it is foods high in fat, sugar, and salt that dominate (Nardocci, Leclerc, et al., 2019; Slater & Yeudall, 2015). The lower cost and high availability of some foods that are considered prestigious in the home country of some newcomers, have been reported to increase the frequency of eating such foods (Blanchet et al., 2018). For some newcomers to Canada, the aggressive food marketing, availability, and low cost of ultra-processed foods, coupled with a lack of understanding of long-term health effects of diets high in such foods add to vulnerability for an inadequate diet

In addition to the wide availability of nutritionally inadequate food, many students face short meal breaks that do not allow sufficient time to eat (Slater & Yeudall, 2015). Newcomer parents described barriers to reheating foods brought from home during lunch deterred them from sending familiar home-prepared foods and affected the foods their children ate during the school day (Henderson et al., 2017).

### *Social and personal factors*

Planning, purchasing, and preparing foods first requires considerable knowledge, skills, motivation, and self-efficacy (Slater & Yeudall, 2015). Food knowledge and skills exchange can take place within families, social networks, or at school. But research shows that many families do not eat meals together regularly and that food skills mentoring has declined due in part to time constraints and a lack of value placed on domestic food skills (Slater & Yeudall, 2015). Eating meals together with family is associated with increased vegetables and fruit consumption and better diet quality in general (Lillico et al., 2014). In addition, formal food skills and literacy

education classes are not required in many Canadian schools, potentially putting youth at extra risk for nutrition insecurity now and as they grow into adulthood. However, possessing food skills and the confidence to use them is not enough to ensure nutritious foods can be prepared in the home. Physical infrastructure, including adequate housing, kitchens, and equipment are also necessary (Slater & Yeudall, 2015).

Personal beliefs, social norms, and cultural values, such as perceptions, palatability, and meaning of foods also contribute to diet patterns (Slater & Yeudall, 2015). This may particularly affect newcomers to Canada who face different social networks in a new country and lead to shifts in diet patterns. The attitudes and parenting practices of newcomer families can influence the food preferences of youth in the household. Parents who are open to trying new foods may continue to prepare their more familiar foods by substituting ingredients that are commonly available in Canadian food stores (Blanchet et al., 2018). On the other hand, parenting practices that use highly processed western foods as rewards may inadvertently encourage preferences for such foods in their children (Blanchet et al., 2018). In addition, newcomer parents often express pressure from their children who refuse to bring foods to school that smell different from the foods eaten by their peers, and to request western-style foods like pizza and sandwiches that are consumed in their peer circles (Blanchet et al., 2018; Lane et al., 2019a). Without the knowledge and skills to prepare these foods, newcomer parents may rely on nutritionally inadequate prepared versions in food stores (Henderson et al., 2017). Newcomer participants in Saskatchewan described difficulties in continuing with traditional diet patterns with a busy schedule and pressures from children, along with diet changes due to exposure to new social networks (Lane et al., 2019a).

As previously mentioned, older adolescents are particularly likely to engage in certain food behaviours that are associated with lower diet quality. A multi-province study reported that one third of 14-18 year-old participants consumed fast food in the 24-hours prior to being surveyed (Lillico et al., 2014). Fast food is associated with increased caloric intake, high in sugars and fats, and associated with reduced vegetables and fruit consumption (Lillico et al., 2014).

Adolescents of all genders are vulnerable to weight-related eating behaviours. European-based research indicated that females were more likely to engage in weight reduction behaviours, but rates were on the rise for males (Dzielska et al., 2020). In Canada, more than one third of youth in grades six to ten who had a healthy weight reported feeling that their body was either too fat or too thin (Public Health Agency of Canada, 2012). A U.S.-based study reported that



46% of their participants who had arrived in the U.S. within one year had tried to lose weight (Sastre & Haldeman, 2020). This study suggested that generational differences may occur within newcomer families with parents placing social value on weight gain, while adolescents valued weight loss. Close to half of the newcomer families in their study discussed the weight of their adolescents indicating the possibility of added sensitivity to weight status for recent newcomers. Restricting food at meal times may lead to increased snacking at other times of the day, which has been shown in other research to consist of foods with poorer nutrient composition (Vatanparast et al., 2019)

The school and community food environment combined with peer influence can impact eating behaviours of youth differently from adult newcomers, setting the stage for poor diet and resulting health conditions.

### **Healthy Immigrant Effect**

The healthy immigrant effect has been used to describe the occurrence where immigrants arrive in a new country with better health than the host country population (Sanou et al., 2014). However, as length of stay in the new country continues, the health advantage declines due to lifestyle and diet changes (Sanou et al., 2014). In Canada, this effect may be mediated in part due to immigration practices where economic class immigrants are selected based on higher education and language skills, and the health screening measures that are in place (Lu & Ng, 2019). A 2015 review study found that the healthy immigrant effect is greater for newcomers who immigrate to Canada or the U.S. compared to some European countries like Sweden, Germany, and the Netherlands, and greater health declines were reported for newcomers who arrived in a new country before they reached adulthood (Popovic-Lipovac & Strasser, 2015). Newcomers have shown health decline in terms of increased body mass index (BMI), increased health care usage, development of chronic disease such as type 2 diabetes and cardiovascular disease, increased mental illness, and reduced self-assessed health (Popovic-Lipovac & Strasser, 2015; Sanou et al., 2014). These adverse changes in health were observed across socioeconomic status (Sanou et al., 2014). Changes in diet with adoption of a western diet were associated with greater intake of fats and sugars, lower intake of vegetables and fruit, along with eating away from home more frequently (Popovic-Lipovac & Strasser, 2015). Children tended to become more acculturated than their parents and reported preferring western foods due to convenience, taste, lower cost, peer influence, and advertising (Blanchet et al., 2018). Adults reported changes in diet were moderated by busy schedules, influence of social networks, familiarity with

shopping at food stores, using new foods, and knowledge of techniques to cook new foods (Sanou et al., 2014).

A 2017 systematic review examined 78 studies that compared the health of newcomers with Canadian-born individuals (Vang et al., 2017). The studies ranged in date from 1980 to 2014, with 85% of studies occurring between 2000 and 2014. Most of the studies examined adults, and only seven percent compared health of youth. Results of the review reported inconsistencies to better health experienced by newcomers. Some studies showed more psychological distress in newcomer children and others reported better mental health in first generation newcomer children compared to those born in Canada, and weight gain over time was inconsistent between the two populations (Vang et al., 2017). It was suggested that the healthy immigrant effect may not be as strong in younger ages, but other theories include that health measures are not as sensitive in younger years when health issues are less severe, or that the effect applies only to adults in the family who initiate the immigration application process (Vang et al., 2017). In adults, the review reported that newcomers tended to have less prevalence of asthma, diabetes, and cardiovascular disease than Canadian-born (Vang et al., 2017). In addition, less anxiety, depression, and distress were reported in newcomer adults, but only within 10 years of arrival in Canada (Vang et al., 2017). Analysis of four cycles of CCHS data found lower BMI in newcomer youth and an associated increase in odds of having overweight or obesity with length of stay in Canada (Wahi et al., 2014). Some research noted that over time in Canada, the health status of newcomers approached the average health status of those Canadian-born, while other research showed worse health outcomes than Canadian-born. Overall, health advantages tended to disappear around 10 years in Canada, with the biggest health advantages noted in adulthood and less apparent in children and older adults (Vang et al., 2017).

In recent research, it has been noted that some immigrants from countries in a pre-transition stage may be introduced to shifts in diet, such as increased consumption of sugary drinks and processed food and decreased vegetables and fruit intake, before arrival in a higher income country (Lane et al., 2019a). This suggests that as global diets change, the healthy immigrant effect observed in countries like Canada may become less pronounced. It should also be noted that dietary change is only one factor associated with health decline during continued stay in a new country. Other factors that also play a role are stress and the adoption of other risky health behaviours, such as physical inactivity and smoking (Lu & Ng, 2019; Sanou et al., 2014).

## **Intersection of Food and Nutrition Insecurity**

Food insecurity and inadequate nutrition often go hand in hand. However, both adequate diets and food security are vital to health and well-being, particularly for youth to ensure optimal growth and development. Parents who experience food insecurity reported buying less nutritionally adequate food to fill hunger and restricting their own food intake before reducing portions for their children (Lane et al., 2019b). Whether the amount of food is adequate or not, food insecurity is associated with poorer diet quality. Newcomer adult participants in Montreal who experienced food insecurity were more likely to consume more soft drinks and white bread products, and fewer fruits, vegetables, dairy, meat, and fish than those who were food secure (Girard & Sercia, 2013). A 2019 study in the U.S., surveyed children aged 7-13 directly to assess their food security status and diet quality intake. Measured using the Health Eating Index 2015 score, they found that, in general, the diet quality of all children was low, but that children who were food insecure showed even lower diet quality scores (Landry et al., 2019). Children who were food insecure consumed fewer greens, legumes, seafood, and plant protein foods, along with greater consumption of added sugars, compared to children who were food secure (Landry et al., 2019). These results are similar to research that compared adult diet quality with food insecurity status (Landry et al., 2019). In understanding diet patterns of newcomer children, researchers found that while refugees had additional risk of deficiencies, both immigrant class and refugee class children had low fibre intakes and were at increased risk for inadequate nutrient intakes of calcium, zinc, and vitamin D (Lane et al., 2019a), which suggests that it is not just the poorest children who are at risk for nutrition insecurity.

## **Impacts of Food and Nutrition Insecurity**

Food and nutrition insecurity greatly impact physical and mental health and well-being across the age spectrum. In childhood, an inadequate diet is associated with social, mental, emotional, and physical impacts that include inattention, hyperactivity, learning challenges, and overall poor performance in school (Che & Chen, 2001; Lane et al., 2019a; PROOF, 2018). Children who experience food or nutrition insecurity are at increased risk for asthma and depression (PROOF, 2018). In addition, diet inadequacies during developmental stages of childhood and adolescence increase the risk of impaired bone development (Lane et al., 2019a). Adolescents with inadequate diets have a greater risk of asthma, depression, and suicidal ideation (Lane et al., 2019b; PROOF, 2018). Food and nutrition insecurity experienced in adulthood increase the risk of several physical and mental health issues, such as type 2 diabetes, cardiovascular disease, anxiety, and suicidal thoughts (PROOF, 2018; Slater & Colatruglio, 2016). Food insecure adults are more likely to report reduced perceived health, skip or reduce

intake of prescription medications, make greater use of health care services, and experience multiple chronic health conditions (PROOF, 2018). According to 2017 CCHS data, 34% of adults aged 20 and older had been diagnosed with at least major chronic disease (Public Health Agency of Canada, 2019b). In an analysis of Canadian adult diets, those who consumed the most ultra-processed foods as a proportion of total energy intake had higher odds of obesity (31%), diabetes (37%), and hypertension (60%) (Nardocci, Polsky, et al., 2019).

### *Overweight and obesity*

For some demographic groups, those who experience food and nutrition insecurity are at greater risk of overweight and obesity. In a study of newcomer children, it was reported that risk of overweight and obesity was greater for older children in families with higher socioeconomic status and for those with nutrition insecurity (Lane et al., 2019a). It has also been reported that for people with food insecurity, when food is available, they are more likely to binge eat or to consume more energy dense foods (Che & Chen, 2001). In addition, one study found greater occurrence of obesity in adults when higher proportions of daily energy intake came from ultra-processed foods (Nardocci, Polsky, et al., 2019). A U.S.-based study with newcomer adolescents found that higher BMI status was associated with both greater dietary acculturation and body dissatisfaction (Sastre & Haldeman, 2020).

In 2017, 30% of children and youth in Canada had overweight or obesity (Public Health Agency of Canada, 2018). Excess weight in children and youth doubled in the past four decades and has remained relatively stable over the past ten years (Rao et al., 2016). Obesity tends to increase throughout childhood and adolescence and continue into adulthood (Rao et al., 2016). The Heart and Stroke Foundation reported that 60% of adults had overweight or obesity (Heart and Stroke Foundation, 2020a). BMI is correlated with both short- and long-term health outcomes, and children and youth in Canada have experienced increases in chronic diseases such as type 2 diabetes, high blood cholesterol and blood pressure, along with joint issues and depression (Rao et al., 2016). Correlation of BMI with long-term health is of particular interest as the beginnings of chronic disease in childhood/youth may continue to develop with greater effects not seen until later in adulthood.

### *Diabetes*

Diabetes Canada identifies an adequate diet as the most important lifestyle factor to reduce risk of type 2 diabetes, which constitutes 90% of total diabetes cases (Diabetes Canada, 2020c). Across Canada, 8.8% of individuals aged one year and older had diagnosed diabetes in 2016-17 (Public Health Agency of Canada, 2019b). The rates in Manitoba are higher, where in

2015, almost 10% of people had the disease (Government of Manitoba, 2018). Once only seen in adults, type 2 diabetes is increasingly occurring in adolescents and children (Diabetes Canada, 2020a).

Not only are those with poor diets more at risk for incidence of diabetes, having food insecurity is associated with difficulty in managing the existing disease and may further exacerbate the condition (PROOF, 2018). Having diabetes is linked to occurrence of other chronic conditions including heart disease, high blood pressure, kidney disease, and mental health conditions (Diabetes Canada, 2020b). When not properly managed, diabetes complications can be as extreme as loss of sight or amputation of a limb (Diabetes Canada, 2020b).

### *Cardiovascular disease*

Cardiovascular disease encompasses a group of heart conditions, many of which are preventable by lifestyle factors including healthy eating patterns and maintaining a healthy weight (Heart and Stroke Foundation, 2020b). Diets that include adequate vegetables, fruit, and whole grains, and limits ultra-processed foods that are high in salt, sugar, and fat help to prevent premature heart disease (Nardocci, Polsky, et al., 2019). Other risk factors for heart disease include obesity, diabetes, and high blood pressure, all of which are associated with unhealthy diets (Nardocci, Polsky, et al., 2019).

The Healthy Immigrant Children study in Saskatchewan found that both newcomer and Canadian-born children reported sodium intake above recommended limits (Lane et al., 2019a). The same study also noted that the newcomer children who consumed the diets highest in sodium, were at greater risk of high blood pressure which is a risk factor for heart disease (Lane et al., 2019a).

For many newcomer children, dietary changes during acculturation in Canada can lead to increased consumption of fat, sugar, and sodium, and there are indications that dietary patterns established in childhood continue into adulthood (Landry et al., 2019; Lane et al., 2019a). Not only do short-term health impacts limit optimal growth and development of children and adolescents, eating a poor diet during critical periods and early signs of noncommunicable diseases in younger years may set the stage for greater health impacts in adulthood.

### *Mental Health*

Food and nutrition security also appear to play a role in mental health of children, youth, and adults. Research has found that optimal mental health requires an appropriate balance of essential nutrient intake and that a good quality diet provides protection against mental health

issues (Davison et al., 2017). This same research reported a bi-directional relationship between food insecurity, diet quality, and mental health for adults. Food insecurity and nutrition insecurity independently predicted lower mental health, and experiencing either food insecurity or poor mental health contributed to poorer dietary intake (Davison et al., 2017). A relationship between food insecurity and mental health is apparent among children as well. A longitudinal study that tracked depression in adolescence and young adulthood, reported an independent relationship with experiencing hunger in youth and depression over the subsequent six years, even after accounting for sociodemographic and family factors (McIntyre et al., 2017).

### *Body image*

Poor body image is common in adolescents, even for youth with a healthy weight. Body dissatisfaction is associated with poorer emotional well-being, low self-esteem, and can lead to eating disorders (Public Health Agency of Canada, 2012). Youth who engage in restrictive eating behaviours are at risk for nutrient deficiencies and chronic diseases such as diabetes, cardiovascular disease, and osteoporosis (Dzielska et al., 2020).

### *Sleep*

Current guidelines indicate that youth aged 14-17 years old should get eight to ten hours of sleep per night to support health and well-being (Public Health Agency of Canada, 2019a). However, many children in Canada have difficulty falling asleep and staying asleep and do not feel refreshed after a night of sleep. A cross-national U.S.-based study found an association between food insecurity, sleep, and mental health disorders. Compared with food secure young adults, those who were food insecure reported increased odds of having difficulty falling and staying asleep, and were more likely to be diagnosed with depression, anxiety, and suicidality (Nagata et al., 2019).

### **Research Gaps**

While there is current research that describes the prevalence and experiences of household food insecurity in Canada, and the reported short and long-term health impacts of having food and nutrition insecurity, significant gaps in research remain. First, the rates of food insecurity for children and youth in Canada have been measured through surveys or interviews of parents rather than directly from children and youth themselves. In addition, the current body of literature fails to describe food insecurity from a Canadian perspective beyond the discourse on financial constraints. Also missing is a recent analysis of nutrition security for Canadian youth with significant sample size. The few existing small sample size studies with children recruited participants only in localized urban regions, which are not representative of the general youth population. Most significantly, there is lack of research that describes how concepts of food and

nutrition insecurity intersect, including who is more at risk due to this intersection, and the diet intake patterns of those affected. In addition, there is no Canadian research that compares consumption patterns of newcomer youth, who may be at greater risk of both food and nutrition insecurity, with those born in Canada. There are also few Canadian studies that link youth food insecurity with diet adequacy and its related health outcomes. It follows, that without this necessary research, there remains a lack of informed interventions to address significant effects for newcomer children and youth.

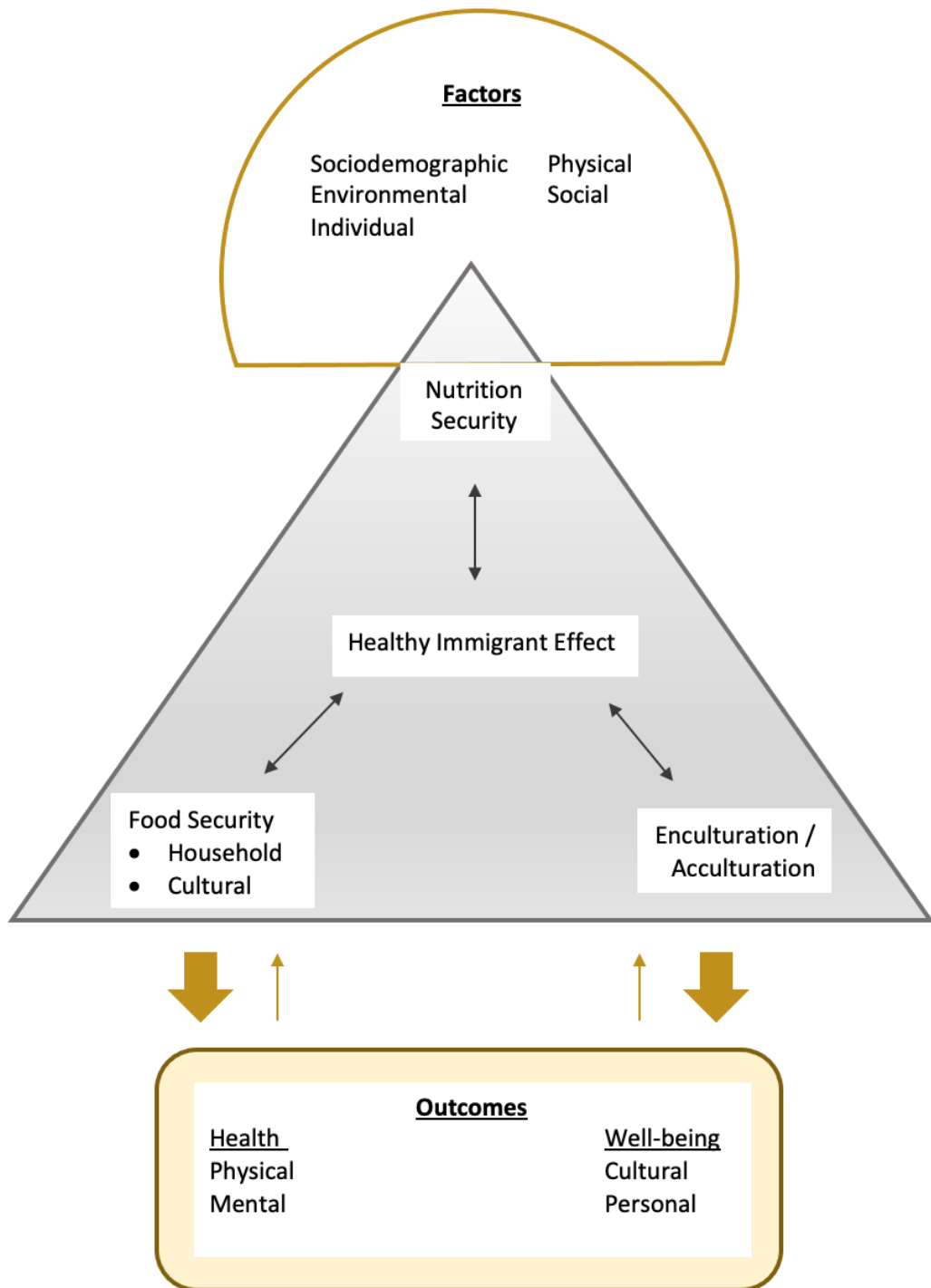
### **Theoretical Framework**

To conceptualize how the concepts, experiences, and impacts of food and nutrition insecurity in newcomer youth are connected, a theoretical framework was developed incorporating three previously described theories: 1) Acculturation/Enculturation; 2) Healthy Immigrant Effect (HIE); and 3) Household and Cultural Food Insecurity.

It is common for newcomers to Canada to experience low income as they gain footing in their new host country due to factors that include unstable employment and language barriers. This limits reliable access to familiar and acceptable foods and can result in both household and cultural food insecurity. This vulnerability to food insecurity also contributes to experiencing shifts in diet patterns as newcomers adopt the foods and food practices of their new country. This dietary acculturation is typically characterized by an increased consumption of ultra-processed and convenience foods which contributes to worsening diet quality. While food insecurity may increase the rate of diet acculturation, it is not a necessary condition to the deterioration of diet patterns. The healthy immigrant effect is the reported phenomenon where newcomers arrive in better health than the typical Canadian-born individual but experience a decline in health as length of stay continues. An increased consumption of a western diet in the new host country plays a significant role in this observed health decline. Each of these concepts on their own play a role in chronic disease and other adverse outcomes, but together, intersect to create an unequal vulnerability for newcomers, and particularly for newcomer youth. The theoretical framework used to explain the problem and to guide the development of research questions for the study is depicted in Figure 2.1.

Figure 2.1

*Food and Nutrition Security in Newcomer Manitoba Youth Theoretical Framework*





## **CHAPTER 3**

### **METHODOLOGY**

Survey data collected for the Food and Nutrition Security (FANS) study was used for this research project. Further study design details can be found elsewhere (Slater et al., 2021).

#### **Study Design**

This study used an observational cross-sectional survey design to collect data from participants and provides a ‘snapshot’ of conditions at the time of survey completion.

#### **Ethics and Community Consultation**

Ethics approval for this study was granted by the Joint Faculty Research Ethics Board at the University of Manitoba (HS21666 J2018:040). The approval certificate is provided in Appendix A.

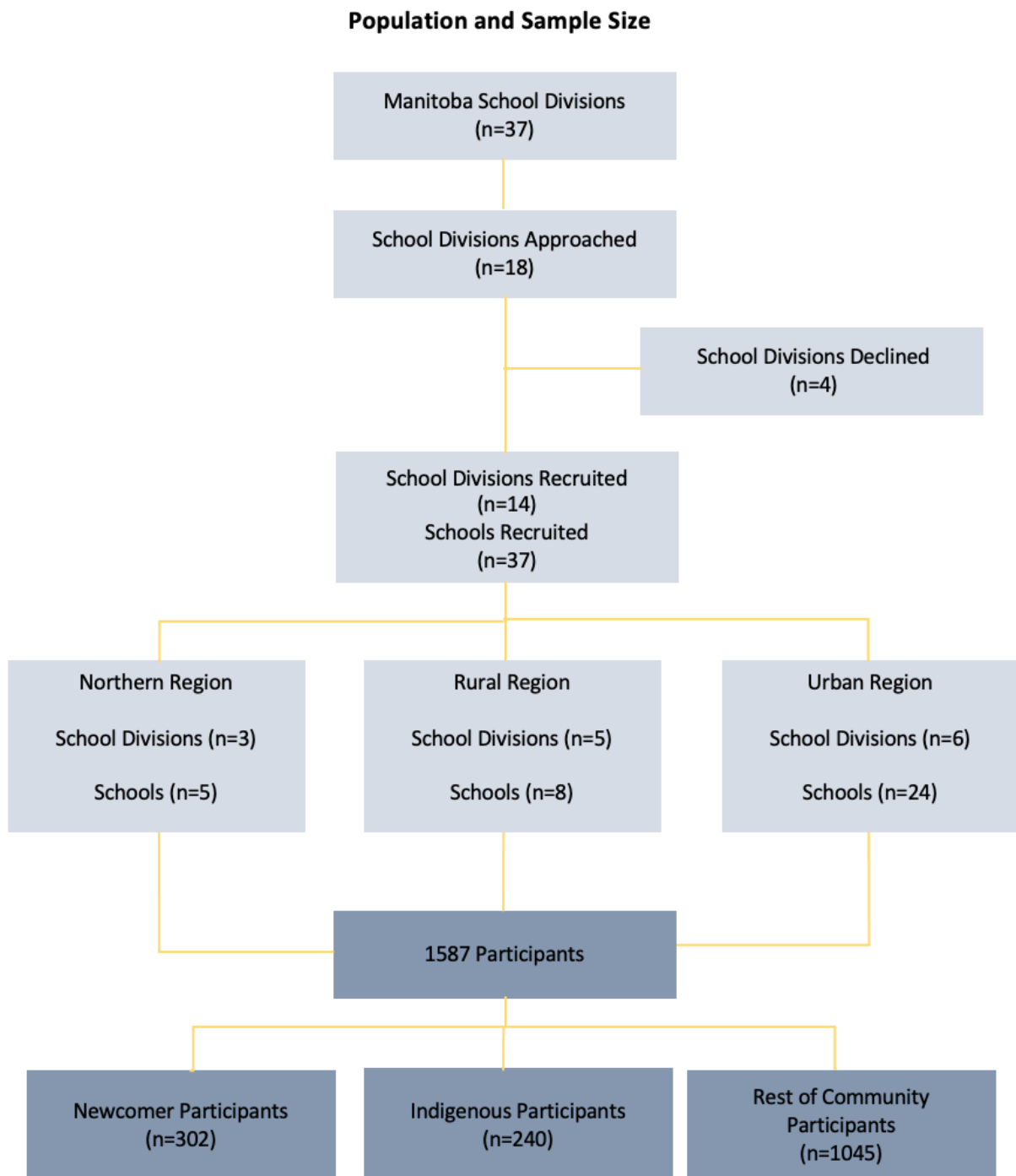
The project partner, N.E.E.D.S. Inc., located in Winnipeg, provides services and support for newcomer children and youth and their families. This community organization, along with FANS project researchers, co-developed the demographic survey question that was used to identify newcomers to Canada.

#### **Recruitment**

There are 37 School Divisions in urban, rural, and northern regions in the province of Manitoba, Canada. Of the 37 divisions, eight are in urban regions, twenty-five in rural, and four are in northern regions of the province. According to 2018 enrolment records, a total of 13,731 grade nine students were enrolled in 699 schools throughout Manitoba School Divisions.

The population for this study is all consenting grade nine youth in Manitoba. Students were recruited from schools in Manitoba School Divisions with a grade nine population of at least 10 students. To ensure that participants in the study were typical of grade nine students in the province, a stratified convenience sampling framework was used to recruit schools. Nine School Divisions provided letters of support before study commencement, and after grant approval, nine additional School Divisions were approached. A total of 14 accepted participation in the study and consist of six urban, five rural, and three northern Manitoba School Divisions. Within the participating School Divisions, grade nine students from 37 schools took part. Twenty-four schools were in urban School Divisions, eight in rural, and five in northern School Divisions. Figure 3.1 summarizes the recruitment of students from Manitoba School Divisions by region. Exclusion criteria for recruitment were home schooled students, independent schools, and francophone schools.

Figure 3.1  
*Flowchart of Recruitment Process*



## **Participant Cohorts**

### *Newcomer*

Since the Canadian literature does not suggest a common length of stay to compare differences between recent newcomers with the rest of the population, a newcomer cohort criterion was defined for this study. This was determined through the comparison of select study variables between newcomers who arrived within five (n=225) and seven (n=302) years since their last birthday. Each group was also separately compared with the rest of the study participants for the same variables. The two possible newcomer cohorts showed statistically significant differences for the same variables, but the larger cohort had increased effect size determined by phi and Cramer's V. For these reasons, a participant in the study who arrived in Canada within seven years of their last birthday was classified as a newcomer.

### *Non-newcomer*

Participants who were born in Canada or arrived in Canada more than seven years since their last birthday, were classified as a non-newcomer. Any participant in the latter group who also identified as Indigenous was not included in the non-newcomer comparison group. Other research papers from the FANS study will include First Nations participants in analysis.

## **Consent**

Consent to collect data from students was obtained from parents/guardians through consent forms distributed by the schools. A sample consent form is provided in Appendix B. Any student who failed to return a signed consent form did not complete the survey. In addition, each student provided their individual assent at the beginning of the online survey. Each respondent was assigned a unique number and no names were collected from students.

## **Data Collection**

Responses were collected from grade nine students during their regular school day from October to May of the 2018-2019 academic year through an online survey. Each respondent independently completed the online survey during 30-45 minutes of class time. A trained research assistant was present to respond to questions and to help with any technical issues encountered while completing the survey.

The single online survey combined four components including: 1) demographic questions; 2) a 24-hour diet recall; 3) eating behaviour and nutrition-related health questions; and 4) questions related to experiences of food insecurity. Survey questions are provided in Appendix C.

### *Demographic questions*

The first module was a short series of demographic questions that included age, gender/sex, and ethnicity. For gender/sex, the questionnaire asked participants to select one of three options (male, female, and other). The terms ‘gender’ or ‘sex’ were not used in the question or response options.

### *Diet recall, eating behaviour, and nutrition-related health questions*

This part of the survey used a web-based surveillance tool, called WEB-Q, that was developed at the University of Waterloo (Hanning et al., 2009). Data collected using WEB-Q are stored on servers at PeaceWorks Technology Solutions in Waterloo, Canada. The WEB-Q database assesses nutrient intakes using The Food Processor (version 8.0) and the 2010 Canadian Nutrient File (*ESHA Research: The Food Processor, Nutrition and Fitness Software (Version 8.0)*, 2002; Health Canada, 2010). WEB-Q has been validated for use by a diverse student population in Canada, including respondents whose first language is not English (Hanning, 2009). With over 600 food choices available in WEB-Q, this tool has much greater selection for ethnically diverse groups than other tools validated for use (Hanning et al., 2009). Validation of the diet recall tool showed 87% agreement between food items selected by adolescents and direct observation of their meal. Intraclass correlations between survey tool and dietitian interview were greater than .50 for energy and macronutrients indicating reliability of the tool (Hanning et al., 2009). Use of WEB-Q in this study ensures a standardized protocol for all respondents and eliminates error risk that occurs with transcription data entry by study researchers.

Using WEB-Q, a single 24-hour diet recall for breakfast, lunch, dinner, and snacks was recorded by each student. The survey tool used an interactive “drag and drop” function for students to add the foods they ate at each meal and snack. Students selected foods from small photos of food choices and then dropped them onto a plate image on the computer screen. Students were able to delete foods from the plate image if necessary. In addition, students were prompted to include common accompaniments for foods (ex. spreads on toast) that are often forgotten in food recall surveys. Students had the opportunity to review their selections on a summary page to make any necessary revisions before final submission.

In addition to diet recall, WEB-Q also captured eating behaviours, such as the frequency in which students typically ate breakfast and lunch each week, frequency of meals consumed with a parent/guardian, and frequency of meals or snacks purchased at school. Students indicated whether they ate the previous day’s meals at home, school, or away from home or school. Further eating behaviour questions asked students whether they were eating more or less than usual to change their weight. Additional health-related questions asked students to provide their

height (in feet/inches or centimeters) and weight (in pounds or kilograms), and to indicate how many hours they typically sleep each night. Finally, students rated their health on a scale from poor to excellent.

#### *Child Food Security Survey Module*

The fourth, and final, component of the survey was the Child Food Security Survey Module (CFSSM), which contained nine questions to assess the food security of respondents. The survey focused on access to food, concerns about availability of food, and modified eating behaviours due to food constraints during the prior year. The CFSSM was adapted at the University of Southern Mississippi from the U.S. Household Food Security Survey Module and has been used in several countries (Baxter et al., 2018; Connell et al., 2004). Development of the CFSSM questions used cognitive testing evaluation with adolescents to ensure face validity. Further, reliability testing indicated that the survey can detect three levels of food security for children aged 12 and older (Connell et al., 2004). The CFSSM was used to measure the food security of individual children from their own perspective rather than the CCHS survey that measures the status of an entire household from the perspective of one adult in the household (Baxter et al., 2018).

### **Data Analysis**

#### *Exclusions*

Participants who indicated Indigenous identity were not included in the data analysis of this study. Diet recall analysis excluded participants with missing food recalls (n=13) and those who reported an implausible energy intake of either below 200 kcal or over 6,000 kcal (n=27) (Hanning et al., 2007). In addition, due to sex-based standards, diet recall and body mass index analysis excluded participants that indicated other gender.

#### *Nutrients and food groups*

Dietary analysis was conducted on energy intake and several macro- and micronutrients. Where established, the Estimated Average Requirement (EAR) was used to determine if a participant met nutrient recommendations (Government of Canada, 2006). Protein requirements differ by individual based on body weight. To determine if a participant met protein requirements, a ratio of their intake in grams was compared to their body weight in kilograms (Institute of Medicine, 2005). Nutrients without an EAR include fibre, for which Adequate Intake was used, and sodium, for which the Upper Limit was used instead. Intake of unsaturated fat was compared to Canada's Food Guide to Healthy Eating (2007) (CFGHE) guidelines (Government of Canada, 2007). The recommended intake guidelines for saturated fat are

presented as a percentage of total energy intake according to World Health Organization recommendations (World Health Organization, 2018).

For food groups, CFGHE serving size guidelines by age and sex were used to determine if a participant met recommendations (Government of Canada, 2007). Analysis for energy was performed based on kilocalories consumed in the 24-hour recall, as defined in the WEB-Q database previously described.

#### *Healthy Eating Index – Canada*

The 24-hour diet recall data were used to generate a modified Healthy Eating Index Score – Canada (HEI-C), which is a diet quality score ranging from 0 - 100. The Healthy Eating Index was initially developed by the United States Department of Agriculture in alignment with the Dietary Guidelines for Americans and was adapted for use with a Canadian population according to recommended servings by age and sex in CFGHE (Jessri et al., 2017). Face validity of the HEI-C 2010 was confirmed through the consistency of higher index scores for lifestyle and socioeconomic factors that are associated with greater diet quality. Internal reliability of the index was shown by achieving a high Cronbach's coefficient (.78). No index component was determined to over-contribute to the variation in index scores (Jessri et al., 2017).

While a new version of Canada's Food Guide was released in 2019, scoring for HEI-C in this study is based on the previous 2007 version for several reasons. First, as the 2019 version came into effect during the data collection period, the validated WEB-Q survey tool was developed using servings and recommendations from the 2007 version (Hanning et al., 2009). In addition, adherence criteria have not yet been developed for the newest version so there is currently no agreed upon method for comparing participant intakes with the new guidelines. Finally, there are serving recommendations in the 2007 version that provide a clear and easy to understand reference for individuals, which are not present in the more recent version.

To incorporate new dietary guidance, further modifications were made to the Healthy Eating Index – Canada for this study, by the addition of two food components: low fat vitamin-D fortified milk and dairy-free beverage alternatives, and seafood and plant-based proteins (Government of Canada, 2007). The HEI-C used in this study is based on intake of 13 nutrient components. Ten of the components are adequacy components. Adequacy components are allocated points based on portions consumed starting at zero and increasing as intake increases to the maximum standard. The remaining three are moderation components with points allocated using a reverse scoring system due to the emphasis on limiting intake. The food component scoring system is shown in Table 3.1.

**Table 3.1**  
*Healthy Eating Index – Canada Food Component Scoring*

| Component  | Points<br>range | Unit       | Points criteria (min, max) |            |
|--|-----------------|------------|----------------------------|------------|
|  |                 |            | Female                     | Male       |
| <b>Adequacy component</b>  |                 |            |                            |            |
| Total vegetables & fruit   | 0 – 10          | servings   | 0, 7                       | 0, 8       |
| Whole fruit  | 0 - 5           | servings   | 0, 1.5                     | 0, 1.7     |
| Dark green and orange vegetables   | 0 - 5           | servings   | 0, 1.5                     | 0, 1.7     |
| Total grain products   | 0 - 5           | servings   | 0, 6                       | 0, 7       |
| Whole grains   | 0 - 5           | servings   | 0, 3                       | 0, 3.5     |
| Milk & alternatives  | 0 - 5           | servings   | 0, 3                       | 0, 3       |
| Low fat vitamin D fortified milk<br>and dairy-free beverage alternatives | 0 - 5           | servings   | 0, 2                       | 0, 2       |
| Meat & alternatives  | 0 - 5           | servings   | 0, 2                       | 0, 3       |
| Seafood & plant-based proteins   | 0 - 5           | servings   | 0, 2                       | 0, 3       |
| Unsaturated fat  | 0 – 10          | grams      | 0, 30                      | 0, 45      |
| <b>Moderation component</b>  |                 |            |                            |            |
| Saturated fat  | 8 - 10          | % energy   | 10, ≤ 7                    | 10, ≤ 7    |
|  | 0 - 8           |            | ≤ 15, 10                   | ≤ 15, 10   |
| Sodium   | 8 - 10          | milligrams | 2300, 1500                 | 2300, 1500 |
|  | 0 - 8           |            | 4600, 2300                 | 4600, 2300 |
| ‘Other’ food   | 0 - 20          | % energy   | ≥ 40, ≤ 5                  | ≥ 40, ≤ 5  |
| <b>Total Score</b>   | 0 - 100         |            |                            |            |

The total HEI-C score for each student was used to further classify their diet quality according to categories in Table 3.2.

**Table 3.2**

*Healthy Eating Index - Canada Score Classification*

| Classification    | Score   |
|-------------------|---------|
| Poor              | < 50    |
| Needs improvement | 50 - 80 |
| Good              | > 80    |

*Child Food Security Survey Module*

The food security module portion of the survey consisted of nine questions. For each question, students chose one of three response options: 1) a lot; 2) sometimes; and 3) never. A survey response was considered affirmative if a participant selected either “a lot” or “sometimes” and was not affirmative if they selected “never”. Using this scoring, students were classified according to two methods. First, participants were classified by three levels of food security according to Table 3.3 (Connell et al., 2004).

**Table 3.3**

*Food Security Classification*

| Level                    | Number of affirmative responses |
|--------------------------|---------------------------------|
| Food secure              | 0 - 1                           |
| Moderately food insecure | 2 - 5                           |
| Severely food insecure   | 6 - 9                           |

A second dichotomous classification combined the two food insecure categories into one composite variable for analysis. In this case, students who responded affirmative to zero or one question were classified as food secure. Those who responded affirmative to two or more questions were classified as food insecure. Participants with more than two missing responses out of the nine total questions were not included in data analysis.

*Self-reported health measures*

The self-reported height and weight values were used to calculate a BMI z-score for each respondent. BMI is a measure of weight adjusted for height and is calculated as weight in



kilograms divided by the square of height in meters (expressed in kg/m<sup>2</sup>). BMI z-scores were calculated using the modified World Health Organization (WHO) growth charts, rather than BMI-for-age percentile scores, as z-scores provide a measure of weight normalized for age and sex (Must & Anderson, 2006). The WHO Growth Charts for Canada have been endorsed by Dietitians of Canada, the Canadian Pediatric Society, and the Public Health Agency of Canada (Rodd et al., 2014). Derived z-values were validated with the online Canadian Pediatric Endocrine Group (CPEG) shiny app (2014 version) on weight-for-age reference curves for ages 0 – 19 years (Canadian Pediatric Endocrine Group, n.d.). BMI z-score cut-off points were then compared to a reference standard that accounts for the age and sex of adolescents and grouped into the BMI categories according to Table 3.4 (World Health Organization, n.d.).

**Table 3.4**

*BMI Categories*

| Category       | z-score cut-off points |
|----------------|------------------------|
| Underweight    | $z < -2.0$             |
| Healthy weight | $-2.0 \leq z \leq 1.0$ |
| Overweight     | $1.0 < z \leq 2.0$     |
| Obese          | $z > 2.0$              |

Participants reported how many hours of sleep they usually get at night by selecting a number from zero to 24 hours. Based on the recommended eight to ten hours of sleep for the participant age group, responses were analyzed by three category groupings of sleep: less than six, six to seven, or eight or more hours per night (Public Health Agency of Canada, 2019a).

Participants rated their health as excellent, very good, fair, or poor. A dichotomous variable for self-rated health was analyzed by excellent/very good and fair/poor.

**Statistical Analysis**

IBM SPSS Statistics Version 27 and Microsoft Excel for Mac Version 16.5 were used to analyze the data. Microsoft Excel was used to compute 95% confidence intervals for differences in proportions and means. SPSS was used for all other statistical analysis.

Study variables based on survey responses include continuous ratio variables, and categorical nominal and ordinal variables. Variables and statistical analysis performed are further described in Table 3.5.

**Table 3.5***Statistical Analysis Summary*

| Survey Component  | Variable   | Type             | Statistical Analysis  |
|-------------------|--|------------------|---|
| 1. Characteristic | Gender/sex   | Nominal          | Frequencies<br>Percentages  |
|                   | Age  | Ordinal          | Frequencies<br>Percentages  |
| 2. Food security  | Food security level  | Ordinal          | Frequencies<br>Percentages<br>Chi-square tests of independence<br>95% confidence intervals, difference in proportions                 |
| 3. Diet quality   | Healthy Eating Index score   | Ratio            | Means, standard deviations<br>95% confidence intervals, difference in means   |
|                   | Healthy Eating Index category  | Ordinal          | Frequencies<br>Percentages<br>Fisher-Freeman-Halton Exact test<br>95% confidence intervals, difference in proportions                 |
|                   | Energy   | Ratio            | Interquartile ranges<br>95% confidence intervals, Hodges-Lehmann estimate of median difference  |
|                   | CFGHE food group (vegetables & fruit, grain products, milk & alternatives, meat & alternatives, other foods) | Ratio<br>Nominal | Means, standard deviations<br>Frequencies, percentages<br>Interquartile ranges<br>95% confidence intervals, difference in proportions |
|                   | Supplemental food group (whole fruit, dark green & orange vegetables, whole                                  | Ratio            | Medians<br>Mann-Whitney U test  |

|                        |  |                  |   |
|------------------------|--|------------------|---|
|                        | grain products, low fat<br>Vitamin-D fortified milk &<br>dairy-free beverage<br>alternatives, seafood &<br>plant-based proteins) |                  |   |
|                        | Macronutrients<br>(carbohydrate, protein)  | Ratio<br>Nominal | Frequencies, percentages<br>Interquartile ranges<br>95% confidence intervals, difference in<br>proportions          |
|                        | Nutrients (unsaturated fat,<br>saturated fat (% of energy),<br>sodium, calcium, iron, zinc,<br>vitamin A, vitamin D, fibre)      | Ratio<br>Nominal | Frequencies, percentages<br>Medians, interquartile ranges<br>95% confidence intervals, difference in<br>proportions |
|                        | Nutrients (sugar, fat,<br>saturated fat (g),<br>monounsaturated fat,<br>polyunsaturated fat)                                     | Ratio            | Medians, interquartile ranges   |
| 4. Eating<br>behaviour | Meal consumption<br>(breakfast, lunch)   | Ordinal          | Frequencies, percentages<br>95% confidence intervals, difference in<br>proportions                                  |
|                        | Eating dinner with<br>parent/guardian  | Ordinal          | Frequencies, percentages<br>95% confidence intervals, difference in<br>proportions                                  |
|                        | School food purchases<br>(cafeteria, vending<br>machine, canteen/snack<br>bar/tuck shop)   | Ordinal          | Frequencies, percentages<br>95% confidence intervals, difference in<br>proportions                                  |
|                        | Meal location (breakfast,<br>lunch, dinner)  | Nominal          | Frequencies, percentages<br>Fisher-Freeman-Halton Exact test  |
|                        | Eating less than usual to<br>lose weight   | Nominal          | Frequencies, percentages  |

|           |   |         |  |
|-----------|---|---------|--|
|           |   |         | 95% confidence intervals, difference in proportions  |
|           | Eating more than usual to gain weight   | Nominal | Frequencies, percentages<br>95% confidence intervals, difference in proportions                  |
|           | Taken a Home Economics course in school | Nominal | Frequencies, percentages<br>95% confidence intervals, difference in proportions                  |
| 5. Health | Body Mass Index                         | Ordinal | Frequencies, percentages<br>Chi-square tests of independence<br>Fisher-Freeman-Halton Exact test |
|           | Usual hours of sleep                    | Ordinal | Frequencies, percentages<br>Fisher-Freeman-Halton Exact test                                     |
|           | Self-rated health                       | Ordinal | Frequencies, percentages<br>95% confidence intervals, difference in proportions                  |

Intake variables were tested using Shapiro-Wilk to determine if they were normally distributed. 95% confidence intervals were determined for mean differences in diet quality scores between study sub-groups. Due to non-normal distributions, energy intake was analyzed using 95% confidence intervals derived from Hodges-Lehmann median difference between subgroups.

For diet quality variables with established intake recommendations for youth in Canada, 95% confidence intervals were determined to investigate differences in proportions not meeting recommendations between sub-groups. For diet quality variables that do not have intake recommendations, the intake amount was tested for differences between subgroups. The non-parametric Mann-Whitney U test was used to test for differences in median intake for variables with non-normal distributions.

95% confidence intervals for differences in proportions were also calculated for dichotomous eating behaviour and self-reported health variables between study subgroups. For variables with more than two categories, chi-square tests of independence were used instead. The Fisher-Freeman-Halton Exact test was performed when chi-square tests indicated low expected cell counts.

#### *Sex/gender*

Data for newcomer youth were stratified by sex or gender. As indicated previously, BMI and dietary intakes are measured based on biological sex, due to biological growth and intake requirements, and were analyzed by sex in this study. To reflect differences in gender group expression and identity, eating behaviour frequencies and proportions were stratified by the gender group identified by participants. Newcomer participant frequencies and proportions for sleep and self-rated health variables were stratified by gender group, but differences were compared between male and female gender groups only due to low cell counts in other sex group.

## CHAPTER 4

### RELATIONSHIP BETWEEN FOOD SECURITY AND NUTRITION SECURITY IN NEWCOMER MANITOBA YOUTH

#### **Abstract**

Food security is a prerequisite for a healthy diet, but additional strategies are also necessary to improve nutrition security. This study compared food security in newcomer and general youth populations and determined associated factors. Survey data were collected from 1,347 grade nine Manitoba students to measure food insecurity, dietary intakes, eating behaviours, and self-reported health. 18.6% of newcomer youth (n=290) were food insecure with no difference between newcomer status. Most newcomer youth (n=270) had nutritionally inadequate diets (98.9%) with no difference in overall quality between food secure status. However, differences were found in the proportion meeting recommendations for grain products, vegetables and fruit, protein, and zinc. A greater proportion of food insecure participants reported purchasing food at school. No differences were found for the self-reported health measures. Interventions are required to address the inadequate diets common in adolescents for both food secure and food insecure newcomer youth.

#### **Introduction**

According to the Food and Agriculture Organization of the United Nations (2006), “food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”. However, the 2012 report by the United Nations Special Rapporteur on Food Security condemned Canada for an inadequate protection of the right to food by its residents (Human Rights Council, 2012). Households that are disproportionately affected by food insecurity have a low income, rely on social assistance, rent their dwelling, have a lone female head, are First Nations, or have recently immigrated (Human Rights Council, 2012). While research indicates that being a newcomer is not a risk factor on its own, newcomers are disproportionately represented in social and economic factors tied to food insecurity (Tarasuk & Mitchell, 2020). An additional factor for many newcomers is cultural food insecurity, characterized by the loss of access to familiar foods and food practices (Moffat et al., 2017). In Manitoba, as measured by financial constraints to access food, more than one in five children lived in a food insecure household in 2017-18 (Tarasuk & Mitchell, 2020).

Many people in Canada do not have food security, which is a necessary condition for an adequate diet. However, food security on its own is not enough to guarantee nutrition security,

which refers to diet patterns that include adequate “variety, diversity, nutrient content, and safety to meet the needs and food preferences for an active and healthy life” (El Bilali et al., 2019).

Despite many people having adequate access to food in Canada, poor diets are common across income levels and age groups (Moubarac, 2017; Slater & Yeudall, 2015). Through national-level analysis the 2015 Canadian Community Health Survey cycle (CCHS), children and youth displayed diets high in nutrients of concern (saturated fats, sugars, and sodium) and reductions in diet quality during the transition to adolescence (Hack et al., 2021). Other analysis of CCHS data showed that adolescents consumed more than half of their energy from ultra-processed foods, which tend to have more sugar and sodium, and less fibre, protein, and micro-nutrients than minimally processed foods (Moubarac, 2017). Such foods are widely available in the food system, are designed to be attractive, and are aggressively marketed for the adolescent audience (Moubarac, 2017). Smaller provincial/regional studies have reported that young people do not meet minimum recommendations for several key nutrients and food groups (Bukambu et al., 2020; Lane et al., 2019a; Slater & Colatruglio, 2016). In addition, youth frequently engage in behaviours associated with poor diet quality, such as skipping meals and purchasing food away from home (Lillico et al., 2014; Slater & Colatruglio, 2016). The lack of formal food skills education in schools and the decline in food skills mentoring at home may affect the ability of youth to eat adequate diets (Slater & Yeudall, 2015). Newcomer youth may face additional barriers that impact their ability to eat an adequate diet. For example, social pressures and personal preferences may lead to purchasing prepared versions of western-style foods for newcomer families who do not know how to prepare these foods at home (Henderson et al., 2017; Lane et al., 2019a). Short meal breaks and barriers to reheating foods may also impact foods consumed at school (Henderson et al., 2017).

Both food and nutrition insecurity during adolescence can have serious impacts on physical and mental health and well-being, including increased risk of asthma, impaired bone development, and depression (Lane et al., 2019a; PROOF, 2018). If poor diet patterns continue, other impacts may be more apparent in adulthood, including risk of type 2 diabetes, cardiovascular disease, anxiety and mood disorders, and sleep issues (Nagata et al., 2019; PROOF, 2018). And for ethnicities with greater risk of nutrition-related chronic disease, poor diets may further exacerbate these impacts (Sanou et al., 2014).

While research has separately indicated impacts of food insecurity and nutrition insecurity on health, little research has investigated the intersection of these two public health issues (Kirkpatrick & Tarasuk, 2008; Lillico et al., 2014; Nagata et al., 2019; PROOF, 2018).

Even less research has focused on the impacts for newcomer youth (Davison & Gondara, 2019; Lane et al., 2019a).

This study draws upon the Food and Nutrition Security (FANS) survey data collected from grade nine students to: 1) describe and compare the food security status of Manitoba youth by newcomer status; and 2) determine dietary intake, eating behaviour, and nutrition-related health factors that are associated with food insecurity in newcomer Manitoba youth.

## **Materials and Methods**

Approval for this study was granted by the Joint Faculty Research Ethics Board at the University of Manitoba.

### *Participants*

Students were recruited from schools in Manitoba School Divisions with a grade nine population of at least 10 students. Independent, francophone, and home schools were excluded. Students of 37 schools from 14 Manitoba School Divisions participated in the study.

The newcomer cohort included participants that were born outside of Canada and had arrived within seven years of their last birthday. The non-newcomer cohort included participants: 1) born in Canada; and 2) born outside of Canada and had arrived more than seven years since their last birthday, and who were not Indigenous.

### *Study design*

The study used an observational cross-sectional design with survey data collected for the FANS study from grade nine students in Manitoba schools during the 2018-2019 academic year. Consent was obtained from parents/guardians by consent forms distributed by the schools and each student provided their individual assent at the beginning of the online survey. Further study design details can be found elsewhere (Slater et al., 2021).

The online survey was completed by students during their regular school day. A trained research assistant was present to respond to questions and to help with any technical issues encountered while completing the survey. The survey combined four components, including: 1) demographic characteristics; 2) questions related to experiences of food insecurity; 3) a 24-hour diet recall; and 4) eating behaviour and self-reported health questions.

### *Measures*

*Food security.* The nine question Child Food Security Survey Module (CFSSM) was used to assess food security of participants from their own perspective. The CFSSM module was adapted at the University of Southern Mississippi from the U.S. Household Food Security Survey Module. The tool has been validated for use by children aged 12 and older and used in several countries (Baxter et al., 2018; Connell et al., 2004). This study classified students according to



two methods. The first classification was completed according to three levels of food security: food secure, moderately food insecure, and severely food insecure (0-1, 2-5, and 6-9 affirmative survey responses, respectively) (Connell et al., 2004). The second was a dichotomous classification of food security status. Students who responded affirmative to zero or one question were classified as food secure. Those who responded affirmative to two or more questions were classified as food insecure.

*Diet recall, eating behaviour, and nutrition-related health.* The web-based surveillance tool, WEB-Q, was used to collect participant responses related to diet recall, eating behaviours, and self-reported health. WEB-Q was developed at the University of Waterloo and has been validated for use by adolescents in Canada, and for ethnically diverse populations, including respondents whose first language is other than English (Hanning, 2009). To collect a 24-hour diet recall, students selected foods and portion sizes they ate at each meal and snack from photos and text of over 600 food choices. The use of WEB-Q ensured a standardized protocol for all respondents and eliminated error risk from data entry by study researchers.

The 24-hour diet recall data from each student were used to generate a modified Healthy Eating Index Score – Canada (HEI-C), ranging from 0 – 100. Initially developed by the United States Department of Agriculture, the Healthy Eating Index was adapted for use in Canada due to the similarity in dietary guidelines between the two countries (Garriguet, 2009). Adaptations to the index were made according to recommended servings by age and sex in Canada's Food Guide to Healthy Eating (2007) (CFGHE) (Garriguet, 2009; Jessri et al., 2017). For this study, two additional food components were added to incorporate new dietary guidance: low fat vitamin-D fortified milk and dairy-free beverage alternatives, and seafood and plant-based proteins (Government of Canada, 2007). The total HEI-C score for each student was used to classify their diet quality as poor (<50), needs improvement (50-80), or good (>80).

Additional intake variables derived from the diet recall included food group servings and select nutrient intakes. Serving size guidelines by age and sex according to CFGHE were used to determine if a participant met food group recommendations (Government of Canada, 2007). Where established, the Estimated Average Requirement (EAR) was used to determine if a participant met recommendations for nutrient intakes (Government of Canada, 2006). Protein requirements differ by individual based on body weight. To determine if a participant met protein requirements, a ratio of their intake in grams was compared to their body weight in kilograms (Institute of Medicine, 2005). Nutrients without an EAR include fibre, for which Adequate Intake was used, and sodium, for which the Upper Limit was used. Intake of

unsaturated fat was compared to CFGHE guidelines (Government of Canada, 2007). The recommended intake guidelines for saturated fat as a percentage of total energy intake were used according to World Health Organization recommendations (World Health Organization, 2018).

For respondents who indicated height and weight values, a body mass index (BMI) z-score was calculated using the modified World Health Organization growth charts. BMI z-scores were chosen over BMI-for-age percentile scores, as z-scores provide a measure of weight normalized for age and sex (Must & Anderson, 2006). Derived z-values were validated with the online Canadian Pediatric Endocrine Group shiny app (2014 version) on weight-for-age reference curves for ages 0 – 19 years (Canadian Pediatric Endocrine Group, n.d.). BMI z-score cut-off points were then compared to a reference standard that accounts for the age and sex of adolescents and grouped into the BMI categories underweight, healthy weight, overweight, or obese (World Health Organization, n.d.).

Diet recall analysis excluded participants with missing food recalls (n=2) and those who reported an implausible energy intake of either below 200 kcal or over 6,000 kcal (n=10) (Hanning et al., 2007). In addition, due to sex-based standards, diet recall and BMI analysis included only male and female participants.

#### *Statistical analysis*

IBM SPSS Statistics Version 27 was used to analyze data, except for computation of 95% confidence intervals, for which Microsoft Excel for Mac Version 16.5 was used.

*Food secure status.* Chi-square tests of independence were used to compare three levels of food security status between the newcomer and non-newcomer participants. The dichotomous food security status of newcomer and non-newcomer participants was compared using 95% confidence intervals and was stratified by sex/gender.

*Dietary intakes, eating behaviours, and health.* Dietary intakes, eating behaviours, and health variables of the newcomer participants were described and compared by food secure status. Due to low cell counts in the food insecure group, data were not stratified by gender or sex. Fisher-Freeman-Halton Exact tests were performed to determine differences in newcomer participants between food secure status for variables with more than two categories. Interquartile ranges were computed for diet intake variables. Due to non-normal distributions determined through Shapiro-Wilk test, energy intake was analyzed using 95% confidence intervals derived from Hodges-Lehmann median difference between groups. For diet quality variables with established intake recommendations for youth, 95% confidence intervals were determined to investigate differences between food secure status in the proportion not meeting

recommendations. Similarly, 95% confidence intervals for differences in proportions were calculated for dichotomous eating behaviour variables and self-rated health.

## Results

### *Participant characteristics*

Table 4.1 shows the age and gender/sex of the study participants.

**Table 4.1**

### *Participant Characteristics*

| Characteristic               | Total<br>(n=1347) |      | Newcomer <sup>1</sup><br>(n=302) |      | Non-newcomer <sup>2</sup><br>(n=1045) |      |
|------------------------------|-------------------|------|----------------------------------|------|---------------------------------------|------|
|                              | n                 | %    | n                                | %    | n                                     | %    |
| <b>Gender/sex</b>            |                   |      |                                  |      |                                       |      |
| Female                       | 678               | 50.3 | 148                              | 49.0 | 530                                   | 50.7 |
| Male                         | 610               | 45.3 | 142                              | 47.0 | 468                                   | 44.8 |
| Other/not specified          | 59                | 4.4  | 12                               | 4.0  | 47                                    | 4.5  |
| <b>Age at time of survey</b> |                   |      |                                  |      |                                       |      |
| 13                           | 46                | 3.4  | 11                               | 3.6  | 35                                    | 3.3  |
| 14                           | 1122              | 83.3 | 249                              | 82.5 | 873                                   | 83.5 |
| 15                           | 173               | 12.8 | 41                               | 13.6 | 132                                   | 12.6 |
| 16                           | 3                 | 0.2  | 1                                | 0.3  | 2                                     | 0.2  |
| Not reported                 | 3                 | 0.2  | 0                                | 0.0  | 3                                     | 0.3  |

<sup>1</sup> Moved to Canada within seven years of last birthday

<sup>2</sup> Born in Canada or moved to Canada more than seven years from their last birthday and not Indigenous

### *Food security*

When food security status was categorized as being food secure, moderately food insecure, or severely food insecure, there was no difference in the proportion between newcomer and non-newcomer students (Table 4.2). There was also no difference when participants were categorized as either food secure or food insecure (Table 4.3).

Chi-square tests of independence of the total study sample for food security status by gender/sex was not statistically significant ( $p=.093$ ; not shown in table).

**Table 4.2**

*Food Security Status and Difference in Proportions between Newcomer and Non-newcomer Participants*

| Food Security Status     | Total    |      | Newcomer |      | Non-newcomer |      | <i>p</i> -value* |
|--------------------------|----------|------|----------|------|--------------|------|------------------|
|                          | (n=1299) |      | (n=290)  |      | (n=1009)     |      |                  |
|                          | n        | %    | n        | %    | n            | %    |                  |
| Food secure              | 1076     | 82.8 | 236      | 81.4 | 840          | 83.3 | .584             |
| Moderately food insecure | 169      | 13.0 | 39       | 13.4 | 130          | 12.9 |                  |
| Severely food insecure   | 54       | 4.2  | 15       | 5.2  | 39           | 3.9  |                  |

\**p*-value derived from chi-square test of independence between newcomer and non-newcomer participants. Bolded value represents statistically significant association,  $p < .05$

**Table 4.3***Food Security Status by Gender/Sex and Difference in Proportions between Newcomer and Non-newcomer Participants*

| Food Security Status | Newcomer         |                   |                 |                 | Non-newcomer      |                   |                 |                 | 95% CI* |       |
|----------------------|------------------|-------------------|-----------------|-----------------|-------------------|-------------------|-----------------|-----------------|---------|-------|
|                      | Total<br>(n=290) | Female<br>(n=143) | Male<br>(n=136) | Other<br>(n=11) | Total<br>(n=1009) | Female<br>(n=511) | Male<br>(n=454) | Other<br>(n=44) | Lower   | Upper |
| Food secure          | 81.4             | 84.6              | 77.9            | 81.8            | 83.3              | 84.9              | 81.1            | 86.4            | -6.9    | 3.1   |
| Food insecure        | 18.6             | 15.4              | 22.1            | 18.2            | 16.7              | 15.1              | 18.9            | 13.6            |         |       |

\*Confidence interval derived from difference in proportions between newcomer (*reference group*) and non-newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals

*Dietary intake*

The median caloric intake was greater for newcomer participants who were food insecure compared with food secure (Table 4.4). Newcomer youth did not meet intake guidelines for several food groups and nutrients. A greater proportion of food secure participants did not meet recommendations for protein, zinc, and grain products. Conversely, a greater proportion of those who were food insecure did not meet recommendations for vegetables and fruit servings.

**Table 4.4**

*Newcomer Youth Interquartile Energy, Nutrient, and Canada's Food Guide (2007) Serving Intakes and Proportions Not Meeting Recommendations in Relation to Food Security Status*

|                             | Intake guideline  | Food secure |        |        |                                     |      | Food insecure |        |        |                                    |      | 95% CI*         |               |
|-----------------------------|---|-------------|--------|--------|-------------------------------------|------|---------------|--------|--------|------------------------------------|------|-----------------|---------------|
|                             |   | (n=230)     |        |        | Not meeting recommendations (n=221) |      | (n=50)        |        |        | Not meeting recommendations (n=49) |      |                 |               |
|                             |   | 25th        | Median | 75th   | n                                   | %    | 25th          | Median | 75th   | n                                  | %    | Lower           | Upper         |
| Energy (kcal)               |   | 1240.7      | 1914.2 | 2414.2 | -                                   | -    | 1700.0        | 2304.8 | 2868.9 | -                                  | -    | <b>-685.6**</b> | <b>-149.9</b> |
| <b>Nutrient</b>             |   |             |        |        |                                     |      |               |        |        |                                    |      |                 |               |
| Carbohydrates (g)           | 100 <sup>c</sup>  | 177.7       | 257.0  | 336.0  | 12                                  | 5.4  | 214.6         | 276.8  | 366.1  | 1                                  | 2.0  | -1.5            | 8.3           |
| Sugar <sup>a</sup> (g)      |   | 40.9        | 66.6   | 104.0  | -                                   | -    | 41.9          | 81.2   | 102.8  | -                                  | -    | -               | -             |
| Fibre (g)                   | 26 <sup>de</sup> , 38 <sup>df</sup>                               | 6.9         | 13.2   | 19.6   | 210                                 | 95.0 | 6.9           | 11.6   | 19.1   | 48                                 | 98.0 | -7.9            | 1.9           |
| Fat (g)                     |   | 35.3        | 58.7   | 87.6   | -                                   | -    | 46.9          | 78.0   | 108.2  | -                                  | -    | -               | -             |
| Saturated fat (g)           |   | 11.8        | 20.0   | 30.6   | -                                   | -    | 17.1          | 26.8   | 36.7   | -                                  | -    | -               | -             |
| Monounsaturated fat (g)     |   | 11.7        | 20.3   | 29.7   | -                                   | -    | 16.8          | 27.3   | 38.7   | -                                  | -    | -               | -             |
| Polyunsaturated fat (g)     |   | 6.4         | 10.1   | 16.2   | -                                   | -    | 7.6           | 13.2   | 20.1   | -                                  | -    | -               | -             |
| Unsaturated fat (g)         | 30 <sup>e</sup> , 45 <sup>f</sup>                                 | 18.9        | 30.5   | 45.7   | 128                                 | 57.9 | 25.1          | 39.9   | 62.5   | 23                                 | 46.9 | -4.4            | 26.4          |
| Protein <sup>b</sup> (g/kg) | 0.71 <sup>ce</sup> ,<br>0.73 <sup>cf</sup> ,<br>485 <sup>ce</sup> | 0.8         | 1.3    | 1.8    | 36                                  | 20.5 | 1.1           | 1.7    | 2.2    | 0                                  | 0.0  | <b>14.5</b>     | <b>26.5</b>   |
| Vitamin A (mcg RAE)         | 630 <sup>cf</sup>   | 174.7       | 373.6  | 634.1  | 156                                 | 70.6 | 170.8         | 441.0  | 667.6  | 30                                 | 61.2 | -5.5            | 24.3          |
| Vitamin D (IU)              | 400 <sup>c</sup>  | 39.1        | 109.0  | 207.2  | 204                                 | 92.3 | 81.7          | 165.0  | 272.7  | 42                                 | 85.7 | -3.8            | 17.0          |
| Calcium (mg)                | 1100 <sup>e</sup>   | 279.9       | 588.0  | 925.0  | 182                                 | 82.4 | 422.0         | 704.5  | 1128.1 | 35                                 | 71.4 | -2.6            | 24.6          |
| Iron (mg)                   | 7.9 <sup>ce</sup> ,<br>7.7 <sup>cf</sup>                          | 7.3         | 10.6   | 15.0   | 67                                  | 30.3 | 7.9           | 13.6   | 16.2   | 12                                 | 24.5 | -7.7            | 19.3          |

|                             |  |        |        |        |     |      |        |        |        |    |       |              |             |
|-----------------------------|--|--------|--------|--------|-----|------|--------|--------|--------|----|-------|--------------|-------------|
| Zinc (mg)                   | 7.3 <sup>ce</sup> ,<br>8.5 <sup>cf</sup> | 5.0    | 7.3    | 10.8   | 122 | 55.2 | 6.7    | 9.5    | 13.1   | 16 | 32.7  | <b>7.8</b>   | <b>37.2</b> |
| Sodium (mg)                 | 2300 <sup>g</sup>                        | 1233.9 | 2300.0 | 3298.5 | 111 | 49.8 | 1538.8 | 2594.0 | 4113.9 | 20 | 59.2  | -24.7        | 5.9         |
| <b>Percentage of energy</b> |  |        |        |        |     |      |        |        |        |    |       |              |             |
| Saturated fat (% of energy) | < 10%                                    | 7.3    | 10.4   | 12.7   | 124 | 56.1 | 8.7    | 10.9   | 13.0   | 30 | 61.2  | -20.2        | 10.0        |
| <b>CFGHE food group</b>     |  |        |        |        |     |      |        |        |        |    |       |              |             |
| Vegetables & fruit          | 7 <sup>e</sup> , 8 <sup>f</sup>          | 1.0    | 2.2    | 4.1    | 213 | 96.4 | 0.2    | 1.7    | 2.8    | 40 | 100.0 | <b>-16.1</b> | <b>-1.1</b> |
| Grain products              | 6 <sup>e</sup> , 7 <sup>f</sup>          | 5.0    | 7.0    | 10.0   | 89  | 40.3 | 6.5    | 9.0    | 11.7   | 11 | 22.4  | <b>4.6</b>   | <b>31.2</b> |
| Meats & alternatives        | 2 <sup>e</sup> , 3 <sup>f</sup>          | 1.0    | 2.0    | 3.3    | 125 | 56.6 | 1.3    | 2.5    | 3.7    | 25 | 51.0  | -9.8         | 21.0        |
| Milk & alternatives         | 3-4                                      | 0.3    | 1.0    | 2.5    | 178 | 80.5 | 0.8    | 1.9    | 3.3    | 34 | 69.4  | -2.8         | 25.0        |

\*Confidence intervals derived from difference in proportions between food secure (*reference group*) and food insecure newcomers. Bolded values represent statistically significant difference, 95% confidence intervals

\*\*Confidence interval derived from Hodges-Lehmann median difference 95% (Hodges-Lehmann median difference = -412.4). Bolded value represents statistically significant difference, p<.05

<sup>a</sup> Sugar includes both naturally occurring and added

<sup>b</sup> Protein requirements were estimated for participants who reported weight and height (food secure n=176, food insecure n=38)

<sup>c</sup> Estimated Average Requirement

<sup>d</sup> Adequate Intake

<sup>e</sup> Recommendation for females

<sup>f</sup> Recommendation for males

<sup>g</sup> Upper Limit



### *Health*

Most food secure (74.7%) and food insecure (79.6%) participants consumed diets categorized as needs improvement (Table 4.5). More than a quarter of food secure (25.3%) and food insecure (26.4%) participants had a BMI classified as either overweight or obese. In addition, 36.1% of food secure and 50.0% of food insecure participants rated their health as either fair or poor. There was no statistically significant difference between the food secure and food insecure groups for HEI-C category, BMI category, hours of sleep at night, or self-rated health.

**Table 4.5**

*Healthy Eating Index, BMI, Sleep, and Self-rated Health of Newcomer Youth in Relation to Food Security Status*

| Health Component                              | Food secure |      | Food insecure |      | <i>p</i> -value* | 95% CI** |       |
|---|-------------|------|---------------|------|------------------|----------|-------|
|   | n           | %    | n             | %    |                  | Lower    | Upper |
| <b>Healthy Eating Index</b>                   |             |      |               |      |                  |          |       |
| <b>category (n=270)</b>                       |             |      |               |      |                  |          |       |
| Poor  | 53          | 24.0 | 10            | 20.4 | .841             | -        | -     |
| Needs improvement                             | 165         | 74.7 | 39            | 79.6 |                  |          |       |
| Good  | 3           | 1.4  | 0             | 0.0  |                  |          |       |
| <b>BMI category (n=216)</b>                   |             |      |               |      |                  |          |       |
| Underweight                                   | 6           | 3.4  | 4             | 10.5 | .243             | -        | -     |
| Healthy weight                                | 127         | 71.3 | 24            | 63.2 |                  |          |       |
| Overweight                                    | 31          | 17.4 | 8             | 21.1 |                  |          |       |
| Obese   | 14          | 7.9  | 2             | 5.3  |                  |          |       |
| <b>Hours of usual sleep per night (n=284)</b> |             |      |               |      |                  |          |       |
| Less than 6 hours                             | 9           | 3.9  | 2             | 3.7  | .581             | -        | -     |
| 6 - 7 hours                                   | 82          | 35.7 | 23            | 42.6 |                  |          |       |
| 8 or more hours                               | 139         | 60.4 | 29            | 53.7 |                  |          |       |
| <b>How do you rate your health (n=280)</b>    |             |      |               |      |                  |          |       |
| Poor/fair                                     | 83          | 36.1 | 25            | 50.0 | -                | -29.1    | 1.3   |
| Very good/excellent                           | 147         | 63.9 | 25            | 50.0 |                  |          |       |

\**p*-values derived from Fisher-Freeman-Halton Exact test. Bolded value represents statistically significant association, *p*<.05

\*\*Confidence intervals derived from difference in proportions between food secure (*reference group*) and food insecure newcomers. Bolded values represent statistically significant association, 95% confidence intervals

### *Eating behaviours*

There were no significant differences between food secure and food insecure participants in the frequency or location of eating meals (Table 4.6). Similarly, there was no difference in the frequency of eating dinner with a parent or guardian. The proportion of food secure and food insecure participants who reported eating less than usual to lose weight or more than usual to gain weight were also not significantly different. However, a greater proportion of food insecure participants reported purchasing food from school than food secure participants.

**Table 4.6***Eating Behaviours of Newcomer Youth in Relation to Food Security Status*

| Survey Question   | Food secure |      | Food insecure |      | <i>p</i> -value* | 95% CI**     |             |
|---|-------------|------|---------------|------|------------------|--------------|-------------|
|   | n           | %    | n             | %    |                  | Lower        | Upper       |
| <b>How often do you eat breakfast?</b>  |             |      |               |      |                  |              |             |
| (n=284)   |             |      |               |      |                  |              |             |
| 5 or more days a week   | 165         | 70.8 | 36            | 70.6 | -                | -14.0        | 13.6        |
| 0 - 4 days a week   | 68          | 29.2 | 15            | 29.4 |                  |              |             |
| <b>How often do you eat lunch?</b>  |             |      |               |      |                  |              |             |
| (n=269)   |             |      |               |      |                  |              |             |
| 5 or more days a week   | 188         | 83.9 | 34            | 75.6 | -                | -21.7        | 5.1         |
| 0 - 4 days a week   | 36          | 16.1 | 11            | 24.4 |                  |              |             |
| <b>How many days per week do you eat dinner/supper with at least one parent/guardian? (n=277)</b>       |             |      |               |      |                  |              |             |
| 5 or more days a week   | 181         | 79.7 | 38            | 76.0 | -                | -16.6        | 9.2         |
| 0 - 4 days a week   | 46          | 20.3 | 12            | 24.0 |                  |              |             |
| <b>How often do you eat meals/snacks purchased from the school cafeteria? (n=279)</b>                   |             |      |               |      |                  |              |             |
| 2 - 7 times a week  | 27          | 11.9 | 13            | 25.0 | -                | <b>-25.6</b> | <b>-0.6</b> |
| 0 - 1 times a week  | 200         | 88.1 | 39            | 75.0 |                  |              |             |
| <b>How often do you eat meals/snacks purchased from school vending machines? (n=276)</b>                |             |      |               |      |                  |              |             |
| 2 - 7 times a week  | 8           | 3.6  | 9             | 17.6 | -                | <b>-25.2</b> | <b>-3.6</b> |
| 0 - 1 times a week  | 217         | 96.4 | 42            | 82.4 |                  |              |             |
| <b>How often do you eat meals/snacks purchased from the school canteen/snack bar/tuck shop? (n=273)</b> |             |      |               |      |                  |              |             |
| 2 - 7 times a week  | 20          | 9.0  | 13            | 25.0 | -                | <b>-28.4</b> | <b>-3.6</b> |

|   |     |      |    |      |      |       |     |  |
|---|-----|------|----|------|------|-------|-----|--|
| 0 - 1 times a week  | 201 | 91.0 | 39 | 75.0 |      |       |     |  |
| <b>Where did you eat breakfast yesterday? (n=276)</b>             |     |      |    |      |      |       |     |  |
| Home  | 207 | 91.2 | 44 | 89.8 | .634 | -     | -   |  |
| School  | 11  | 4.8  | 4  | 8.2  |      |       |     |  |
| Away from home or school  | 9   | 4.0  | 1  | 2.0  |      |       |     |  |
| <b>Where did you eat lunch yesterday? (n=276)</b>                 |     |      |    |      |      |       |     |  |
| Home  | 52  | 23.1 | 11 | 21.6 | .541 | -     | -   |  |
| School  | 163 | 72.4 | 36 | 70.6 |      |       |     |  |
| Away from home or school  | 10  | 4.4  | 4  | 7.8  |      |       |     |  |
| <b>Where did you eat dinner yesterday? (n=281)</b>                |     |      |    |      |      |       |     |  |
| Home  | 218 | 95.2 | 45 | 86.5 | .051 | -     | -   |  |
| School  | 3   | 1.3  | 2  | 3.8  |      |       |     |  |
| Away from home or school  | 8   | 3.5  | 5  | 9.6  |      |       |     |  |
| <b>I am eating less than usual to try and lose weight (n=281)</b> |     |      |    |      |      |       |     |  |
| No  | 159 | 68.5 | 31 | 63.3 | -    | -20.0 | 9.6 |  |
| Yes   | 73  | 31.5 | 18 | 36.7 |      |       |     |  |
| <b>I am eating more than usual to try and gain weight (n=274)</b> |     |      |    |      |      |       |     |  |
| No  | 170 | 75.9 | 33 | 66.0 | -    | -24.2 | 4.4 |  |
| Yes   | 54  | 24.1 | 17 | 34.0 |      |       |     |  |

\*p-values derived from Fisher-Freeman-Halton Exact test. Bolded values represent statistically significant association,  $p < .05$

\*\*Confidence intervals derived from difference in proportions between food secure (*reference group*) and food insecure newcomers. Bolded values represent statistically significant association, 95% confidence intervals

## **Discussion**

### *Food insecurity*

This is one of few studies in Canada to ask youth directly about their experiences of food insecurity. A slightly lower percentage of all youth in this study were food insecure than the percentage of children reported to live in a food insecure household according to 2017-18 CCHS data for Manitoba (17.2% and 21.6%, respectively) (Tarasuk & Mitchell, 2020). However, because the CCHS data provide a household-level measure, the results are not directly comparable. In addition, unlike the CCHS data, results from this study do not include Indigenous identifying youth, who may experience food insecurity differently from newcomer and non-Indigenous youth. This study found that 18.6% of newcomer youth were food insecure. A much greater proportion of food insecurity was reported for newcomer children (41%) by a Saskatchewan study with a large refugee family representation in their study sample (Lane et al., 2019b). Food insecurity may be experienced differently by refugee and economic immigration paths. However, this study did not differentiate between immigration path of participants.

Survey data for this study were collected prior to the COVID-19 global pandemic. New, or worsened, financial constraints are one of the heightened stressors that many have experienced during the pandemic. Rates of food insecurity were higher during the pandemic than reported by 2017-18 CCHS data (Statistics Canada, 2020). The charitable food sector experienced increases in clients accessing services but was not equipped to meet the increased needs (Statistics Canada, 2020). More Canadian research may be forthcoming to determine whether the pandemic further impacted food insecurity for newcomers but is limited at the time of writing. However, U.S. based research revealed that job losses related to COVID-19 led to disproportionate increases in food insecurity for visible minority groups, and that measures such as lockdowns, physical distancing, and school closures disrupted food procurement methods and impacted access to community resources (Payán et al., 2021). Like Canada, the U.S. also experienced an increased demand on the charitable food sector, that did not have the capability to provide nutritionally adequate diets in the first place (Payán et al., 2021). While the U.S. has different social support systems, it is reasonable to expect that those with extra vulnerability in Canada would face similar disruptions in food security and have greater reliance on poorer quality diets during such crises.

### *Diet quality*

Similar to other research, both food secure and food insecure newcomer youth had nutritionally inadequate diets. However, unlike a U.S.-based study with children (Landry et al., 2019), the food insecure newcomer youth in this study did not have lower overall diet quality

scores compared with those who were food secure. The differing social support services in the U.S. and Canada may contribute to the contrast noted between the two countries.

Very few of the newcomer youth in this study met the criteria for a ‘good’ overall diet quality. Youth were particularly poor at meeting recommended servings for vegetables and fruit, and milk and alternatives. The large proportion of youth that did not meet recommendations for fibre, Vitamin D, and calcium is consistent with failing to meet recommendations for the two noted food groups.

Despite the overall similarities in both food secure and food insecure newcomer youth, there were some differences in meeting specific food group and nutrient recommendations. It was previously noted that a smaller proportion of food insecure participants met vegetables and fruit servings and a greater proportion met recommendations for grain products. In addition, a greater proportion of those who were food insecure met recommendations for protein and zinc recommendations. Other research using CCHS data that compared the intake amounts (rather than proportions meeting recommendations) of youth born in- and outside of Canada did not report differences for these same nutrients (Kirkpatrick & Tarasuk, 2008). Unlike the current study, the CCHS data did not show a difference in average energy intake by household food security status. It did, however, show a difference in energy density by food security status, which was not measured in the current study. It is worth noting that the CCHS data analyses had fewer differences in macro- and micronutrient intake by food secure status in children than in adults (Kirkpatrick & Tarasuk, 2008). Since the general adolescent population in Canada has worse diet patterns than the adult population, it is possible that adequacy differences between food secure status are less obvious in younger ages.

Newcomer youth tend to experience dietary acculturation at a faster rate than their parents and the adoption of western diet patterns may contribute to poorer adherence to nutrient recommendations. It has been reported by others that the introduction of western-style foods, such as dairy products, improve calcium intake, but also increase fat and energy intakes (Sastre & Haldeman, 2021). The same authors noted that those who reported less dietary acculturation ate more vegetables and fruit and had a higher overall diet quality. The wide availability and aggressive marketing of ultra-processed foods to youth, combined with personal preferences and social pressures, may encourage the accelerated adoption of inadequate diets in both food secure and food insecure newcomer youth.

### *Eating behaviours*

While many newcomer youth reported eating behaviours that are associated with poor diet quality, this study only found a significant difference in the frequency of purchasing food at school between food secure status. One quarter of food insecure newcomers in this study purchased food from their school cafeteria two or more times per week. The study survey did not ask youth about food purchases outside of school, like fast food outlets or convenience stores. Other research showed that on any day of the week, more than half of Canadian adolescents ate food that was prepared away from home (Watts et al., 2017). And while research was not found to directly compare school food purchases among food insecure newcomer youth, it does indicate a greater reliance on energy-dense foods, refined grains, and foods with added sugars and fats by food insecure children and adults (Girard & Sercia, 2013; Landry et al., 2019). The added intersecting dietary acculturation among food insecure newcomer youth, and its associated reliance on convenience foods, may help to explain the greater frequency of school food purchases by food insecure participants noted in this study (Moffat et al., 2017). Given the limited options to buy vegetables, fruit, and whole grains at school, those who purchase school food have diminished opportunity to fulfill dietary guidelines. And for those food insecure households with inadequate physical infrastructure at home to prepare meals, there may be increased reliance on food purchased away from home.

While most newcomer youth regularly ate breakfast and lunch, 29.4% and 24.4% of food insecure newcomer youth reported eating breakfast and lunch four or fewer times per week, respectively. Other research showed that adolescents are more likely than younger children to skip breakfast and that snacking contributed more than a quarter of daily energy intake (Lillico et al., 2014; Vatanparast et al., 2019). Regular meals may have been replaced by snacking for these newcomer youth, and as snacking is associated with higher intakes of added sugars and refined grains, the reported meal patterns may have contributed to the reduced diet quality.

### *Health*

None of the health-related factors studied were different between food security status. While this study did not find a significant difference between usual hours of sleep youth get at night, other research that measured difficulty falling or staying asleep noted more issues among those who were food insecure (Nagata et al., 2019).

It is notable that while average energy intake was higher in food insecure newcomer youth, there was no significant difference in BMI category. If the observed diet patterns continue into adulthood, body composition changes may be more evident later in life.



Since nutrition-related chronic diseases take years to develop, it is difficult to directly measure the impact of poor diets on health in a younger population. However, this study showed that both food secure and food insecure youth had poor quality diets characterized by high intakes of sodium and saturated fats, and low intake of vegetables and fruit, which are known risk factors for development of chronic disease. Other newcomer-based research showed that poor quality diets and living in higher socioeconomic status households are risk factors for obesity in older newcomer children, which supports the suggestion that food security does not guarantee optimal health (Lane et al., 2019a).

### *Limitations*

As with all research, there are limitations to this study. The newcomer sample in this study was a binary construct with no distinction between newcomers who arrived through economic and refugee paths. In addition, for inclusion in the newcomer sample, the study used a cut-off of having arrived in Canada within seven years of their last birthday. Further, a parent/guardian-signed consent form was required for students to participate. Since consent forms were only available in English, it is possible that students of parents/guardians who could not read English are under-represented in the survey. Finally, participants in this study were recruited from Manitoba schools. Country of origin immigration patterns differ across provinces and territories in Canada. Future research, with a larger newcomer sample, may be undertaken to determine if other differences between food secure and insecure youth occur by immigration path, duration of stay, or country of origin. Since newcomer youth tend to experience dietary acculturation at a faster rate than their parents, research from a Canadian perspective that includes a measure of acculturation to a western diet may also be undertaken to further explore diet quality differences.

This study did not include a qualitative component to determine how food choices or eating behaviours (ex. school food purchases) were made. Interviews with newcomer youth may help elucidate if food costs, convenience, peer pressure, household influences, or other factors play a role by food secure status.

All data in this study were based on self-reported survey responses. And unlike other national-level research of food insecurity, this study did not collect information about household income and did not control for its effect on dietary intakes (Kirkpatrick & Tarasuk, 2008). In addition, only one 24-hour diet recall was collected from participants, whereas larger sample studies generally include a second recall from a portion of respondents to control for intake variation and to predict usual intakes (Jessri et al., 2017).

Despite these limitations, newcomers across regions in Canada are subject to national level policies for immigration selection practices, settlement services, and social supports, which improves generalizability of the study findings beyond newcomer adolescents in Manitoba.

### *Conclusion*

Irrespective of food secure status, newcomer youth have diets that contribute to physical and mental health concerns. The study findings indicate that being food secure is not enough on its own for optimal health and well-being. Nutrition security is an additional and necessary requirement.

Initiatives, such as the incorporation of compulsory practical-based food and nutrition skills education in schools, are recommended. With busy families, declining food skills mentoring at home, and increased autonomy in food selection during adolescence, it is key that youth have the knowledge and skills necessary to select and prepare nutritionally adequate meals and snacks. For newcomer families who are adjusting to new foods, and different food procurement and preparations methods, practical food and nutrition skills in a Canadian context are invaluable. It is imperative that adequate diet quality, and not just food sufficiency, is a component of any school or community-based food or nutrition education programs and policies. Further, the incorporation of traditional diets and familiar foods may help to minimize the loss of cultural food security.

Given the Government of Canada's commitment to support population growth and fulfillment of humanitarian promises through immigration, it is important to ensure healthy diets are possible for all youth who are new to Canada. Community-based initiatives to food access and the creation of a National School Food Program were identified as key components in the recent Food Policy for Canada to support nutritionally adequate diets that consider both cultural diversity and those most at risk for food insecurity (Agriculture and Agri-Food Canada, 2019). A national-level school food program can address some of the hunger and the forced selection of poorer quality foods for many who are food insecure. Since poor quality diets are widespread and not limited to only those food insecure, any national-level program must be universally available to adolescents. As students spend a considerable portion of the day at school, spanning regular meals and snacks, policies and programs that make healthy food at school a viable option have great potential for impact on short and long-term health and well-being.

The study data were collected prior to the global COVID-19 pandemic. Disruptions in employment, community supports, and food procurement during the pandemic have exacerbated the tenuous food security for demographic groups with extra vulnerability, such as newcomers to

Canada. It has also reinforced that reliance on the charitable food sector to fill dietary needs is not a reasonable solution. Long-term and sustainable government-resourced programs and policies are needed.

All youth, regardless of food security and newcomer status, will benefit from school and community-based programs and policies that assure high quality diets and support development of long-term dietary patterns to promote health and well-being, and prevent nutrition-related chronic disease.

## CHAPTER 5

### DIET PATTERNS AND SELF-REPORTED HEALTH OF NEWCOMER MANITOBA YOUTH AND COMPARISONS WITH NON-NEWCOMER YOUTH

#### Abstract

**Purpose** – This paper describes the dietary intake, eating behaviours, and self-reported health of newcomer youth, and how they compare to non-newcomer youth.

**Design/methodology/approach** – An observational cross-sectional design was used with survey data from 1,347 grade nine Manitoba students. Using the WEB-Q online survey, students responded to a 24-hour diet recall, eating behaviour, and self-reported health questions. Diet recalls were used to derive a Healthy Eating Index – Canada score and to measure adherence with guidelines. Descriptive statistical analysis was performed, and further analyses compared differences between newcomer youth and other study participants.

**Findings** – Newcomer youth did not meet recommendations for most components, especially for vegetables and fruit (97.1%), fibre (95.3%), calcium (80.3%), and vitamin D (91.0%). No differences were found in overall diet quality between newcomer and other study participants. However, there were sex-based differences for some components. More males met recommendations for milk and alternatives, and iron intakes, but females ate more servings of whole fruit, and dark green and orange vegetables. A greater proportion of newcomer participants reported changing their eating behaviours to gain (95% CI: 4.9, 16.1) or lose (95% CI: 2.3, 14.3) weight. While no differences were found in self-reported health measures between newcomer and other study participants, a greater proportion of newcomer females than males reported inadequate sleep ( $p=0.001$ ) and lower self-rated health (95% CI: 4.8, 27.6).

**Originality** – Using a large province-wide sample of adolescents, this study contributes to a gap in Canadian research by describing nutrition security for youth and how newcomer youth are differently affected. It is also the first known Canadian study to compare nutrition-related eating behaviours and self-reported health outcomes between the two groups.

**Keywords** – Nutrition security; Newcomer; Adolescent; Diet quality; Immigrant

**Paper type** – Research paper

## **Introduction**

Nutrition security refers to diet patterns that include adequate “variety, diversity, nutrient content, and safety to meet the needs and food preferences for an active and healthy life” (El Bilali et al., 2019). Developed countries have high rates of nutrition-related chronic disease and the trend is also being seen in the wealthier segments of lower income countries (Moubarac, 2017; Popkin, 2012). The diet patterns of youth in Canada indicate that many are nutrition insecure, and newcomer youth may be especially vulnerable due to additional social and personal factors (Bukambu et al., 2020; Henderson et al., 2017; Lane et al., 2019a; Slater & Colatruglio, 2016).

The last national-level data on *overall* diet quality of adolescents was based on the 2004 cycle of the Canadian Community Health Survey (CCHS). However, analysis of the more recent 2015 CCHS showed diets high in saturated fats, sugars, and sodium among children and youth (Hack et al., 2021). Further, the transition from childhood to adolescence was characterized by greater average energy intake from high fat and sugary foods and beverages. Other research using the same CCHS cycle data showed that adolescents consumed more than half of their energy from ultra-processed foods (Moubarac, 2017). These foods, which tend to be higher in sugar and sodium, and lower in fibre, protein, and micro-nutrients, are widely available and directly marketed to youth (Moubarac, 2017). Smaller studies in the Canadian prairie provinces found that children and youth do not meet recommendation for many nutrients and food groups (Bukambu et al., 2020; Lane et al., 2019a; Slater & Colatruglio, 2016).

In addition to dietary intake patterns, youth often engage in eating behaviours that are associated with lower diet quality, including skipping meals, not eating regularly with family members, and eating away from home (Lillico et al., 2014; Slater & Colatruglio, 2016; Watts et al., 2017). Half of Canadian youth are reported to eat foods prepared away from home on any given day (Watts et al., 2017). And since the North American food market is dominated by highly processed foods, it is not surprising that there are often limited fruits, vegetables, and whole grains available for purchase at or near school (Nardocci, Leclerc, et al., 2019; Slater & Yeudall, 2015). With family time constraints, and the lack of value held for domestic food work, food skills mentoring at home has declined (Slater & Yeudall, 2015). In addition, formal food skills and literacy education classes are not required in many Canadian schools. Without the knowledge and skills to prepare preferred foods, families may rely on nutritionally inadequate versions available in food stores (Blanchet et al., 2018; Henderson et al., 2017).

Newcomer youth may experience additional challenges to consuming an adequate diet. For some newcomers to Canada, the aggressive food marketing, wide availability, and low cost of highly processed foods, coupled with a lack of understanding of long-term health effects of diets high in such foods add to vulnerability for an inadequate diet (Blanchet et al., 2018; Henderson & Slater, 2019; Lane et al., 2019a). Some foods that are considered prestigious in a home country have lower cost and are widely available in Canada (ex. meat and fast foods). Newcomer families may increase the frequency of consuming such foods, in part due to the perception of having higher status (Blanchet et al., 2018).

Children and youth are particularly influenced by exposure to western foods by their peers at school. It is common for youth to request the foods that they see others eat at school, and to refuse to bring familiar foods that smell different than the foods eaten by their peers (Blanchet et al., 2018). Short meal breaks at school and barriers to reheating foods prepared at home have also been reported to influence the foods consumed (Henderson et al., 2017). These social pressures, along with personal preferences, can lead to buying prepared versions of western-style foods, especially for families who do not know how to prepare them at home (Henderson et al., 2017; Lane et al., 2019a).

The attitudes and parenting practices in families also contribute to food preferences in newcomer youth. Parents who are open to trying new foods may prepare familiar foods with ingredients that are more commonly available in Canada (Blanchet et al., 2018). Further, parenting practices that use highly processed western foods as rewards, may inadvertently encourage preferences for such foods in their children. Lastly, newcomer families are more at risk for having lower income and other socioeconomic disadvantage that can make it difficult to buy food for a nutritious diet (Tarasuk & Mitchell, 2020; Wahi et al., 2014).

As newcomers settle in a new country, changes in diet commonly take place. Young newcomers tend to acculturate to host country diet patterns more quickly than their parents, and the adoption of western diets is associated with less intake of vegetables and fruit, along with greater intake of fats and sugars (Blanchet et al., 2018; Popovic-Lipovac & Strasser, 2015). The healthy immigrant effect has been used to describe the occurrence where newcomers arrive in a new country with better health than the host country population, but the advantage declines with length of stay due to diet and lifestyle changes (Sanou et al., 2014). However, a systematic review showed inconsistencies in the presence of this effect in Canada, particularly in younger ages (Vang et al., 2017). Research has suggested possibilities for a reduced healthy immigrant effect in recent years. One suggestion is the occurrence of diet changes prior to arrival from

countries in a pre-transition stage that include increased consumption of sugary drinks and processed foods, and decreased intake of vegetables and fruit (Lane et al., 2019a).

Inadequate diets during adolescence impact short- and long-term health. Impaired bone development may occur with poor diet quality during periods of growth, and overweight and obesity are more common in children who are nutrition insecure (Lane et al., 2019a; Rao et al., 2016). Chronic conditions associated with overweight and obesity, such as type 2 diabetes, high blood pressure, joint issues, and depression, have increased for youth in Canada in recent years (Lane et al., 2019b; Rao et al., 2016). Obesity in adolescence tends to track into adulthood, and youth who experience socioeconomic disadvantage have greater risk of overweight and obesity later in life (Wahi et al., 2014). The beginnings of related chronic disease during adolescence may continue to develop with full impacts not seen until later in life. Moreover, poor diets in adolescents with ethnic backgrounds already at higher risk for chronic conditions, like type 2 diabetes and cardiovascular disease, may further heighten their risk of health impacts (Blanchet et al., 2018; Popkin, 2012; Sanou et al., 2014). Inadequate diets have also been shown to impact mental health, and are a predictor for poor perceived mental health in adults (Davison et al., 2017).

A healthy body image and adequate sleep are additional components to mental and emotional, as well as physical well-being that are common concerns for adolescents (Public Health Agency of Canada, 2012, 2019a). Adolescents are commonly dissatisfied with their body size, even among those who have a healthy weight (Public Health Agency of Canada, 2012). Restricting food at meal times may lead to increased snacking at other times of the day, which has been shown in other research to consist of foods with poorer nutrient composition (Vatanparast et al., 2019). There is little qualitative research to describe these concerns for newcomer youth. However, one U.S. study reported that bodies were more frequently discussed in newcomer families and suggested that added sensitivity to body weight may occur when there are generational differences within newcomer families (Sastre & Haldeman, 2020).

Sleep habits are also tied to diet patterns, health, and body weight. An independent association between inadequate sleep duration and higher weights has been shown, with a stronger effect in youth than adults (Patel & Hu, 2008). Similar to the increase in body weights over the past several decades, length of sleep at night has declined for youth, and is influenced by social and environmental factors, along with school pressures and modern technology (Chaput & Dutil, 2016; Patel & Hu, 2008). Studies of youth in several countries have indicated that those who have shorter sleep durations have greater energy intakes and prefer energy-dense

foods that are high in fats and added sugars, even after controlling for socioeconomic status, physical activity, and ethnicity (Chaput & Dutil, 2016; Kjeldsen et al., 2014; Patel & Hu, 2008). It has been suggested that sleeping fewer hours increases opportunities to eat, and environments that have food readily available contribute to increased intake and, subsequently, obesity (Kjeldsen et al., 2014; Patel & Hu, 2008). And while it is possible that obesity contributes to sleep quality issues, study authors have suggested that reduced sleep duration leads to obesity and is an independent risk factor for poor diets (Kjeldsen et al., 2014; Patel & Hu, 2008).

Despite the extra vulnerability to nutrition insecurity, there is a clear gap in the current body of literature to describe the current dietary patterns and nutrition-related health of newcomer youth compared with longer-term residents. This study draws upon the Food and Nutrition Security (FANS) survey data collected from grade nine students in Manitoba to: 1) describe the dietary intake of newcomer youth; 2) determine whether the dietary intakes of newcomer youth meet guidelines; 3) describe the eating behaviours of newcomer youth; 4) describe the self-reported health of newcomer youth; and 5) examine how diets, eating behaviours, and health of newcomer youth compare with other study participants.

## **Materials and Methods**

Approval for this study was granted by the Joint Faculty Research Ethics Board at the University of Manitoba.

### *Study participants*

Participants were recruited from schools in Manitoba School Divisions with a grade nine population of at least 10 students. Exclusion criteria were independent, francophone, and home schools. Thirty-seven schools from 14 Manitoba School Divisions participated.

Students that were born outside of Canada and had arrived within seven years of their last birthday were classified as newcomers. The non-newcomer classification was assigned to participants born in Canada, and to those who were born outside of Canada and arrived more than seven years since their last birthday and were not Indigenous.

### *Study design*

The study used an observational cross-sectional design with survey data collected for the FANS study from grade nine students in Manitoba schools during the 2018-2019 academic year. Consent was obtained from parents/guardians through consent forms distributed by the schools. Each student also provided their individual assent at the beginning of the online survey. Further study design details can be found elsewhere (Slater et al., 2021).



## *Measures*

The web-based surveillance tool, WEB-Q, was used to collect participant survey responses. WEB-Q was developed at the University of Waterloo and has been validated for use by adolescents in Canada for ethnically diverse populations, including respondents whose first language is other than English (Hanning, 2009). Students completed the online survey during their regular school day. A trained research assistant was present to respond to questions and to help with any technical issues encountered while completing the survey. Using WEB-Q, students responded to survey questions including demographic characteristics, dietary intakes, eating behaviours, and self-reported health.

*Dietary intake and eating behaviours.* Using the interactive “drag and drop” function in WEB-Q, students provided a single 24-hour diet recall including the foods and portions they ate for each meal and snack from photos of over 600 food choices. Students were prompted by the tool to include commonly forgotten accompaniments for foods, such as spreads on toast, and reviewed their selections on a summary page for revision prior to final submission.

The recall was used to derive a modified Healthy Eating Index – Canada (HEI-C) score based on reported intakes of 13 food components. The Healthy Eating Index was initially developed by the United States Department of Agriculture. Due to similarities in guidelines between the U.S. and Canada, the index was adapted for use with a Canadian population according to recommended servings by age and sex in Canada’s Food Guide to Healthy Eating (2007) (CFGHE) (Garriguet, 2009; Jessri et al., 2017). Further modifications were made to the HEI-C for this study to incorporate new dietary guidance, by the addition of two food components: low fat vitamin-D fortified milk and dairy-free beverage alternatives, and seafood and plant-based proteins (Government of Canada, 2007). In addition to determining an overall score out of 100, each student’s score was also used to classify their diet quality as poor (<50), needs improvement (50-80), or good (>80) (Woodruff & Hanning, 2010).

Additional dietary measures included determining intakes of key nutrients and adherence to recommended guidelines. For food groups and unsaturated fats, intakes were compared to CFGHE guidelines for sex and age (Government of Canada, 2007). Saturated fat was compared as a percentage of total energy intake according to World Health Organization recommendations (World Health Organization, 2018). Estimated Average Requirements were used for other nutrients (Government of Canada, 2006). As fibre and sodium do not have an established EAR, the Adequate Intakes and Upper Limit were used respectively.

In addition to diet intake, participants responded to a series of questions about eating behaviours. Respondents indicated how many times per week they purchased food at school, ate regular meals, and ate dinner with a parent or guardian. Students also indicated whether they were eating more or less than usual to modify their weight, and if they had taken a food and nutrition course in school.

*Health.* A body mass index (BMI) z-score was calculated using the modified World Health Organization growth charts for each respondent who provided their height and weight. Derived z-values were validated with the online Canadian Pediatric Endocrine Group shiny app (2014 version) on weight-for-age reference curves for ages 0 – 19 years (Canadian Pediatric Endocrine Group, n.d.). BMI z-score cut-off points were then compared to a reference standard that accounts for the age and sex of adolescents and grouped into four BMI categories: underweight, healthy weight, overweight, or obese (World Health Organization, n.d.).

For other health measures, participants indicated the number of hours of sleep they typically get at night and rated their health on an ordinal scale from poor to excellent.

#### *Statistical analysis*

Data was analyzed using IBM SPSS Statistics Version 27, except for computation of 95% confidence intervals, for which Microsoft Excel for Mac Version 16.5 was used.

Dietary intake analysis excluded participants with missing food recalls (n=13) and those who reported implausible energy intakes of below 200 kcal or over 6,000 kcal (n=27) (Hanning et al., 2007).

For diet quality variables with established intake recommendations, 95% confidence intervals were determined to investigate differences between subgroups in the proportion not meeting recommendations. Similarly, 95% confidence intervals were used to investigate differences between subgroups in: 1) mean HEI-C scores; 2) proportions in HEI-C categories; 3) proportions in dichotomous eating behaviour variables; and 4) proportions in the dichotomous self-rated health variable. For diet quality variables without established intake recommendations, and due to non-normal distributions, Mann-Whitney U tests were used to compare median intake between subgroups.

Chi-square tests of independence were used to compare differences in BMI category between subgroups. Due to low expected cell counts for the categorical sleep variable, Fisher-Freeman-Halton Exact tests were performed instead.

*Sex/gender.* All participant genders were included in reporting the diet intake interquartile ranges for total newcomer and non-newcomer cohorts. However, due to sex-based standards,

dietary intake measures for the cohorts were stratified by sex, and other gender participants (n=59) were excluded from analysis of recommended intake guidelines. Similarly, other gender participants were excluded from BMI analysis.

To reflect differences in gender group expression and identity, survey responses for eating behaviours, sleep, and self-rated health were stratified by the gender group identified by participants. However, due to low cell counts (<5) in other gendered newcomer participants, statistical testing for differences between groups was limited to female and male participants.

## Results

### *Participant characteristics*

Table 5.1 shows the shows the age and gender/sex of the study participants.

**Table 5.1**

### *Participant Characteristics*

| Characteristic               | Total<br>(n=1347) |      | Newcomer <sup>1</sup><br>(n=302) |      | Non-newcomer <sup>2</sup><br>(n=1045) |      |
|------------------------------|-------------------|------|----------------------------------|------|---------------------------------------|------|
|                              | n                 | %    | n                                | %    | n                                     | %    |
| <b>Gender/sex</b>            |                   |      |                                  |      |                                       |      |
| Female                       | 678               | 50.3 | 148                              | 49.0 | 530                                   | 50.7 |
| Male                         | 610               | 45.3 | 142                              | 47.0 | 468                                   | 44.8 |
| Other/Not specified          | 59                | 4.4  | 12                               | 4.0  | 47                                    | 4.5  |
| <b>Age at time of survey</b> |                   |      |                                  |      |                                       |      |
| 13                           | 46                | 3.4  | 11                               | 3.6  | 35                                    | 3.3  |
| 14                           | 1122              | 83.3 | 249                              | 82.5 | 873                                   | 83.5 |
| 15                           | 173               | 12.8 | 41                               | 13.6 | 132                                   | 12.6 |
| 16                           | 3                 | 0.2  | 1                                | 0.3  | 2                                     | 0.2  |
| Not reported                 | 3                 | 0.2  | 0                                | 0.0  | 3                                     | 0.3  |

<sup>1</sup> Moved to Canada within seven years of last birthday

<sup>2</sup> Born in Canada or moved to Canada more than seven years from their last birthday and not Indigenous

### *Dietary intake*

Apart from grain products and iron, most newcomer participants did not meet intake recommendations for food groups and nutrients. Interquartile intake ranges and the proportion of newcomer youth who did not meet recommendations are presented in Table 5.2, stratified by sex. There were differences by sex for some components. A greater proportion of male newcomers met recommendations for milk and alternatives, calcium, and iron intakes. On the other hand, a greater proportion of female newcomers met recommendations for sodium intake. On average, females ate more servings of whole fruit, and dark green and orange vegetables than males.

**Table 5.2**

*Food Group and Select Nutrient Intakes with Proportions of Newcomer Youth Not Meeting Recommendations in Relation to Sex*

| Intake Recommendation  | Total (n=290)                   |     |      |        |      |                            |     |      |     |      | Female (n=147) |      |     |     |      | Male (n=132)               |      |        |      |      | p-value* | 95% CI** |             |            |             |
|--|---------------------------------|-----|------|--------|------|----------------------------|-----|------|-----|------|----------------|------|-----|-----|------|----------------------------|------|--------|------|------|----------|----------|-------------|------------|-------------|
|  |                                 |     |      |        |      | Not meeting recommendation |     |      |     |      |                |      |     |     |      | Not meeting recommendation |      |        |      |      |          | Lower    | Upper       |            |             |
|  | Mean                            | SD  | 25th | Median | 75th | n                          | %   | Mean | SD  | 25th | Median         | 75th | n   | %   | Mean | SD                         | 25th | Median | 75th | n    |          |          |             | %          |             |
| <b>CFGHE (2007) food group</b>   |                                 |     |      |        |      |                            |     |      |     |      |                |      |     |     |      |                            |      |        |      |      |          |          |             |            |             |
| Vegetables & fruit (servings)  | 7 <sup>a</sup> , 8 <sup>b</sup> | 2.5 | 2.3  | 0.8    | 2.0  | 4.0                        | 271 | 97.1 | 2.7 | 2.3  | 1.0            | 2.3  | 4.0 | 141 | 95.9 | 2.3                        | 2.3  | 0.5    | 1.8  | 3.5  | 130      | 98.5     |             | -6.4       | 1.2         |
| Grain products (servings)  | 6 <sup>a</sup> , 7 <sup>b</sup> | 7.7 | 4.0  | 5.0    | 7.0  | 10.1                       | 105 | 37.6 | 7.0 | 3.5  | 4.8            | 6.5  | 9.0 | 54  | 36.7 | 8.5                        | 4.4  | 5.5    | 7.9  | 11.0 | 51       | 38.6     |             | -13.3      | 9.5         |
| Milk & alternatives (servings)   | 3-4                             | 1.7 | 1.7  | 0.4    | 1.1  | 2.7                        | 219 | 78.5 | 1.3 | 1.5  | 0.1            | 0.9  | 1.9 | 128 | 87.1 | 2.1                        | 1.9  | 0.6    | 1.7  | 3.4  | 91       | 68.9     |             | <b>8.6</b> | <b>27.8</b> |
| Meat & alternatives (servings)   | 2 <sup>a</sup> , 3 <sup>b</sup> | 2.4 | 2.1  | 1.0    | 2.0  | 3.4                        | 157 | 56.3 | 2.2 | 1.9  | 1.0            | 2.0  | 3.0 | 75  | 51.0 | 2.6                        | 2.2  | 1.0    | 2.1  | 3.9  | 82       | 62.1     |             | -22.7      | 0.5         |
| Other foods (servings)   | -                               | 3.3 | 3.0  | 1.4    | 2.5  | 4.0                        | -   | -    | 2.9 | 2.6  | 1.5            | 2.0  | 4.0 | -   | -    | 3.6                        | 3.4  | 1.1    | 3.0  | 4.5  | -        | -        | .100        | -          | -           |
| <b>Supplemental food group</b>   |                                 |     |      |        |      |                            |     |      |     |      |                |      |     |     |      |                            |      |        |      |      |          |          |             |            |             |
| Whole fruits (servings)  | -                               | 0.8 | 1.1  | 0.0    | 0.5  | 1.0                        | -   | -    | 0.9 | 1.1  | 0.0            | 1.0  | 1.0 | -   | -    | 0.6                        | 1.0  | 0.0    | 0.0  | 1.0  | -        | -        | <b>.002</b> | -          | -           |
| Dark green & orange vegetables (servings)  | -                               | 0.3 | 0.7  | 0.0    | 0.0  | 0.3                        | -   | -    | 0.4 | 0.7  | 0.0            | 0.0  | 0.5 | -   | -    | 0.3                        | 0.8  | 0.0    | 0.0  | 0.0  | -        | -        | <b>.013</b> | -          | -           |
| Whole grain products (servings)  | -                               | 1.0 | 1.5  | 0.0    | 0.0  | 1.5                        | -   | -    | 1.1 | 1.4  | 0.0            | 0.0  | 2.0 | -   | -    | 0.8                        | 1.5  | 0.0    | 0.0  | 1.0  | -        | -        | .052        | -          | -           |
| Low fat Vitamin-D fortified milk and dairy-free beverage alternatives (servings) | -                               | 0.7 | 1.1  | 0.0    | 0.0  | 1.0                        | -   | -    | 0.6 | 1.0  | 0.0            | 0.0  | 1.0 | -   | -    | 0.8                        | 1.2  | 0.0    | 0.0  | 1.3  | -        | -        | .428        | -          | -           |
| Seafood & plant-based proteins (servings)  | -                               | 0.3 | 0.8  | 0.0    | 0.0  | 0.5                        | -   | -    | 0.4 | 0.9  | 0.0            | 0.0  | 0.3 | -   | -    | 0.3                        | 0.6  | 0.0    | 0.0  | 0.5  | -        | -        | .706        | -          | -           |
| <b>Nutrient</b>  |                                 |     |      |        |      |                            |     |      |     |      |                |      |     |     |      |                            |      |        |      |      |          |          |             |            |             |

|                              |                                       |        |        |        |        |        |     |      |        |        |        |        |        |     |      |        |        |        |        |        |     |      |              |             |
|------------------------------|---------------------------------------|--------|--------|--------|--------|--------|-----|------|--------|--------|--------|--------|--------|-----|------|--------|--------|--------|--------|--------|-----|------|--------------|-------------|
| Unsaturated fats (g)         | 30 <sup>a</sup> , 45 <sup>b</sup>     | 35.5   | 21.0   | 19.4   | 31.5   | 47.1   | 159 | 57.0 | 30.6   | 16.4   | 17.3   | 29.5   | 42.1   | 76  | 51.7 | 41.0   | 24.5   | 22.8   | 36.4   | 57.2   | 83  | 62.9 | -22.7        | 0.3         |
| Saturated fats (% of energy) | <10%                                  | 10.5   | 4.1    | 7.4    | 10.4   | 12.8   | 158 | 56.6 | 10.0   | 4.0    | 7.0    | 10.2   | 12.2   | 77  | 52.4 | 11.0   | 4.1    | 8.2    | 10.8   | 13.3   | 81  | 61.4 | -20.6        | 2.6         |
| Sodium (mg)                  | 2300 <sup>c</sup>                     | 2524.2 | 1599.6 | 1255.4 | 2330.4 | 3321.1 | 141 | 50.5 | 2172.9 | 1328.7 | 1146.8 | 1968.2 | 3001.9 | 62  | 42.2 | 2883.0 | 1793.5 | 1494.6 | 2610.9 | 3969.6 | 79  | 59.8 | <b>-29.2</b> | <b>-6.0</b> |
| Calcium (mg)                 | 1100 <sup>d</sup>                     | 701.9  | 508.0  | 288.5  | 601.8  | 951.5  | 224 | 80.3 | 594.8  | 450.4  | 255.0  | 506.6  | 822.7  | 127 | 86.4 | 819.2  | 553.0  | 414.9  | 739.8  | 1148.2 | 97  | 73.5 | <b>3.6</b>   | <b>22.2</b> |
| Iron (mg)                    | 7.9 <sup>ad</sup> , 7.7 <sup>bd</sup> | 12.0   | 6.4    | 7.4    | 10.7   | 15.3   | 82  | 29.4 | 10.7   | 5.5    | 6.9    | 9.7    | 13.4   | 51  | 34.7 | 13.4   | 7.2    | 7.8    | 12.2   | 17.2   | 31  | 23.5 | <b>0.6</b>   | <b>21.8</b> |
| Zinc (mg)                    | 7.3 <sup>ad</sup> , 8.5 <sup>bd</sup> | 8.9    | 5.6    | 5.0    | 7.7    | 11.3   | 143 | 51.3 | 7.7    | 4.7    | 4.6    | 6.6    | 9.9    | 82  | 55.8 | 10.3   | 6.3    | 6.0    | 8.9    | 13.2   | 61  | 46.2 | -2.1         | 21.3        |
| Vitamin A (mcg RAE)          | 485 <sup>ad</sup> , 630 <sup>bd</sup> | 452.7  | 369.9  | 173.0  | 381.8  | 640.0  | 193 | 69.2 | 414.7  | 343.8  | 171.0  | 363.0  | 581.0  | 103 | 70.1 | 503.7  | 403.0  | 203.9  | 420.9  | 695.9  | 90  | 68.2 | -9.0         | 12.8        |
| Vitamin D (IU)               | 400 <sup>d</sup>                      | 163.8  | 171.0  | 42.7   | 119.8  | 219.4  | 254 | 91.0 | 145.4  | 166.1  | 36.0   | 105.0  | 195.0  | 136 | 92.5 | 189.2  | 178.5  | 52.0   | 139.0  | 277.0  | 118 | 89.4 | -3.7         | 9.9         |
| Fibre (g)                    | 26 <sup>ae</sup> , 38 <sup>be</sup>   | 13.9   | 8.5    | 6.9    | 13.0   | 19.4   | 266 | 95.3 | 13.2   | 7.8    | 6.6    | 12.4   | 18.5   | 135 | 91.8 | 14.3   | 9.4    | 6.7    | 13.1   | 20.1   | 131 | 99.2 | <b>-12.1</b> | <b>-2.7</b> |

\*p-value derived from Mann-Whitney U test between sex. Bolded values represent statistically significant difference, p<0.05

\*\*Confidence intervals derived from difference in proportions not meeting recommendations between female (*reference group*) and male newcomers. Bolded values represent statistically significant difference, 95% confidence intervals

<sup>a</sup> Recommendation for females

<sup>b</sup> Recommendation for males

<sup>c</sup> Upper Limit

<sup>d</sup> Estimated Average Requirement

<sup>e</sup> Adequate Intake

Similar to newcomer participants, most non-newcomer students did not meet intake recommendations for food groups and nutrients. Over 90% of newcomer and non-newcomer participants did not meet the recommended intakes for vegetables and fruit, fibre, and vitamin D. The median intake for each supplemental food group was one or fewer servings in the day for both newcomer and non-newcomer participant groups. While a greater proportion of newcomers met recommendations for saturated fat intake, a smaller proportion met recommendations for vegetables and fruit, calcium, iron, zinc, and Vitamin A. Interquartile intake ranges and the proportion of newcomer and non-newcomer youth who did not meet recommendations is presented in Table 5.3 and stratified by sex for non-newcomer youth. Table 5.3 also shows differences between newcomer and non-newcomer participants for the food group and nutrient intakes.

**Table 5.3**

*Food Group and Select Nutrient Intakes with Proportions of Participants Not Meeting Recommendations in Relation to Newcomer Status*

|  | Intake Recommendation           | Newcomer (n=290) |     |                              | Non-newcomer (n=1017) |        |        |     |        |      | p-value* | 95% CI** |      |                 |            |   |
|--|---------------------------------|------------------|-----|------------------------------|-----------------------|--------|--------|-----|--------|------|----------|----------|------|-----------------|------------|---|
|  |                                 | Total            |     | Not meeting recommendation n | Total                 |        | Female |     | Male   |      |          |          |      |                 |            |   |
|  |                                 | Median           | n   |                              | %                     | Median | n      | %   | Median | n    |          |          |      | %               | Median     | n |
|  |                                 |                  |     |                              |                       |        |        |     |        |      |          |          |      |                 |            |   |
| <b>CFGHE (2007) food group</b>                           |                                 |                  |     |                              |                       |        |        |     |        |      |          |          |      |                 |            |   |
| Vegetables & fruit (servings)                            | 7 <sup>a</sup> , 8 <sup>b</sup> | 2.0              | 271 | 97.1                         | 2.7                   | 900    | 92.6   | 2.5 | 480    | 93.0 | 2.9      | 420      | 92.1 | <b>1.9</b>      | <b>7.1</b> |   |
| Grain products (servings)                                | 6 <sup>a</sup> , 7 <sup>b</sup> | 7.0              | 105 | 37.6                         | 7.0                   | 407    | 41.9   | 6.0 | 240    | 46.5 | 8.0      | 167      | 36.6 | -10.8           | 2.2        |   |
| Milk & alternatives (servings)                           | 3-4                             | 1.1              | 219 | 78.5                         | 1.8                   | 708    | 72.8   | 1.5 | 403    | 78.1 | 2.2      | 305      | 66.9 | -0.1            | 11.1       |   |
| Meat & alternatives (servings)                           | 2 <sup>a</sup> , 3 <sup>b</sup> | 2.0              | 157 | 56.3                         | 2.1                   | 547    | 56.3   | 1.8 | 292    | 56.6 | 2.7      | 255      | 55.9 | -6.6            | 6.6        |   |
| Other foods (servings)                                   | -                               | 2.5              | -   | -                            | 3.0                   | -      | -      | 2.9 | -      | -    | 3.8      | -        | -    | <b>.028</b>     | -          | - |
| <b>Supplemental food group</b>                           |                                 |                  |     |                              |                       |        |        |     |        |      |          |          |      |                 |            |   |
| Whole fruits (servings)                                  | -                               | 0.5              | -   | -                            | 0.8                   | -      | -      | 1.0 | -      | -    | 0.5      | -        | -    | <b>.049</b>     | -          | - |
| Dark green & orange vegetables (servings)                | -                               | 0.0              | -   | -                            | 0.0                   | -      | -      | 0.0 | -      | -    | 0.0      | -        | -    | <b>&lt;.001</b> | -          | - |
| Whole grain products (servings)                          | -                               | 0.0              | -   | -                            | 1.0                   | -      | -      | 0.0 | -      | -    | 1.0      | -        | -    | <b>.002</b>     | -          | - |
| Low fat Vitamin-D fortified milk and dairy-free beverage | -                               | 0.0              | -   | -                            | 0.3                   | -      | -      | 0.0 | -      | -    | 0.5      | -        | -    | <b>.024</b>     | -          | - |



|  |                                       |        |     |      |        |     |      |        |     |      |        |     |      |             |              |             |
|--|---------------------------------------|--------|-----|------|--------|-----|------|--------|-----|------|--------|-----|------|-------------|--------------|-------------|
| alternatives<br>(servings)                         |                                       |        |     |      |        |     |      |        |     |      |        |     |      |             |              |             |
| Seafood &<br>plant-based<br>proteins<br>(servings) | -                                     | 0.0    | -   | -    | 0.0    | -   | -    | 0.0    | -   | -    | 0.0    | -   | -    | <b>.031</b> | -            | -           |
| <b>Nutrient</b>                                    |                                       |        |     |      |        |     |      |        |     |      |        |     |      |             |              |             |
| Unsaturated<br>fats (g)                            | 30 <sup>a</sup> , 45 <sup>b</sup>     | 31.5   | 159 | 57.0 | 35.5   | 497 | 51.1 | 30.5   | 257 | 49.8 | 42.6   | 240 | 52.6 |             | -0.7         | 12.5        |
| Saturated fats<br>(% of energy)                    | <10%                                  | 10.4   | 158 | 56.6 | 11.9   | 649 | 66.8 | 11.7   | 334 | 64.7 | 12.3   | 315 | 69.1 |             | <b>-16.7</b> | <b>-3.7</b> |
| Sodium (mg)  | 2300 <sup>c</sup>                     | 2330.4 | 141 | 50.5 | 2539.4 | 542 | 55.8 | 2213.3 | 236 | 45.7 | 3129.6 | 306 | 67.1 |             | -11.9        | 1.3         |
| Calcium (mg)                                       | 1100 <sup>d</sup>                     | 601.8  | 224 | 80.3 | 769.2  | 680 | 70.0 | 686.8  | 405 | 78.5 | 925.3  | 275 | 60.3 |             | <b>4.8</b>   | <b>15.8</b> |
| Iron (mg)  | 7.9 <sup>ad</sup> , 7.7 <sup>bd</sup> | 10.7   | 82  | 29.4 | 12.6   | 208 | 21.4 | 10.7   | 150 | 29.1 | 14.7   | 58  | 12.7 |             | <b>2.1</b>   | <b>13.9</b> |
| Zinc (mg)  | 7.3 <sup>ad</sup> , 8.5 <sup>bd</sup> | 7.7    | 143 | 51.3 | 8.4    | 425 | 43.7 | 7.1    | 268 | 51.9 | 10.6   | 157 | 34.4 |             | <b>1.0</b>   | <b>14.2</b> |
| Vitamin A<br>(mcg RAE)                             | 485 <sup>ad</sup> , 630 <sup>bd</sup> | 381.8  | 193 | 69.2 | 451.6  | 571 | 58.7 | 392.7  | 305 | 59.1 | 527.7  | 266 | 58.3 |             | <b>4.3</b>   | <b>16.7</b> |
| Vitamin D<br>(IU)                                  | 400 <sup>d</sup>                      | 119.8  | 254 | 91.0 | 139.0  | 862 | 88.7 | 104.9  | 485 | 94.0 | 179.7  | 377 | 82.7 |             | -1.6         | 6.2         |
| Fibre (g)  | 26 <sup>ae</sup> , 38 <sup>be</sup>   | 13.0   | 266 | 95.3 | 14.9   | 918 | 94.4 | 12.8   | 479 | 92.8 | 16.7   | 439 | 96.3 |             | -2.0         | 3.8         |

\*p-value derived from Mann-Whitney U test between newcomer and non-newcomer participants. Bolded values represent statistically significant difference, p<0.05

\*\*Confidence intervals derived from difference in proportions not meeting recommendations between newcomer (*reference group*) and non-newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals

<sup>a</sup> Recommendation for females

<sup>b</sup> Recommendation for males

<sup>c</sup> Upper Limit

<sup>d</sup> Estimated Average Requirement

<sup>e</sup> Adequate Intake

Most newcomer and non-newcomer participants had a Healthy Eating Index score that was categorized as ‘needs improvement’. Mean scores and category percentages are shown in Table 5.4.

**Table 5.4***Healthy Eating Index Score and Category of Newcomer and Non-newcomer Youth by Sex with Comparisons by Newcomer Status*

|                              | Score Range | Newcomer      |      |      |                |      |   |              |      |      | Non-newcomer  |      |   |                |      |      |              |      |      | 95% CI |       |        |     |
|------------------------------|-------------|---------------|------|------|----------------|------|---|--------------|------|------|---------------|------|---|----------------|------|------|--------------|------|------|--------|-------|--------|-----|
|                              |             | Total (n=279) |      |      | Female (n=147) |      |   | Male (n=132) |      |      | Total (n=972) |      |   | Female (n=516) |      |      | Male (n=456) |      |      |        |       |        |     |
|                              |             | Mean          | SD   | %    | Mean           | SD   | % | Mean         | SD   | %    | Mean          | SD   | % | Mean           | SD   | %    | Mean         | SD   | %    | Lower  | Upper |        |     |
| Healthy Eating Index score   | 0 - 100     | 56.6          | 10.4 |      | 59.1           | 10.0 |   | 53.8         | 10.3 |      | 57.3          | 11.2 |   | 57.8           | 11.6 |      | 56.6         | 10.7 |      | -2.1*  | 0.8   |        |     |
| Health Eating Index category |             |               |      |      |                |      |   |              |      |      |               |      |   |                |      |      |              |      |      |        |       |        |     |
| Poor                         | 0 - 49      |               |      | 24.0 |                |      |   |              |      | 15.6 |               |      |   |                |      | 26.2 |              |      | 24.6 |        | 28.1  | -7.9** | 3.5 |
| Needs improvement            | 50 - 80     |               |      | 74.9 |                |      |   |              |      | 82.3 |               |      |   |                |      | 71.2 |              |      | 72.5 |        | 69.7  |        |     |
| Good                         | 81 - 100    |               |      | 1.1  |                |      |   |              |      | 2.0  |               |      |   |                |      | 2.6  |              |      | 2.9  |        | 2.2   |        |     |

\*Confidence interval for derived from difference in means between newcomer and non-newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals

\*\*Confidence interval derived from difference in proportions between newcomer (*reference group*) and non-newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals

There were no significant differences in HEI-C score or category for newcomer youth compared with non-newcomers. However, there were differences found between sex for newcomers. Thirty-three percent of males and 15.6% of females had a score in the 'poor' diet quality range (95% CI: -27.3, -7.5).

#### *Eating behaviours*

Responses to eating behaviour survey questions are presented in Table 5.5 as proportions and stratified by gender for newcomer and non-newcomer participants. Twenty-nine percent of newcomer participants reported eating breakfast four or fewer days per week. A smaller percentage (17.6%) reported eating lunch four or fewer days per week. A greater proportion of newcomer youth reported eating more than usual to try to gain weight or eating less than usual to try to lose weight (26.0% and 33.1%, respectively). Fewer newcomer participants reported having taken a food and nutrition course at school than non-newcomer participants.

**Table 5.5**

*Eating Behaviours of Newcomer Youth and Non-newcomer Youth by Gender with Comparisons by Newcomer Status*

| Survey Question  | Total | Newcomer |        |      |       | Non-newcomer |        |      |       | 95% CI*      |             |
|--|-------|----------|--------|------|-------|--------------|--------|------|-------|--------------|-------------|
|  |       | Total    | Female | Male | Other | Total        | Female | Male | Other |              |             |
|  | n     | n        | n      | n    | n     | n            | n      | n    | n     |              |             |
|  | %     | %        | %      | %    | %     | %            | %      | %    | %     |              |             |
|  | %     | %        | %      | %    | %     | %            | %      | %    | Lower | Upper        |             |
| <b>How often do you eat breakfast?</b>   | 1296  | 288      | 142    | 134  | 12    | 1008         | 514    | 452  | 42    |              |             |
| 5 or more days a week  | 63.5  | 70.8     | 61.3   | 80.6 | 75.0  | 61.4         | 52.3   | 71.7 | 61.9  |              |             |
| 0 - 4 days a week  | 36.5  | 29.2     | 38.7   | 19.4 | 25.0  | 38.6         | 47.7   | 28.3 | 38.1  | <b>-15.5</b> | <b>-3.3</b> |
| <b>How often do you eat lunch?</b>   | 1202  | 272      | 133    | 127  | 12    | 930          | 466    | 424  | 40    |              |             |
| 5 or more days a week  | 83.1  | 82.4     | 80.5   | 84.3 | 83.3  | 83.3         | 78.3   | 88.4 | 87.5  |              |             |
| 0 - 4 days a week  | 16.9  | 17.6     | 19.5   | 15.7 | 16.7  | 16.7         | 21.7   | 11.6 | 12.5  | -4.2         | 6.0         |
| <b>Typically, how many days per week do you eat dinner/supper with at least one parent/guardian?</b> | 1264  | 280      | 138    | 131  | 11    | 984          | 504    | 439  | 41    |              |             |
| 5 or more days a week  | 77.5  | 79.3     | 79.0   | 80.2 | 72.7  | 76.9         | 73.8   | 80.0 | 82.9  |              |             |
| 0 - 4 days a week  | 22.5  | 20.7     | 21.0   | 19.8 | 27.3  | 23.1         | 26.2   | 20.0 | 17.1  | -7.8         | 3.0         |
| <b>How often do you eat meals/snacks purchased from the school cafeteria?</b>                        | 1283  | 282      | 137    | 133  | 12    | 1001         | 510    | 447  | 44    |              |             |

|   |      |      |      |      |      |      |      |      |      |              |             |
|---|------|------|------|------|------|------|------|------|------|--------------|-------------|
| 2 - 7 times a week  | 15.0 | 14.5 | 9.5  | 17.3 | 41.7 | 15.2 | 15.7 | 14.8 | 13.6 |              |             |
| 0 - 1 times a week  | 85.0 | 85.5 | 90.5 | 82.7 | 58.3 | 84.8 | 84.3 | 85.2 | 86.4 | -5.4         | 4.0         |
| <b>I am eating less than usual to try and lose weight</b>   | 1311 | 293  | 143  | 139  | 11   | 1018 | 517  | 459  | 42   |              |             |
| No  | 73.4 | 66.9 | 62.9 | 72.7 | 45.5 | 75.2 | 70.4 | 80.4 | 78.6 |              |             |
| Yes   | 26.6 | 33.1 | 37.1 | 27.3 | 54.5 | 24.8 | 29.6 | 19.6 | 21.4 | <b>2.3</b>   | <b>14.3</b> |
| <b>I am eating more than usual to try and gain weight</b>   | 1298 | 285  | 138  | 138  | 9    | 1013 | 516  | 456  | 41   |              |             |
| No  | 82.2 | 74.0 | 83.3 | 63.8 | 88.9 | 84.5 | 92.6 | 76.1 | 75.6 |              |             |
| Yes   | 17.8 | 26.0 | 16.7 | 36.2 | 11.1 | 15.5 | 7.4  | 23.9 | 24.4 | <b>4.9</b>   | <b>16.1</b> |
| <b>Have you taken a Home Economics/Human Ecology course with a focus on food and nutrition in school?</b> | 1246 | 276  | 136  | 129  | 11   | 970  | 366  | 242  | 31   |              |             |
| No  | 37.7 | 50.4 | 50.7 | 51.2 | 36.4 | 34.1 | 26.8 | 43.6 | 24.4 |              |             |
| Yes   | 62.3 | 49.6 | 49.3 | 48.8 | 63.6 | 65.9 | 73.2 | 56.4 | 75.6 | <b>-22.9</b> | <b>-9.7</b> |

\*Confidence intervals derived from difference in proportions between newcomer (*reference group*) and non-newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals

*Health*

Table 5.6 shows the health-related survey responses for newcomer and non-newcomer participants with differences between female and male newcomer participants.

**Table 5.6***BMI, Sleep, and Self-rated Health of Participants and Comparisons by Sex or Gender in Newcomer Youth*

| Health measure              | Non-newcomer |      | Newcomer |      |        |      |      |      | p-value | 95% CI*** |               |            |             |
|-----------------------------|--------------|------|----------|------|--------|------|------|------|---------|-----------|---------------|------------|-------------|
|                             | Total        |      | Total    |      | Female |      | Male |      |         | Other     |               |            |             |
|                             | n            | %    | n        | %    | n      | %    | n    | %    |         | n         | %             |            |             |
| <b>BMI category</b>         |              |      |          |      |        |      |      |      |         |           |               |            |             |
| Underweight                 | 26           | 3.1  | 11       | 4.9  | 3      | 2.8  | 8    | 6.9  | -       | -         | .110*         |            |             |
| Healthy weight              | 616          | 74.3 | 157      | 69.8 | 84     | 77.1 | 73   | 62.9 | -       | -         |               |            |             |
| Overweight                  | 146          | 17.6 | 41       | 18.2 | 15     | 13.8 | 26   | 22.4 | -       | -         |               |            |             |
| Obese                       | 41           | 4.9  | 16       | 7.1  | 7      | 6.4  | 9    | 7.8  | -       | -         |               |            |             |
| <b>Usual hours of sleep</b> |              |      |          |      |        |      |      |      |         |           |               |            |             |
| Less than 6                 | 63           | 6.2  | 11       | 3.7  | 6      | 4.1  | 4    | 2.9  | 1       | 10.0      | <b>.001**</b> |            |             |
| 6 - 7                       | 407          | 39.8 | 110      | 37.4 | 69     | 47.6 | 39   | 28.1 | 2       | 20.0      |               |            |             |
| 8 or more                   | 552          | 54.0 | 173      | 58.8 | 70     | 48.3 | 96   | 69.1 | 7       | 70.0      |               |            |             |
| <b>Self-rated health</b>    |              |      |          |      |        |      |      |      |         |           |               |            |             |
| Poor/fair                   | 360          | 36.4 | 108      | 38.4 | 64     | 46.0 | 39   | 29.8 | 5       | 45.5      |               | <b>4.8</b> | <b>27.6</b> |
| Very good/excellent         | 630          | 63.6 | 173      | 61.6 | 75     | 54.0 | 92   | 70.2 | 6       | 54.5      |               |            |             |

\*p-value derived from chi-square test of independence between sex in newcomer participants. Bolded values represent statistically significant association,  $p < 0.05$

\*\*p-value derived from Fisher-Freeman-Halton Exact test between sex in newcomer participants due to low expected cell counts. Bolded values represent statistically significant association,  $p < 0.05$

\*\*\*Confidence intervals derived from difference in proportions between female (*reference group*) and male newcomer participants. Bolded values represent statistically significant difference, 95% confidence intervals



Differences between newcomer and non-newcomer groups are not shown in the tables. No significant differences were found for BMI category ( $p=.306$ ), typical hours of sleep at night ( $p=.158$ ), or self-rated health (95% CI: -4.4, 8.4).

## **Discussion**

This study fills a gap in Canadian research by describing diet patterns, eating behaviours, and nutrition-related health of newcomer adolescents compared with the general youth population.

### *Diet quality*

Participants did not have adequate diets and almost one quarter of newcomer youth had a poor diet quality. Very high proportions of newcomer participants did not meet recommendations for vegetables and fruit (97.1%), fibre (95.3%), or vitamin D (91.0%), and more than three quarters did not meet milk and alternatives, or calcium requirements. Similar findings are evident from research in younger newcomer children that found only 3% met fibre intake recommendations, and large proportions were at risk for inadequate calcium and vitamin D intakes (80% and 90%, respectively) (Lane et al., 2019a). This study reported some differences between newcomer female and male participants. Fewer females than males met guidelines for milk and alternatives and calcium, putting them at greater risk for impaired bone health and development during adolescence. Despite this inadequacy, a greater proportion of males than females had an overall ‘poor’ diet quality score.

While diets were not adequate regardless of immigration status, some differences were previously noted between newcomer youth and other study participants for food components. National level analysis of adolescent diets for comparison to food groups and micronutrients is not up to date. However, smaller regional studies generally confer that intake patterns of children and youth do not meet recommendations, with particularly low adherence to certain food groups (vegetables and fruit, milk and alternatives) and nutrients (fibre, calcium, vitamin D) (Bukambu et al., 2020; Slater & Colatruglio, 2016). The lack of overall diet quality difference between newcomer and general population youth may be an indication of newcomer youth having inadequate diet patterns before arrival in Canada, or a rapid dietary acculturation upon arrival (Lane et al., 2019a; Sastre & Haldeman, 2021).

### *Eating behaviours*

Despite most participants having a BMI in the healthy weight range, many indicated engaging in eating behaviours to change their weight. More than a quarter of study participants reported eating less than usual to lose weight and close to one in five reported eating more than usual to gain weight. A greater proportion of newcomer youth reported engaging in these

behaviours. Newcomer youth reported eating patterns to modify their weight that are consistent with gender-based social ideals that value thin female bodies and muscular male bodies (Dzielska et al., 2020).

There is scant research for comparison of weight-related eating behaviours in newcomer youth. Earlier Canadian research noted that 9% and 20% of adolescent boys and girls, respectively, reported trying to lose weight (Public Health Agency of Canada, 2012). A smaller study reported that among newcomer participants within one year of arrival in the U.S., 46% had tried to lose weight and that body dissatisfaction increased with higher BMI (Sastre & Haldeman, 2020). However, with differing immigration patterns, the U.S. study results are not directly comparable to Canada. And while some research is available for weight reduction behaviours in newcomer youth, even less was found to describe intentional weight gain behaviours. One Canadian study found that young adult males who identified as mixed ethnicity were more likely to attempt weight gain through diet or exercise than those who identified as white-only (Minnick et al., 2020). The study, however, did not include a measure of newcomer status. Despite the inability to directly compare rates, results from this study suggest that youth are engaging in weight-modification eating behaviours aligned with socialized gender differences and these behaviours are not unique to youth outside a healthy weight BMI. In addition, the greater engagement of weight-related eating behaviours by newcomer youth in this study may be influenced by a desire to conform to western body standards through acculturation to new social norms. These behaviours may be further conflicted in some newcomer families when parents place value on weight gain but adolescents value smaller bodies (Sastre & Haldeman, 2020).

Results for other eating behaviours showed that while there was no difference in the proportion of newcomers compared with non-newcomers who skipped breakfast, more than one third of female newcomers skipped breakfast, which aligns with the noted pattern among females who reported eating less to lose weight. Many newcomer and non-newcomer participants indicated other behaviours associated with reduced diet quality and inability to meet recommended guidelines, including not eating lunch daily and eating food purchased at school (Storey et al., 2009; Watts et al., 2017). Participants in this survey were not asked why they skipped meals or purchased food at school. These behaviours may be influenced by time constraints. While other research indicates that adults are more influenced by convenience and time constraints in making food choices than youth, adolescents may be affected by parental choices if parents typically prepare food for the household (Sastre & Haldeman, 2021). In

addition, not eating lunch on school days may be influenced by short meal breaks, inability to reheat foods, and refusal to eat home-cooked foods that look or smell different from peers (Blanchet et al., 2018; Henderson et al., 2017). Adolescents may skip meals to intentionally reduce body weight, which may be motivated by avoidance of body shaming that is common in adolescent peers, or by fitting in with peers and/or parents who diet (Dzielska et al., 2020).

### *Health*

*BMI.* This study had fewer obese or overweight participants than the national rate of 30% for children aged 5-17 in 2017 (Public Health Agency of Canada, 2018). This discrepancy may be due, in part, to the self-reported measures in this study, as respondents tend to overestimate height and under-report weight (Wahi et al., 2014). The exclusion of Indigenous participants may also contribute to the discrepancy since they may have different rates of overweight and obesity than other youth in Canada (Public Health Agency of Canada, 2011). However, nearly a quarter of study participants were overweight or obese, which is much higher than rates seen in youth a few decades ago (Rao et al., 2016; Wahi et al., 2014). These higher weights tend to continue in adulthood and leave many at increased risk for type 2 diabetes, heart disease, and depression now and in later years (Rao et al., 2016; Sastre & Haldeman, 2020). And while rates of overweight and obesity have been stable over the last decade, current diets rely on heavily processed foods that are energy dense and contribute to higher BMI (Lane et al., 2019b; Nardocci, Leclerc, et al., 2019; Vatanparast et al., 2019). Youth, in particular, eat snacks, which often consist of energy-dense and nutrient-poor foods, and displace the consumption of more nutritionally adequate foods (Moubarac, 2017; Sastre & Haldeman, 2020; Vatanparast et al., 2019). Newcomer youth, who are disproportionately represented by factors of socioeconomic disadvantage, are at even further risk for overweight and obesity (Rao et al., 2016; Wahi et al., 2014).

*Sleep.* The sleep recommendation for adolescents in the participant age range is eight to ten hours at night (Public Health Agency of Canada, 2019a). While there was no difference in sleep between newcomer and non-newcomer youth in this study, over 40% of participants did not meet the guideline, putting them at risk for poorer physical and mental well-being. A greater proportion of youth in this study did not get enough sleep compared to other research that reported one in four children aged 5-17 not getting enough (Public Health Agency of Canada, 2019a). One possibility for this difference could be related to age with adolescents having less adequate sleep than younger children. Future FANS study research may be undertaken to determine reasons that adolescent participants reported for not getting enough sleep.

*Self-rated health.* Many newcomer participants rated their health as fair/poor and a greater proportion of females (46.0%) than males (29.8%) reported this.

It is interesting that more newcomer females indicated poorer self-rated health and less sleep at night, but better overall diet quality and BMI status, than males. While reporting bias is often present in self-reported height and weight, under-reporting of weight is more common in females which may have contributed to the noted differences (Wahi et al., 2014). Further analysis by the FANS study project may determine if there are similar gender or sex differences in health care usage or diagnosis in youth.

Despite the noted gender differences, this study did not show a difference between newcomer and non-newcomer adolescents in health-related results. This supports suggestions from other research that the healthy immigrant effect may not be as apparent in youth than in adults due to the duration required for long-term health effects to become apparent (Vang et al., 2017). Other research has suggested that global shifts in diets may have resulted in diet changes prior to immigration (Lane et al., 2019a). For newcomers who began eating diets similar to western patterns before arrival, the resulting health issues may have begun earlier, and an effect is less obvious in the new host country. This study did not measure diets before immigration and did not include a measure of dietary acculturation. Like the recommendation for future research to elucidate the noted gender differences, other research could be undertaken to look for relationships in newcomer status and health care usage.

### *Limitations*

This study has limitations. First, all data were collected based on self-report. Length of sleep may be subject to overestimation by respondents through recall bias and desire to conform with social norms (Chaput & Dutil, 2016). Self-reported dietary intakes are subject to recall bias and error in estimating portion sizes. Under-reporting of foods consumed is common and may be motivated by conforming to socially desirable diets (Garriguet, 2009; Hanning et al., 2009; Hebert et al., 2008). In addition, only one 24-hour diet recall was provided by participants which may not indicate day-to-day variability in an individual's diet. However, the study methods included several approaches to minimize these errors. The diet recall tool displayed images and descriptions of portion sizes to help respondents estimate accurately and included prompts to include commonly forgotten items. In addition, respondents completed the recall independently online which may minimize shame in reporting less socially desirable foods. Further, the large study sample size captures greater intake variability across participants. This study used the EAR cut-point method for nutrient intakes, which tends to overestimate iron inadequacy in females

(Luo et al., 2021). Interpretations of the proportion of female participants meeting recommendations should consider the possible overestimation.

This study was conducted with youth living in Manitoba. Home country migration patterns differ by region, even within Canada. This study did not collect information on country of origin. Since intake patterns, including eating behaviours, may differ by home country, results from adolescents in other regions of Canada may differ. Further, the study survey did not distinguish between economic and refugee classes of immigration. Since participation required a parent/guardian-signed consent form that was provided only in English, selection bias may have contributed to fewer participants represented from families with greater English language barriers.

In addition, due to the binary newcomer cohort construct, there was no graduated comparison by length of stay in Canada. While sensitivity analysis of the survey data (not reported) suggested that newcomers who have lived in Canada for five or fewer years were similar to those who arrived within seven years, there may be differences in the very early years of settlement, or by age of exposure to a new food environment, that were not elucidated here.

Despite these limitations, generalizability to newcomer adolescents in Canada may remain given that the current study results confer with patterns noted in other Canadian research and since immigration selection practices, social supports, and settlement services are established at the national level.

The cross-sectional nature of the study does not allow for inference of causality and no follow-up with participants will occur. Consistent and timely analysis of CCHS cycle data may be useful to monitor trends or changes over time. Additional research may be undertaken to determine relationships and interactions between sleep at night, health, eating behaviours, and diet intakes for adolescents.

Data collected in this survey was quantitative in nature. While some research described factors for food choices made by newcomer adults in Canada, and the influence of U.S. newcomer adolescents on household food choices, there is a gap for qualitative factors in food choices of newcomer youth in Canada (Sanou et al., 2014; Sastre & Haldeman, 2021). Research with a qualitative component may be useful to determine themes among food choices and eating behaviours in youth, including peer pressures, compliance with gender norms, household influences, availability, convenience, and other factors.

## *Conclusion*

Newcomer youth are eating diets that are known to contribute to future risk of chronic diseases with great economic and societal costs. And as the Government of Canada fulfills immigration promises, the number of newcomer adolescents who are at risk for nutrition-related chronic conditions in Canada will continue to grow. Eating patterns and body weights developed in youth are known to track into adulthood when even greater health impacts may be seen. So long as current diet patterns are allowed to continue, youth will continue to experience the high levels of chronic diseases observed in recent years. Other health factors in adolescence that were not examined in this study, like physical inactivity, smoking behaviour, and alcohol consumption, may act in synergy to establish the beginnings of chronic disease that persist later in life (Alamian & Paradis, 2009).

Since diet transition occurs soon after arrival in a new country, nutrition education programs should be offered to all newcomers early in the settlement process. As both parents and adolescents influence the foods purchased and prepared in the home, community programs that are targeted to families can support the whole household as they adjust to a new food environment.

While newcomer youth did not have worse diet quality than non-newcomers in this study, the reported diet quality of all study participants is clearly insufficient and worrisome. Programs and policies that foster eating regular meals, and include nutritious food selections, are recommended to benefit both newcomer and non-newcomer students. In its Food Policy for Canada, the federal government has committed to reducing nutrition-related chronic disease through a nutritious food system that supports culturally diverse foods and food practices (Agriculture and Agri-Food Canada, 2019). The policy further promises action on the development of a National School Food Program. A universal school-based program is encouraged to address the poor diet patterns widespread in adolescents, regardless of newcomer status or gender.

In addition, compulsory practical food and nutrition classes in schools present an opportunity to improve knowledge and skills for eating in support of long-term health. Practical food skills education must include a variety of foods, adhere to dietary intake guidelines, and minimize reliance on sweet or savoury snack recipes, or cooking shortcuts that use ultra-processed foods. In addition, the inclusion of topics in food-related curriculum, such as body satisfaction, and the impacts of peers and social media on related health and well-being, may address some of the adverse eating behaviours common in youth. As youth experience increased

autonomy, that includes making food and eating choices, this is an important time to support nutritious food choices and promote healthy attitudes and perceptions.

Investments to support adequate eating patterns in both newcomer and Canadian-born youth can work toward optimal growth and development during adolescence, and to reduce the burden of personal, societal, and economic costs of diet-related health issues.

## CHAPTER 6

### GENERAL DISCUSSION

This study used a cross-sectional observational design to answer the following research questions with newcomer Manitoba youth: 1) what is the food security status; 2) how does food security status compare with other study youth; 3) what factors are associated with food insecurity; 4) what is the dietary intake and do intakes meet dietary guidelines; 5) what are the eating behaviours; 6) what is the self-reported health; and 7) how do the diets, eating behaviours, and health compare with other study youth?

This thesis presented results in two separate but related manuscripts. The first paper examined the relationship between food security and nutrition security in newcomer Manitoba youth (Chapter 4). The second paper explored the diet patterns, eating behaviours, and self-reported health of newcomer Manitoba youth with comparisons to other study participants (Chapter 5).

This study found that rates of food insecurity were similar for newcomer and non-newcomer youth. However, this study did not distinguish between those who immigrated to Canada through refugee and economic paths, who may have different rates of food insecurity. While inadequate diets were common regardless of food security status, this study found a few differences within newcomer participants. Adolescents who were food insecure ate more calories on average, and fewer met dietary guidelines for vegetables and fruit. Food insecure adolescents also bought food from school more frequently. These results may further suggest that the food options available for purchase at school contribute to the inability to meet dietary recommendations. In general, newcomer youth had inadequate diets. It is likely that both food secure and food insecure newcomer youth face similar personal preferences and social pressures. Combined with the ubiquitous availability and aggressive marketing of ultra-processed foods, it is not surprising that poor diets are commonly adopted by newcomers after arrival in Canada.

Results from this study suggest that while it is very difficult for those with food insecurity to eat a good quality diet, having food security is not enough to ensure an adequate diet. Inadequate diets in this study were common and almost one quarter of newcomer youth had a poor diet quality. There was an especially high proportion of newcomers who did not meet recommendations for vegetables and fruit, milk and alternatives, and fibre. Results showed that it was more common for males to have a poor-quality diet.



The inadequate diet quality common across both newcomer and other youth in the study may indicate that newcomer youth do not have adequate diets prior to arrival in Canada, or that diet changes take place rapidly after arrival through acculturation (Lane et al., 2019a; Sastre & Haldeman, 2021).

Newcomer participants reported many eating and health behaviours that, in other research is associated with poor diets, such as skipping breakfast, restricting food intake, eating foods prepared away from home, and not getting enough sleep at night (Kjeldsen et al., 2014; Patel & Hu, 2008; Storey et al., 2009; Watts et al., 2017). This study did not examine why newcomer students engaged in these behaviours, but other research suggests that pressures to fit in with their peers by eating similar foods and placing value western body ideals influence their diets (Dzielska et al., 2020; Sastre & Haldeman, 2020).

Through the theoretical framework used in this study, it was reasoned that a variety of environment, personal, and social factors intersect with food security, nutrition security, and acculturation as they impact the health and well-being of newcomers to Canada. Many of the findings in this study support the framework. This study found that nutrition insecurity was not limited to newcomer youth who were food insecure, which suggests that other factors also contribute to inadequate diets. In addition, more newcomer youth reported engaging in eating behaviours to modify their weight, which may be an indication of acculturating to the western body ideals in Canada. Despite these findings that support the study framework, the BMI and self-rated health of newcomers were not different than the other study participants, which may suggest the lack of a healthy immigrant effect. On the other hand, it is possible that analysis by duration in Canada may find a difference in health, or that a healthy immigrant effect is not as noticeable in youth than in adults.

### **Strengths**

This study had a large sample size and participation from youth in schools across Manitoba. The study findings are strengthened by survey tools that were validated by other researchers for use with adolescents. The FANS project researchers collaborated with a newcomer-serving community organization to develop the survey question used to identify newcomers to Canada.

### **Limitations**

The newcomer cohort in this study was based on a binary construct that did not distinguish between country of origin or immigration path. Dietary or health changes that began prior to arrival in Canada were not examined by this study. In addition, since participation in the

study was voluntary, the newcomer cohort in the study may not be representative of newcomer youth in the province. Study results did not control for household income since the survey was completed by adolescents independently of their parents or guardians. Finally, due to the cross-sectional observational nature of this study, results can only indicate associations and not causation between study variables.

### **Implications of Findings**

Some programs, policies, and initiatives exist to address food insecurity and several community organizations commit to supporting newcomers as they transition to dietary (and other) changes in their new host country. However, navigating healthy diets in a new country is not currently a priority in Canadian settlement services. Nutrition education programs that are incorporated early in the settlement process for families, parents, or youth may help to minimize the incorporation of highly processed foods and other adverse diet patterns.

In addition, since inadequate diets are widespread across socioeconomic groups, regardless of food security status and newcomer status, large-scale and coordinated efforts across sectors are vital to improve diet patterns. Action on the development and implementation of a universal National School Food Program is encouraged to improve the inadequate diets found so commonly in adolescents. At a provincial level, school-based programs and policies may be introduced or expanded, such as compulsory practical-based food and nutrition skills education classes, along with curriculum that incorporates body satisfaction, and the influence of peers and social media on health and well-being. At the school-level, scheduling ample time to eat lunch and providing the means to reheat foods brought from home will support healthy eating patterns.

These study findings may be used, in conjunction with other literature, to support the development of newcomer-focused initiatives in community organizations and in larger-scale programs and policies by provincial and federal governments that address healthy and equitable diet patterns.

### **Future Research**

Since, dietary acculturation is more rapid for youth than their parents, a longitudinal study that recruits newcomers early in the settlement process could explore trends and timing of dietary acculturation specifically for youth. Other nation-wide studies with a large sample may be undertaken to determine if newcomer youth have similar rates of food insecurity, and diet and eating patterns to participants in this study that was undertaken in Manitoba only. Larger studies may also examine differences among newcomer youth between immigration paths. The health data in this study was based on self-report by participants. Future research may be undertaken to

determine if there are differences in health care usage between newcomer and Canadian-born youth. Finally, data collected in this study was quantitative in nature. Future research may use qualitative measures to explore themes in food choices and eating behaviours by newcomer adolescents. Such qualitative findings may be especially useful to guide the approach of programs and policies that aim to support healthy diet changes for newcomer youth.

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*APPENDIX A: Ethics Approval Certificate*



**UNIVERSITY OF MANITOBA** | **Research Ethics and Compliance**

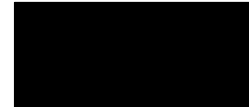
Human Ethics  
208-194 Dafoe Road  
Winnipeg, MB  
Canada R3T 2N2  
Phone +204-474-7122  
Email: humanethics@umanitoba.ca

**PROTOCOL APPROVAL**

**TO:** Joyce Slater  
Principal Investigator

**FROM:** Kevin Russell, Chair  
Joint-Faculty Research Ethics Board (JFREB)

**Re:** Protocol J2018:040 (HS21666)  
**FANS: Building Evidence to Inform Policies and Programs for Food and Nutrition Security in Manitoba Youth**



**Effective:** August 30, 2018

**Expiry:** August 30, 2019

**Joint-Faculty Research Ethics Board (JFREB)** has reviewed and approved the above research. JFREB is constituted and operates in accordance with the current *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans*.

This approval is subject to the following conditions:

1. Approval is granted only for the research and purposes described in the application.
2. Any modification to the research must be submitted to JFREB for approval before implementation.
3. Any deviations to the research or adverse events must be submitted to JFREB as soon as possible.
4. This approval is valid for one year only and a Renewal Request must be submitted and approved by the above expiry date.
5. A Study Closure form must be submitted to JFREB when the research is complete or terminated.
6. The University of Manitoba may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

**Funded Protocols:**

- Please mail/e-mail a copy of this Approval, identifying the related UM Project Number, to the Research Grants Officer in ORS.

Research Ethics and Compliance is a part of the Office of the Vice-President (Research and International)  
[umanitoba.ca/research](http://umanitoba.ca/research)

***APPENDIX B: FANS Study Parent/Guardian Informed Consent Form***



UNIVERSITY  
OF MANITOBA

Faculty of Agricultural  
and Food Sciences  
Food and Human Nutritional Sciences

Amy Henderson, MSc  
FANS Study Coordinator  
417 Human Ecology  
Winnipeg, Manitoba  
Canada R3T 2N2  
Phone: [REDACTED]

**FANS Study Parent/Guardian Informed Consent Form**

*For more information about this study, please contact the Research Coordinator:*

[REDACTED]

**Dear Parents/Guardians:**

Your child is being asked to participate in **FANS: Building Evidence to Inform Policies and Programs for Food and Nutrition Security in Manitoba Youth**, a research study conducted by Dr. Joyce Slater, an Associate Professor in the Faculty of Agricultural and Food Sciences at the University of Manitoba. The purpose of this study is to describe the nutritional status of grade 9 students living in Manitoba, including challenges with accessing healthy food, and how these impact health and educational outcomes, in order to inform programs and policies to improve the health of Manitoban children and youth.

For your child to participate in this study, you must give permission or “consent”. This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what is involved in participation. Please take the time to read this carefully and be sure you understand the information. If you would like more information, please contact Joyce Slater ([REDACTED]) or the study coordinator (contact information listed above).

**Study purpose:**



The purpose is to conduct a study to describe the nutritional status of grade 9 students in Manitoba. This includes a description of Manitoban youths' dietary intake (nutrients and food groups); ability to access healthy food regularly; their health and well-being; and food and eating behaviours. This study will examine how these relate to health, social and educational outcomes in order to inform programs and policies to improve the health of Manitoba's young people.

**Procedures for the study:**

There are two parts to this study:

1) Your child will complete an online *Food Behaviour Questionnaire* in their school computer lab. In this survey, your child will be asked questions about:

- Basic demographic information (age, sex, weight, height, ethnicity)
- Food intake (food and beverages consumed the previous day)
- Sleep habits
- Meal consumption patterns
- Ability to access and eat healthy food regularly
- Frequency of caffeine/energy drink/sports drink consumption
- Their health including physical, psychological and emotional well-being

Upon completion of the survey, an analysis of your child's dietary information will be generated for them.

2) If you agree to provide your child's Manitoba Health PHIN (more information at the end of this form), survey responses will be linked to health, social and education data through the secure computing facilities of the Manitoba Centre for Health Policy at the University of Manitoba. NO ONE involved in this study will have access to your child's medical, social service or education records. We will be looking at health services accessed (e.g. diagnosis for mental health issues and visits to specialists); social services accessed (income and housing assistance) and number of credits achieved at the end of grade 9. Further, as your child's health number will be scrambled by Manitoba Health before being used in the study, there is NO WAY any of the study researchers will know which data belongs to your child. All the data is completely de-identified at Manitoba Health before being transferred to the Manitoba Centre for Health Policy.

3) **The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.**

**Benefits of taking part in this study:**

Potential benefits of this study include the generation of information that could improve our understanding of the nutritional status and needs of Manitoban children and youth. Each participant will automatically receive a print out of their dietary intake which they can choose to make individual improvements on. Finally, this study will be used to advocate for programs and policies to improve food and nutrition security for young Manitobans.

**Risks of taking part in the study:**

There are very minimal risks to conducting this research. There may be questions that participants do not feel comfortable answering or do not understand. Students will be reminded that they do not have to answer a question and can ask for clarification at any time during the survey. As well, students will be reminded that their responses are confidential and are free to withdraw from answering the questionnaire at any time without consequence. Even after completing the questionnaire, you or your child can ask to have their data removed from the study up until July 31, 2019 after which it will not be possible to find their individual data for removal. Please contact Amy Henderson at [REDACTED] or [REDACTED] if you would like your child's data removed.

**Confidentiality:**

Participants' privacy will be strictly maintained as no names will be collected or recorded, and all data is de-identified. All electronic data will be stored in secure facilities at the University of Manitoba (secure University server and Manitoba Centre for Health Policy offices), and consent forms will be stored in a locked cabinet in a secure, locked room (403a) Human Ecology Building at the University of Manitoba). Any identifiable information will be destroyed by July 2024. Your child's non-identifiable survey results will be kept indefinitely. If you provide your child's Personal Health Information Number and Family Registration Number, the research team will **not** have access to ANY of your child's identifiable data, as this information will be de-identified and encrypted by Manitoba Health before it is used in any of our analyses.

**Payment:**

There is no payment for participating in this study.

**Voluntary nature of study:**

Taking part in this study is completely voluntary. This means that you may choose that your child does not take part in it. As well, if you decide to allow your child to take part now, you can change your mind at any point in the future. There are no negative consequences for you or your child if you decide you no longer wish for them to participate in the study. Please see “Risks” section for information on how to remove your child’s data.

**Assent (child):**

Your child can decide whether or not to participate in the survey by answering the following question at the beginning of the on-line survey: “Do you agree to participate in this survey?”

**Results:**

Results of this study will be summarized and published in various formats. Examples include:

- Reports that will be provided to the participating schools and School Division, as well as other stakeholders, including community agencies and government departments who work with youth and food/nutrition issues.
- Presentations at scientific conferences and papers published in scientific journals.

You are being asked for permission to allow us to use the information, or data, that is collected from the survey. You are also being asked to provide your child’s Manitoba Health number, so we can link their de-identified and encrypted survey data to health, social service and educational data. This is done **confidentially** in the secure computing facilities of the Manitoba Centre for Health Policy, according to the research protocols established by the Government of Manitoba and the University of Manitoba. **Your child’s personal health information will NOT be accessible by any of the research team members.**

This study has been approved by the Joint-Faculty Research Ethics Board and if you have any concerns or complaints, please contact the Human Ethics Coordinator at

**Human Ethics Coordinator**

University of Manitoba

(204) 474-7122

humanethics@umanitoba.ca

**Please read and sign the attached page if you consent to have your child participate in this study.**

**Thank you for your consideration of this request!**

UNIQUE ID: \_\_\_\_\_

**Consent (Parent/Guardian): Please complete both parts:**

By signing below, you give permission for the information gathered to be used as outlined above. You give permission for the information to be inspected and used by research staff at the University of Manitoba Research Ethics Board. **Please note:** you can consent to #1 below without consenting to #2 below. Please sign both copies and send ONE back with your child in the envelope provided, and keep the other for your records.

1. If you choose to provide consent for your child to participate in the Building Evidence to Inform Policies and Programs for Food and Nutrition Security in Manitoba Youth (FANS) Survey, please sign below:

Child Name (please print): \_\_\_\_\_ Postal Code: \_\_\_\_\_

Parental/Guardian Signature: \_\_\_\_\_ Date: \_\_\_\_\_

2. I agree to allow my child's Manitoba Health number to be used to link their FANS survey data to health, social and education data (please fill in number below). I understand that this will be done **confidentially** and my child will not be identified. *Please indicate your agreement by checking YES or NO, and signing below. Also note, your child can complete the FANS survey without providing their Manitoba Health numbers.*

YES I agree to allow my child's Manitoba Health number to be used to link their FANS survey data to health, social and education data (provide numbers below)

NO I do not agree to allow my child's Manitoba Health number to be used to link their FANS survey data to health, social and education data

Parental/Guardian Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Family Registration Number-6 Digits

Child's Personal Health Identification Number (PHIN) - 9 Digits

**From your child's Manitoba Health Card:**

1. Family Registration Number – 6 digits:  
\_\_\_\_\_
2. Child's Personal Health Identification (PHIN) Number - 9 digits:  
\_\_\_\_\_

Research delegate signature:

If you would like to receive a summary of the results please indicate this below.

I want to receive a summary of findings:

Yes \_\_\_ No \_\_\_

Please send it to the following email or ground mail address:

\_\_\_\_\_

*APPENDIX C: Survey Questionnaire*

| <b>Survey Question</b>   | <b>Response Options</b>   |
|--|---|
| How old are you?   | 12 - 16   |
| Are you:   | Male<br>Female<br>Other   |
| If you were not born in Canada, how old were you when you moved to Canada? | 1 - 16  |
| If you were born in Canada, are you an Indigenous person?                  | Yes<br>No<br>Don't Know   |
| How many hours of sleep do you usually get each night?                     | 0 - 24  |
| How much do you weigh?   | ___ lbs<br>OR ___ kg  |
| How tall are you?  | ___ <i>feet</i> ___ <i>inches</i><br>OR ___ <i>cm</i>             |
| I am eating less than usual to try and lose weight:                        | Definitely Not<br>Not Really<br>Kind of<br>Yes                    |
| I am eating more than usual to try and gain weight:                        | Definitely Not<br>Not Really<br>Kind of<br>Yes                    |
| How often do you eat the following meals?<br>Breakfast<br>Lunch            | Every day<br>5-6 days a week<br>2-4 days a week<br>0-1 day a week |
| Where did you eat yesterday?<br>Breakfast<br>Lunch                         | Home<br>School<br>Away from home or school                        |



|  |   |
|--|---|
| <p>Dinner/Supper</p>   |   |
| <p>Typically, how many days per week do you eat dinner/supper with at least one parent/guardian?</p>   | <p>Every Day<br/>5-6 days a week<br/>2-4 days a week<br/>0-1 day a week</p> |
| <p>Think about your experience with food over the past year, and choose one answer for each question.</p> <p>Did you worry that food at home would run out before your family got money to buy more?</p> <p>Did the food that your family bought run out, and you didn't have money to get more?</p> <p>Did your meals only include a few kinds of cheap foods (i.e. instant or canned noodles, boxed macaroni and cheese, etc.) because your family was running out of money to buy food?</p> <p>How often were you not able to eat a balanced meal because your family didn't have enough money?</p> <p>Did you have to eat a lot less because your family didn't have enough money to buy food?</p> <p>Has the size of your meals been cut because your family didn't have enough money for food?</p> <p>Did you have to skip a meal because your family didn't have enough money for food?</p> | <p>A lot<br/>Sometimes<br/>Never</p>  |

|  |  |
|--|--|
| <p>Were you hungry, but didn't eat because your family didn't have enough food?</p> <p>Did you not eat for a whole day because your family didn't have enough money for food?</p>  |  |
| <p>How do you rate your health?</p>  | <p>Excellent</p> <p>Very Good</p> <p>Fair</p> <p>Poor</p>                        |
| <p>Have you taken a Home Economics/Human Ecology course with a focus on food and nutrition in school?</p>  | <p>Yes</p> <p>No</p>   |
| <p>How often do you eat meals/snacks purchased at school?</p> <p>From school cafeteria (including pizza days and other special meals)</p> <p>From school vending machines</p> <p>From school canteen/snack bar/tuck shop</p> | <p>Once a day</p> <p>2-6 times a week</p> <p>Once a week</p> <p>Rarely/Never</p> |

***APPENDIX D: Knowledge Translation Infographics***

# FOOD INSECURITY IN NEWCOMER\* MANITOBA YOUTH

Prepared as part of the study  
FANS: Food and Nutrition Security for Manitoba Youth

**ALMOST 1 IN 5 NEWCOMER YOUTH WERE FOOD INSECURE**



Being food insecure can mean:

- food runs out before there is \$\$ to buy more
- not enough \$\$ to eat balanced meals
- being hungry but there is not enough food to eat

**FOOD INSECURE NEWCOMER YOUTH BOUGHT FOOD FROM THE SCHOOL CAFETERIA MORE OFTEN**

BUT

vegetable, fruit, and whole grain choices may be limited to buy at school



**BEING FOOD INSECURE MAKES IT HARD TO EAT A GOOD QUALITY DIET**



Poor diets can lead to:

- impaired bone development
- type 2 diabetes
- heart disease
- trouble sleeping
- depression
- anxiety

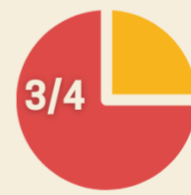


## HEALTH

Half of food insecure newcomer youth rated their health as fair or poor

## EATING TOGETHER

More than 3/4 of food insecure newcomer youth regularly ate dinner with a parent or guardian



Disruptions in getting food and accessing community resources, like during the COVID-19 pandemic, can make the situation worse

## WHAT CAN WE DO?

Teach youth how to buy and prepare foods without relying on convenience foods  
Ensure that programs offer foods that satisfy hunger *and* contribute to good quality diets  
Foster healthy food environments at school

\*In this study, a newcomer is a student who arrived in Canada within seven years of their last birthday

### Supporting sources

Diabetes Canada. (2020). <https://www.diabetes.ca/type-2-risks/preventing-diabetes>  
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Nagata, J. M., Falter, K. B., Gooding, H. C., Carter, A. K., White, H. J., Sabino-Camargo, K., & Weiser, S. D. (2019). <https://doi.org/10.1016/j.jadhealth.2019.08.010>  
Payak, D. D., Diaz-Rios, L. K., Ramirez, A. S., & De Trinidad Young, M. E. (2021). <https://doi.org/10.1016/j.jadhealth.2021.01.005>  
PICOOP. (2018). <https://proof.futuroronto.ca/food-insecurity/>

Infographic content and design by Tressa Alexiuk  
November 2021  
More information: [FANS18@umanitoba.ca](mailto:FANS18@umanitoba.ca)  
Images by Canva



# DIET PATTERNS AND HEALTH IN NEWCOMER\* MANITOBA YOUTH

Prepared as part of the study  
**FANS: Food and Nutrition Security for Manitoba Youth**

- Many newcomer youth did not meet minimum serving recommendations



- Almost all (98.9%) had a diet that was 'poor' or 'needs improvement'



## Eating a good quality diet can be challenging for many reasons:

- adapting to the food environment of a new country
- wide availability and aggressive marketing of convenience foods
- lack of skills to plan, purchase and prepare foods
- social pressures



## Poor diets can lead to:

- impaired bone development
- type 2 diabetes
- heart disease
- trouble sleeping
- depression
- anxiety



**50% OF NEWCOMER YOUTH HAVE NOT TAKEN A FOOD AND NUTRITION COURSE AT SCHOOL**



## MANY NEWCOMER YOUTH WERE EATING TO CHANGE THEIR WEIGHT DESPITE 70% HAVING A HEALTHY WEIGHT

37% of *females* reported eating *less* than usual to lose weight



36% of *males* reported eating *more* than usual to gain weight



Two in five usually get less than 8 hours of sleep at night

Close to half of females and one third of males rated their health as *fair* or *poor*



## WHAT CAN WE DO?

Teach youth how to select and prepare foods without relying on convenience foods

Foster healthy food environments at school

Emphasize healthy body image in school and community programs

\*In this study, a newcomer is a student who arrived in Canada within seven years of their last birthday

**Supporting sources**  
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 December 2021  
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 Images by Canva

