Household Food Insecurity in Canada: Towards an Understanding of Effective Interventions

by

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ABSTRACT

Over 12% of households were food insecure in Canada in 2011. Despite recognition of this problem, there remains no targeted public policy to address it. To inform interventions, examined in this thesis were how changes in financial resources related to changes in severity of food insecurity, the needs of food insecure households, and the effectiveness of current interventions. Studies 1, 2, 4, and 5 utilized data from a sample of 485 low income families living in high poverty neighbourhoods in Toronto, and Study 3 used data from the Canadian Community Health Survey (CCHS) 2009-2011. In Study 1, the sensitivity of severity of food insecurity to changes in employment and income was observed. In Study 2, it was found that severity of food insecurity was associated with increasing probability of experiencing hardships in other domains such as delayed bill payments and giving up household services. The relationship between food insecurity and obesity among women was examined in Study 3, and it was shown that diagnoses of mood disorder partially explained the association. Patterns of association also varied by family status and severity of experiences. In Studies 4 and 5, use and non-use of current interventions focused on alleviating hunger (i.e. food banks) and improving healthy food access in communities (i.e. community gardens, Good Food Box) were examined among food insecure families. There was a low prevalence of use of all types of programs. Programs were not used

because programs were not accessible or were not viewed as appropriate supports to meet needs. Taken together, findings suggest that interventions focused on potential manifestations and consequences of food insecurity are misplaced, and reinforce the urgent need for interventions to alleviate the financial insufficiency and insecurity that underpins food insecurity.

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List of Abbreviations

CCHS	Canadian Community Health Survey
HFSSM	Household Food Security Survey Module
NHANES	National Health and Nutrition Examination Survey
OECD	Organisation for Economic Co-operation and Development
SNAP	Supplemental Nutrition Assistance Program
USDA	United States Department of Agriculture

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1 INTRODUCTION

Household food insecurity is defined as the "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" [1]. As a concept, it is a measure of material poverty, where households are unable to meet, or have the assurance of meeting, basic needs. Based on recent estimates from the 2011 Canadian Community Health Survey (CCHS), household food insecurity has remained persistently high in the Canadian population, affecting 12.3% of households. Living in these households are 1.1 million children and 3.9 million adults [2].

After nearly a decade of monitoring in Canada, this problem has been recognized as a critical determinant of population health, and yet food insecurity has not been explicitly tied to any provincial or federal policy, nor has it been made a target for poverty reduction strategies. In part, development of policy has been hindered by a lack of clarity about what types of interventions are needed to prevent and ameliorate food insecurity. Specifically, more needs to be known about the nature of household food insecurity, how it manifests, and what factors mitigate the problem.

Though there has been a lack of targeted action at the provincial and federal level, over the past two decades, there has been steady growth in the number of organizations that explicitly name increasing access to food for low income individuals and families as part of their mandate or programming. Despite ongoing investment in these types of initiatives, there has been little evaluation of whether these programs reach and ameliorate the circumstances of food insecure populations.

The overall objective of this thesis was to critically contribute to the knowledge base needed to inform interventions aimed at reducing household food insecurity. The five studies that make up this thesis contribute to the knowledge base in three areas:

1) Financial determinants of food insecurity.
2) Needs of food insecure households in other material and health domains.
3) Effectiveness of community food programs in addressing household food insecurity.

In the chapter that follows, the broad literature that set the stage for the studies in this thesis is reviewed. Each study is then presented in manuscript form, highlighting the literature pertinent to the objectives of each study, as well as methods, results, and conclusions. The findings from these studies are collected into a final discussion, which considers their significance in relation to the overall objective of this thesis and for moving forward with future research to advance understanding of household food insecurity interventions. Overall conclusions are highlighted in the final chapter.

2 LITERATURE REVIEW

This chapter describes the research and development of the concept of household food insecurity, and the body of research that has resulted from its routine measurement in Canada, supplemented with relevant research from the United States. The contribution of this research to understanding the potential causes and consequences of food insecurity is discussed, as well as its relevance for understanding the interventions that have developed and their potential to address the problem.

2.1. Household Food Insecurity in High Income Countries[1]

2.1.1. Development of the Construct

The widely accepted definition of food insecurity is "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways." [1] This definition was established by the Life Sciences Research Office Task Force after a period of debate in the United States through the 1980s about how hunger should be defined and how it should be measured [3]. There was recognition that problems of undernutrition and nutritional deficiency were largely absent in high-income countries, and yet, line-ups at soup kitchens and food pantries were indications that people faced insufficient food supplies. The conditions leading people to seek food assistance were unlikely to be captured by anthropometric, clinical, or biochemical indicators of nutritional status that had typically been used as indicators of insufficient food intake, and thus a new conceptualization and appropriate measures were required to capture this phenomenon [3]. The Task Force of Food Assistance assigned by President Reagan to investigate validity of mounting alarm about hunger, summarized this gap in conceptualization in the following quote (as referenced in [3]):

[1] This thesis specifically focuses on household food insecurity as a concept as opposed to food security. While food security has been broadly defined at the individual, community, and national level, there is no agreed upon way to operationalize the concept. The absence of food insecurity at the individual or household level does not necessarily mean food security as it has been defined as "access at all times to enough food for an active, healthy life." [1]. Of additional note is that food insecurity was not a new term, as it had been used in international research to refer to instability in national and community food supplies [3], but it was new to use it at an individual or household level referring to insecurity of food supplies.

> To many people hunger means not just symptoms that can be diagnosed by a physician, it bespeaks the existence of a social, not a medical, problem: a situation in which someone cannot obtain an adequate amount of food, even if the shortage is not prolonged enough to cause health problems. It is the experience of being unsatisfied, of not getting enough to eat. This, of course, is the sense in which people ordinarily use the word (President's Task Force on Food Assistance, 1984).

In the 1980s, studies conducted among low income families were the first to contribute to understanding of what hunger meant in an industrialized world context and informed development of measurement tools [4, 5]. Radimer, Olson, and Campbell [4] published findings from qualitative research with low income mothers, whose descriptions of their experiences of hunger were delineated into two levels: the nature of the experience at the household level and the nature of the experience at the individual level. Experiences were described as having four components. *Quantity* at the household level, referred to depleting food supplies and at the individual level, meant insufficient intake of food. Descriptions of an unsuitable food supply marked *qualitative compromise* at the household level and at the individual level, meant eating foods that did not meet perceived ideas of dietary quality. A *psychological* component at the household level was described as uncertainty that food supplies would last. At the individual level, this meant feelings of deprivation and lack of choice. Finally, there was a *social* component, which meant experiences of having to acquire foods for the household in unacceptable ways, and at the individual level, in being unable to maintain socially prescribed ways of eating [4].

These concepts are consistent with findings from qualitative studies in Canada [6-8]. Of importance to research in Canada was early work by Hamelin, Beaudry, and Habicht [6], who, from interviews conducted among low income families with children, also identified that core characteristics of food insecurity were experiences of a shortage of food, unsuitability of the food supply and diets, uncertainty and accompanying anxiety, and alienation. These experiences manifested in perturbations in ways food were acquired, eating patterns, and relationships within families [6]. They also manifested in physical feelings of hunger and psychological distress.

Other elements of the experience that emerged from qualitative studies were differences in the temporality of the experience. While some families described the experience as specifically connected to a point in time (e.g. following job loss), others described the experience as

recurring monthly (e.g. prior to receiving a monthly income payment) or a constant experience of worry and insufficient money for food [6-8]. Food insecurity was also described as a "managed process" for families [4], where mothers employed various strategies in the face of food supply depletion, which included the ways they would modify their diets to make food last, especially for their children [4]. From these descriptions, the notion of food insecurity as a graded experience emerged, where anxiety preceded actual depletion of food supplies, followed by qualitative and then quantitative changes to diets, experiences of hunger, and, most severely, going without food [4]. That mothers prioritize their children's food needs above their own has been a theme common in much of the qualitative food insecurity research [4, 6], and is an explanation invoked to explain difference in prevalence rates between adult and child food security [9]. Recently, the validity of parent reports for children have been questioned, as in-depth interviews with children have revealed that they have significant awareness of their household situations and also use their own strategies to reduce the stress of their parents [10].

The graded nature of the experience featured prominently in the development of a tool to measure food insecurity, discussed next. Variability in timing and manifestations of the experience also highlighted the need for a multi-item measurement tool, as no single description or possible manifestation of the experience was sufficient to capture the underlying core construct.

2.1.2. Measurement of Household Food Insecurity

The research on food insecurity in the 1980s and into the 1990s in the United States was motivated by a need to develop a tool for measurement. In 1990, the Expert Panel identified that the lack of agreement by what was meant by hunger in the United States was a hindrance to understanding the problem and its magnitude, and also the ability to target interventions toward alleviating it and evaluate the ones in place already to do so [1]. For example, household food insecurity is used to evaluate publically funded programs specifically aimed at food provisioning in the United States. These included the Food Stamp Program (now known as the Supplemental Nutrition Assistance Program (SNAP)) and the National School Lunch Program. Following from an act passed by Congress in 1990 that specifically recommended a standard mechanism be developed to measure household food insecurity [3], through the 1990s, extensive research was

carried out by the United States Department of Agriculture (USDA) to develop a questionnaire that could capture severity of food insecurity and the multiple dimensions of the experience.

This work resulted in the development of the Household Food Security Survey Module (HFSSM) (included in Appendix 1) [3]. The module includes 10 questions that reference the household food supply, general experiences of adults in the household, and specific experiences for an adult respondent. Eight questions are only asked of respondents who have children in their households and make reference to the experiences of children who are under 18 years of age. The experiences defined in the scale items range in severity from worry that will food will run out, not being able to eat balanced meals, cutting the size of meals or skipping meals, and feelings of hunger but being unable to eat. Questions at the most severe end of the scale ask the respondent if he/she, and if any children in the household, went a whole day without eating. All questions make reference to the past 12 months and specify that experiences were due to a lack of finances for food. The latter clause is important for reducing the likelihood that experiences of reduced food intake for other reasons, such as dieting or time restraint, are reported [3]. Questions are ordered, reflecting the understanding that emerged from qualitative studies that food insecurity is a managed process and ranges in severity [11], whereby households tend to first experience concern about the potential an insufficient food supply followed restricted food choice and qualitative and quantitative compromises in intake. The ordering of questions reflects the results of the development work of the scale using Rasch modeling, which orders the questions according to the probability that one would affirm the question, based on previously affirmed questions. The ordering also permits the use of skip patterns to reduce respondent burden, such that if first questions on either the adult or child scale are not affirmed, it is unlikely that any of the subsequent questions will be affirmed, and no further questions are asked. Important to note is that no single question is intended to provide a measure of one of the domains of food insecurity, but together questions indicate insecure access to food for the household and reflect the broad construct of food insecurity.

The scale does not capture all elements contained in the broader definition of food insecurity. The construct measured by the HFSSM has been defined as “uncertainty and insufficiency of food availability and access that are limited by resource constraints, and the worry or anxiety and hunger that may result from it.” [3] Absent from any of the questions in the scale is reference to nutritional adequacy of one’s diet or the safety of the food one eats, elements captured in the

original definition proposed by the Life Sciences Research Office Task Force [1]. To the former point, in recognition of that suboptimal nutritional intakes are highly prevalent in the general population, surveys using dietary recall methods are used to monitor the nutritional adequacy of populations [3].

Some aspects of qualitative changes in diet are captured in the HFSSM. The reference to an ability to eat a "balanced diet" is intended to capture whether financial constraint restricts one's ability to obtain a subjectively perceived balance of foods in one's diet. A second refers to having to rely on "low cost foods to feed the children", though this is only part of the child scale.

In contrast, almost all questions reference quantitative depletion of food supplies, consequences arising from it, or concern about this becoming a reality. Tarasuk [12] discussed how the quantitative emphasis in the scale could be considered a strength in that there is face-validity to the severity of the problems that families are affirming. Previously used questions to measure food insecurity have lacked this specificity, such as one aspect of the food sufficiency question, which asks if a respondent always has the kinds of food one wants to eat, or questions used to measure food poverty in the UK and Ireland, which reference inability to eat fruit and vegetables every day, have friends over for meals once a fortnight, and have meat or a vegetarian equivalent every other day [13]. These questions are open to interpretation of what kinds of food one desires to have in their diet and what should be considered deprivation.

The HFSSM does not contain elements that capture ability to participate in social and cultural practices related to food. Coping strategies such as using non-conventional food acquisition methods are also not part of the scale, and thus, use of "socially unacceptable" [3] ways to acquire food are not part of the measurement. In the development of the measurement tool, use of coping strategies did not map onto the latent concept being measured by the scale [3].

2.1.3. Classification of Food Insecurity

The number of items affirmed on the scale gives an indication of the severity of household food insecurity, independent of the specific nature of the items affirmed to have been experienced [14]. The number of items a household has to affirm before being classified as food insecure is debated [15, 16] and inconsistent thresholds between Canada and the United States highlight the arbitrary nature of classification. In the United States, three affirmative responses designate a

household as food insecure [14] (**Table 2.1**). In Canada, affirmative responses to child and adult questions are considered separately, and answering affirmatively to two or more questions on either of the scales is considered an indication of food insecurity [17] (Table 2.1). Food insecurity is further categorized into moderate and severe levels (named low food security and very low food security in the United States). A moderate level of food insecurity indicates that enough questions were affirmed such that an individual indicated qualitative or quantitative changes to the household food supply or their food intake, while a severe level is indicative of reduced food intake and disruptions in eating patterns.

Table 2.1 Thresholds and Classifications of Household Food Insecurity for Households with Children used in Canada and the United States[1].

Canada	United States
Key feature: Responses to adult/household questions on HFSSM considered separately from responses to questions referencing children in HFSSM.	Key feature: Responses to questions in entire HFSSM considered together to classify household.
Food Secure: No affirmative responses on either child or adult scale.	Food Secure: No affirmative responses to any questions on HFFSM.
Marginal Food Insecurity: Only 1 affirmative response on either the adult or child scale or both.	Marginal Food Security: 1-2 affirmative responses to any of the questions on the HFSSM.
Moderate Food Insecurity: 2-5 affirmatives on adult scale or 2-4 affirmatives on child scale and no higher on either scale.	Low Food Security: 3-7 affirmative responses to any of the questions on the HFSSM.
Severe Food Insecurity: 6+ affirmatives on adult scale or 5+ affirmatives on child scale.	Very Low Food Security: 8+ affirmative responses to any of the questions on the HFSSM.

[1] Both countries use the same Household Food Security Survey Module (HFSSM).

Increasingly, researchers are using any affirmative response on the HFSSM as a threshold for food insecurity [15, 18]. The use of this threshold aligns with the definition of food insecurity as all questions on the scale indicate uncertain food availability and access, thus, there is face validity in counting these households as food insecure [15]. Coleman-Jensen [15] used data from the Current Population Survey to examine that the characteristics of households answering affirmatively to one or two questions on the HFSSM (named marginal food insecurity) in comparison to those answering no questions affirmatively. Households differed across indicators of vulnerability, including lower incomes, education level, and employment. Marginally food insecure households also spent significantly less on food. In studies of health outcomes, greater

vulnerability among individuals who are marginally food insecure also suggests this category is different than food secure [16]. Recognition of this category of food insecurity is important from an intervention perspective because it changes the magnitude of the problem [19], but also what is targeted for intervention. As opposed to a more severe level of food insecurity, where adults experience hunger and not eating, food insecurity at a marginal level denotes vulnerability to deprivation and anxiety about deprivation. Even if individuals in these households never reach a 'point' of hunger or going without food, ensuring the assurance of access to food is necessary for well-being.

Many studies have used dichotomous classifications of food insecurity when studying potential causes and consequences of food insecurity. The use of the measure in this way masks the variation in the experience that was originally observed in qualitative studies and confirmed in validation studies relating severity to household food supplies, income, and food spending [4, 20, 21]. As reviewed in Section 2.2, in studies where researchers have begun to use different levels of severity examined by categorical measures, they have observed higher concentrations of poor health and chronic conditions in higher ends of the scale [22-26]. These studies suggest that potential consequences of the experience could be a function of severity of the experiences, but also highlight that households with higher levels of severity face are more likely to be facing hardship in the domain of health. Understanding co-occurring hardships that accompany food insecurity and how they map onto the severity of the experience is informative for understanding the lived realities of food insecure families and variation in their experiences.

The suppression of the scalar property also has implications for studies capturing change in the experience. As will be reviewed below, studies examining transition in and out of food insecurity have used thresholds and examined the characteristics associated with movement in or out. There could be significant variation of experiences contained within these categories, thus improvements related to changes in severity of circumstances could have been missed. Severity is also an important consideration for targeting interventions and for evaluating their effectiveness.

2.1.4. Other Measures of Household Food Insecurity

While the HFFSM is the measurement tool used in regular monitoring of household food insecurity in the United States and Canada, shorter versions of the scale, individual items of the

scale, and questions that resemble items in the scale have appeared in a number of studies carried out in the United States, Canada, and other high income countries. These measures could result in misclassification because they do not capture the range of items found in the larger module. They also tend to capture either only a marginal level of food insecurity and therefore do not have the ability to distinguish moderate and severe levels from the marginal category (e.g. the Behavioural Risk Factor Surveillance Study in the Unites States includes a question asking "How often in the past 12 months would you say you were worried or stressed about having enough money to buy nutritious meals?") or they capture only severe manifestations (e.g. National Longitudinal Survey of Children and Youth in Canada asked parents "Has your child ever experienced being hungry because the family had run out of food or money to buy food?"). Variation in measurement could be a source of error when examining the consistency of findings from one study to the next. For the sake of brevity, food insecurity is used to describe any measure attempting to capture the construct in the next sections.

2.1.5. Monitoring of Household Food Insecurity in Canada

Reflecting the importance of monitoring of household food insecurity in the United States, the USDA Economic Research Service annually publishes a report characterising the problem of food insecurity in the United States and carries out studies evaluating the impact of state-funded programs on the problem. In contrast, Canada does not have specific programs in place that aim to ensure Canadians have enough to eat. This may be a reason why monitoring of food insecurity in Canada has never been a specific mandate of any governmental department. In the absence of any national monitoring related to food insecurity, the numbers of people using food banks served as the only indicator of hunger in Canada until the mid-1990s [27]. In recognition of household food insecurity as a determinant of health, however, various measures have appeared on national health surveys since 1996, and the HFSSM was added the CCHS in 2004 [27]. It has been a part of core content of this survey in every other cycle since 2004, and an optional component in many provinces in alternate years.

The inclusion of food insecurity measures on national surveys has allowed for research exploring who is affected and how it is associated with health and well-being to be conducted in a Canadian setting. This work is reviewed in the next sections. Because measures of the food insecurity have been limited to cross-sectional health surveys, exploration of causes and

consequences has been limited by a lack of longitudinal data and the limited range of economic information collected in health surveys. In the next section, research from smaller scale surveys is drawn upon to provide more insight, as is research from studies in the United States.

2.2. Food Insecurity Measures in Relation to Nutritional Intake, Health and Well-Being

Through the 1990s studies examining how food insecurity associated with nutrition and dietary intakes were conducted to provide validation of the concept and to characterize food insecurity as a public health nutrition problem [28]. In addition to how food insecurity could affect health through nutritional pathways, research also expanded to examine how food insecurity associated with other measures of well-being and chronic health conditions.

2.2.1. Nutritional Intake

One of the earliest studies of food insecurity and nutrition was an analysis of the Continuing Survey of Food Intake by Individuals, where Rose and Oliveira [28] examined the measure of food insufficiency in relation to intakes of energy and nutrients relative to the recommended daily allowance values available at that time. Among preschoolers, nutrient intake inadequacies were generally nonexistent and those living in food insecure households were no more likely to have low intake levels than food secure children. Differences were observed for women for some nutrients and total energy, with food insecurity associating with higher odds of having intakes less than 50% of the recommended level for energy and some vitamins. Similar results were also found for the elderly in this study, and in the case of energy intake, associations were stronger. This study was one of the first to suggest that food insecurity could put individuals at risk of dietary inadequacy, but also showed that these concepts were not synonymous, given that more food insecure individuals were meeting requirements than were not. These results were consistent with findings from a later analysis of the National Health and Nutrition Examination Survey (NHANES), which included measures of serum indicators of nutritional status, where it was observed that food insecure adults and adolescents showed some evidence of elevated levels of deficiency, but that this was not true for children [29].

The first study to examine how food insecurity was associated with nutrition and diet in the general Canadian population was an analysis of the 2004 CCHS by Kirkpatrick and Tarasuk [30]. In this study, energy intakes did not differ by food security status, but food insecure women

in the 19-30 and 31-50 age groups had lower intakes of dietary fibre, and across adult age and sex groups, food insecurity was associated with lower protein intakes. Food insecurity was also associated with lower intakes of fruit and vegetables among males and females in the 19-30 age and among women in the 31-50 age group, and with lower milk intakes among males and females over 50. Using population assessment methods to examine prevalence of nutrient inadequacies, food insecurity marked adults in all age and sex groups as more likely to have inadequate intakes of magnesium and protein, and this was also true for folate, vitamin A, zinc, and vitamin C for some groups [30]. Inadequate intakes were not found for young children, but some groups of children in the 9-13 and 14-18 age groups had high prevalence of inadequate intakes of protein, vitamin A, vitamin C, magnesium, and zinc, though results were not consistent across groups. Food insecure adolescents also had significantly lower intakes of fruit and vegetables. Diets of high energy-density have been proposed to characterise the diets of food insecure individuals [31], but variation in energy-density was mixed across groups in this study, with only some groups of adolescents having indications of diets higher in energy-density and no significant differences found for adults in multivariate models. A study using NHANES data from 1999-2002 also showed that energy-density did not differ by food insecurity status among adults [32].

Smaller scale studies of high-risk groups shed light on how severity of food insecurity may relate to risk of nutritional compromise. Studies among homeless youth [33] and women using food banks in Canada [34, 35] have shown serious indications of inadequate dietary intakes higher than those observed in general population surveys. Among women in the latter study, it was observed that dietary intakes were related to severity of their food insecurity in the past 30 days, with greater compromise observed among those who had experienced hunger in the past 30 days in comparison to those who had not [35].

In summary, data on the relationship between food insecurity and dietary quality and quantity highlight that food insecurity is associated with a greater probability of compromised nutritional intakes; however, findings were also inconsistent across age and sex groups and nutritional intake inadequacy and food insecurity are not synonymous. This reinforces the definition of the construct, where qualitative and quantitative changes in diet are possible but not necessary consequences of food insecurity. Further, the extent to which the qualitative and quantitative manifestations of food insecurity impact long term dietary intakes may also be a function of the

severity of the condition and the timing not captured in studies. These studies also supported findings from qualitative studies which suggested that parents protect children from nutritional compromise, though this has appeared to only be true for young children within food insecure households.

2.2.2. Psychosocial Correlates of Food Insecurity

By definition, food insecurity is also the experience of anxiety about food supplies running out. Thus, it is also of importance to consider how food insecurity could affect emotional, psychological, and social well-being. Qualitative studies were the first to observe these potential consequences of food insecurity. For example, among low income parents in Quebec, Hamelin et al. [6] observed alienation to be a core characteristic of food insecurity, described by feeling a lack of control over the food situation, accompanied by feelings of powerless, guilt, embarrassment and shame, and feelings of exclusion. Another aspect of alienation was feelings that food insecurity was something to hide. Disruptions in household dynamics and psychological suffering, encompassing loss of dignity and distress were also described as possible consequences, as was not being able to participate in social norms such as having friends over for dinner, celebrating birthdays, and having family meals be an enjoyable family time [6]. Similar feelings were also captured in a qualitative study of low income, food insecure women in Nova Scotia, who expressed their experiences as a constant struggle, feelings of stress about their household food resources, and feeling judged about their circumstances and unsupported [8].

Quantitative studies charting associations with various indicators of well-being and behaviours reflect these qualitative findings. Although often construed as a predictor of food insecurity, inverse associations between markers of social captial measured by trust and support in neighbours and food insecurity [36-38]could reflect an outcome of the isolation of food insecurity. In the literature on relationships between food insecurity and child health and well-being, studies have shown relationships between food insecurity and parent well-being, such as feelings of frustration toward children, depressive affect, sensitivity to the infant's cues, response to distress, social-emotional growth fostering behavior, and cognitive growth fostering behavior [39, 40]. Drawing from theoretical models of the role of family stress on child health, the experience of food insecurity among parents is thought to affects parents' socioemotional well-

being and interaction with children, which influence child health and behaviour [39, 41]. Studies that have examined these relationships through structural equation modeling have suggested that the relationship between food insecurity and child health outcomes is partially mediated through compromised parenting interactions and well-being [39, 41, 42], sometimes no longer having an independent relationship with some indicators of child well-being after these were accounted for [40, 42]. Qualitative studies among children suggest they can recognize and experience the stress of food insecurity, even when parents try to protect them from knowing of their struggles [10, 43], however, suggesting that it may also be important to directly measure children's experiences of food insecurity to fully understand its impact on their well-being.

The potential manifestations of food insecurity of feelings of alienation, anxiety, and stress could result in compromised mental health conditions. Poor mental health, psychological distress, and diagnoses of depression and anxiety among adults have consistently been found to be elevated in food insecure populations [23, 44, 45], though many studies that have contributed to this literature have only included mothers [22, 46-49] and relationships may be bidirectional. For example, deterioration in mental health has been associated with transition into food insecurity [50], but food insecurity has also been observed to precede depression outcomes [51, 52]. Poor mental health and stress may be important pathways through which food insecurity could impact other chronic health conditions, such as obesity, but this has been an underexplored area of study.

Studies relating health, nutrition, and other markers of well-being are important for providing external validity of the concept of food insecurity in that they highlight that as a measure, food insecurity is indicative of vulnerability in multiple domains. It is of interest to note that evidence of nutritional vulnerability is relatively inconsistent in comparison to other health and socioemotional outcomes, particularly for findings among young children, where indications of nutritional compromise have not been observed, but poor health and psychosocial outcomes have been [53] . These findings reinforce the notion that food insecurity is a multi-dimensional and graded phenomenon. Yet, as discussed in later sections, many interventions have focused on the potential nutritional outcomes associated with food insecurity.

The idea of stress and poor socioemotional health as mediators of relationships between child and adult health have implications for understanding food insecurity interventions, where

removing the source of stress may have more impact on the health of individuals within households rather than on addressing potential health and nutrition outcomes associated with experience.

2.2.3. Chronic Health Conditions

Because of the potential for food insecurity to impact dietary quality, there has been a lot of interest in relationships between food insecurity and diet-related chronic conditions, such as diabetes, metabolic syndrome, and obesity, where researchers propose causal relationships through dietary pathways [24, 54, 55]. Studies exploring an association between food insecurity and obesity proliferated after a 1995 case study was published that documented a serious case of child obesity in the context of the patient's family reporting running out of money for food and reliance on inexpensive foods at times when finances were low [56]. In this report, Dietz first speculated that food insecurity could cause obesity, and named this a paradox because food insecurity was viewed as an experience of deprivation. His original hypothesis [56], elaborated upon by Dinour et al. [55], was that food insecure individuals experience cycles of "feast-famine", possibly tied to the SNAP available in the United States, where excessive intake of food may occur when resources are available, but be followed by a period of deprivation. Dietz suggested that a maladaptive metabolic response to this cycle may promote weight gain [56]. There is currently little evidence to support this hypothesis, and a pattern of excessive energy intakes among food insecure individuals following income receipt has not been documented [57]. Energy intake has not been found to differ by food insecurity status in population-based studies [30, 32]. Drewnowski and Specter [31] have proposed that financial resource constraint may promote selection of inexpensive, nutrient-poor, energy-dense foods (e.g. high in sugar, fat, and salt; low in nutrients) since these foods offer satiety for low cost. As outlined in Section 2.1, there is lack of consistent evidence documenting a dietary pattern characterized by high energy density among food insecure individuals; thus, though food insecurity causes perturbations in food intake, it does not necessarily pattern dietary intakes over the long term. Further, while there has been evidence that obesity occurs at a higher prevalence among food insecure women in comparison to food secure women, this is not observed for men [58]. Longitudinal studies have also not provided evidence that transition into food insecurity is associated with weight gain [59-61], suggesting that factors that could conjointly lead to food insecurity and obesity may explain cross-sectional associations among women. More exploration of these relationships is

warranted because food insecurity is increasingly being characterized as a condition that promotes weight gain, leading to interventions focused on healthy food selection for food insecure and low income populations.

Some studies have reported that risk of diabetes and metabolic syndrome is elevated among individuals in food insecure households [58, 62, 63]. For example, in a sample of adults from NHANES, food insecurity was associated with a slightly elevated prevalence of hypertension among men and women, but other metabolic measures such as hyperlipidemia were not different [63]. Clinical diabetes based on fasting blood glucose measures or reported use of diabetes medications was significantly higher among food insecure men and women in this study as well, but not after adjustment for sociodemographic characteristics. When severe food insecurity was used as a measure, associations were robust after adjustment for sociodemographic characteristics [63]. Data from Canada based on self-report of physician diagnosed conditions of diabetes, heart disease, and hypertension showed significantly higher prevalence of these conditions among respondents in food insecure households in multivariate adjusted analyses [44]. Other studies have also highlighted particularly elevated prevalence of diabetes among respondents in severely food insecure households, but less consistent associations among those with marginal or moderate food insecurity [25, 64]. Lastly, though diabetes was found to be elevated among both men and women who were severely food insecure in the study using NHANES data by Seligman et al., there was no evidence of association with high obesity, mean BMI, or higher waist circumference with severe food insecurity for either men or women, and adjustment for these variables did not attenuate the associations between severe food insecurity and diabetes prevalence [25].

Non-nutritive pathways may explain why food insecurity associates with metabolic abnormalities. As an experience that has been characterised by anxiety and uncertainty, food insecurity is a stressor within households, as evidenced by studies that have examined relationships between food insecurity and measures of life stress [22, 44]. While mechanistic pathways relating stress to metabolic conditions are still unclear [65], there is a body of literature that indicates that experiences of chronic stress negatively impact metabolic processes [65]. Chronic low-grade inflammation may play a role [65], and recently it was observed food insecurity was associated with elevated markers of low-grade inflammation [66]. Observed

associations of food insecurity with fibromyalgia, migraines, and arthritis could also associate through mechanisms of inflammation [64, 67].

Perhaps more important than highlighting the specific mechanisms through which food insecurity could lead to chronic health problems, however, is highlighting the non-specific nature of the health outcomes and measures of well-being that associate with food insecurity. In this way, household food insecurity embodies the concept of "fundamental cause" [68]. As one manifestation of insufficient finances, food insecurity could also indicate resource constraint in other domains, such as poor housing conditions [69] and inability to pay for dental care [70], which could directly impact health. The relationship between food insecurity and other material hardships has been examined in only few studies [71-73], which have suggested that measures correlate but do not necessarily overlap. Studies examining relationships between material hardships and health have shown cumulative relationships between number of hardships and child health outcomes [74, 75], but also shown relationships between only some types of hardships and child health, with household food insecurity being one of the strongest predictors [39, 76].

Studies relating health and other indicators of well-being to food insecurity independent of measures of household income or income-poverty inform understanding of the nuance between these indicators. An income gradient in health is widely recognized, and material deprivation is one mechanism through which it is thought to operate, but independent relationships between low income and measures of material hardships in relation to health outcomes suggest they are not interchangeable concepts (e.g. [39, 41]). Household food insecurity is a direct measure of material hardship. Direct measures provide a measure of income-sufficiency relative to needed resources and capture this mismatch with greater precision than income-poverty measures [39]. Incomes below variously determined income thresholds have traditionally been the way that "low income" and "poverty" have been understood in Canada and the United States [77, 78]. Yet, insofar as these measures are intended to indicate shortfalls in income available to meet needs [79], which is one way to define poverty, they are imperfect measures because they do not directly measure households' ability meet their needs [39]. In the literature on health, the fact that food insecurity predicts poor health independent of "poverty" is often highlighted (e.g. [24, 29]) but what is meant by poverty is unclear. Since the measurement of food insecurity captures insufficient and insecure financial resources to meet basic needs, it is a measure of poverty.

However, perhaps because food is the focal point of the measurement and income independently relates to health outcomes, the concept of food insecurity has been considered a phenomenon separate from poverty, which could be contributing to confusion about whether food or income-sufficiency and security should be the target of interventions. Next, what is known about food insecurity in relation to risk factors and vulnerability in the population is reviewed, which sheds light on how food insecurity is an indicator of net financial insufficiency and insecurity.

2.3. Household Food Insecurity in Canada

2.3.1. Magnitude of Problem

Most recently available data on household food insecurity are from the CCHS conducted in 2011[2]. In this year, 12.3% households were food insecure. More specifically, 4.1% of households were marginally food insecure, 5.6% of households were moderately food insecure, and 2.5% of households were severely food insecure [19]. Based on the number of people living in these households, it was estimated that 2.7 million adults and over 1.1 million children lived in food insecure households. These figures are significantly increased from 2008. In this survey year, 11.3% of households were food insecure, which translated to 450 000 more individuals living in food insecure households in 2011 than in 2008 [19].

One limitation of data from Canada has been the inability to examine the extent to which household food insecurity is a persistent or transient problem for Canadian households. The only longitudinal survey that has included measures of household food insecurity over multiple years has been the Quebec Longitudinal Study of Child Development. Acknowledging the lack of representativeness owing to the fact that all households were families with children and also that there was a higher attrition rate among families who were food insecure in the earliest interview wave, over a span of 6 years, and 3 waves of interviews (at child ages 4, 8, and 10), of the 11.4% of families who were food insecure at least once and participated in more than one survey, 43% were food insecure in two or three of the interviews. In the United Studies, data from a

[2] Absent from the CCHS study population are individuals/households living in institutions, living in shelters or without a home, or living on First Nations reserves or in remote locations. Since there are indications that these are particularly vulnerable populations to food insecurity, national estimates likely underestimate the true prevalence of food insecurity in Canada.

longitudinal survey of families with children documented that over a ten year span from Kindergarten to eighth grade, 35% of children lived in food insecure homes at least once over the period, of whom over half lived in a food insecure home for at least two of the four time periods captured in the survey [80]. Chronicity of the experience is a source of variation when trying to understand both causes and consequences of food insecurity because measures only capture the situation in the past 12 months, and it cannot be known whether the problem captured was a new occurrence or an ongoing problem. These circumstances could be differently tied to predictors and outcomes. For example, recent longitudinal studies of child health have suggested that there is a positive relationship between number of years children experience food insecurity and probability of having poor health status [81, 82].

2.4. Vulnerability to Household Food Insecurity

2.4.1. Individual and Household Factors Related to Food Insecurity

Most of what is known about characteristics that associate with household food insecurity in Canada comes from national health surveys. The sociodemographic characteristics studied in relation to household food insecurity are mostly those measured at the household level in these surveys, specifically, household income, highest level of education in the household, the household's main source of income, home ownership, and household composition. In effort to examine other factors that may associate with household food insecurity, respondent characteristics are sometimes used as proxy for the household even though information on all household members is not available (e.g. Aboriginal status, chronic health conditions; nature of employment).

Reflecting the central importance of annual income in determining a household's financial ability to acquire food, data from the national surveys have routinely shown that as household income declines, the prevalence of household food insecurity rises. Most recent data available from the 2011 CCHS showed that among households whose incomes were at or below 50% of the low income measure, the prevalence of food insecurity was 45% [19]. The prevalence dropped to 24% and 13.9% among households between 50% and 100%, and 100% and 150% of the low income measure, respectively, and continued to decline from there. In the most recent analysis of national data from Canada, it was observed that for every $1000 dollar increase in income (adjusted for household size), the odds of a household being food insecure decreased by 5% [64].

This relationship was illustrated by examining mean household-size adjusted incomes by severity of food insecurity, which were $46200, $25500, $20000, and $13000, for food secure, marginal, moderate, and severe food insecure groups, respectively.

Main source of income has also been found to significantly correlate with household food insecurity independent of annual income. Among households reliant on social assistance, odds of food insecurity have ranged from 2.2 times higher to over 3 times higher than those whose main source was employment [64, 83]. Households relying on Employment Insurance or Workers' Compensation as their main source of income are also more likely to be food insecure than households reliant on employment income [64, 83]. Households receiving pensions or dividends are less likely to be food insecure than those reliant on employment income [64].

Of note, is that while the prevalence rates of food insecurity are significantly higher among households reliant on income from social assistance and EI/Workers Compensation, these households make up 19% of the food-insecure population, whereas households reliant on wages, salaries, or self-employment as their main source of income make up 61% of food insecure households [19]. Thus, from a population health perspective, the problem is not limited those reliant on state assistance, but includes many of the working poor. This observation prompted researchers to examine vulnerability to food insecurity among households reliant on labour force participation for their income [84]. Consistent with factors associated with food insecurity in the general population, low income and single-led households were associated with food insecurity. In analyses limited to respondents who were primary earners, having more than one earner in the household was associated with lower odds of food insecurity, and low levels of education interacted with industry-type to associate with greater likelihood of food insecurity independent of income for some groups [84]. The authors speculated that the patterns observed for some industries could reflect income insecurity related to reliance on shift work and low rates of unionization. These results are supported by an analysis of the US Current Population Survey. In households where individuals held multiple jobs, part-time work, or had varied hours, there were greater odds of food insecurity independent of income in comparison to fulltime work [85].

Independent of income, families living in rented homes are more likely to be food insecure than those living in owned dwellings in Canada [64], and regional variation has also been documented, where households in the territories are significantly more likely to be food insecure

[64]. Household structure independently impacts odds of food insecurity, where couple households without children have the lowest prevalence of food insecurity, and in comparison, coupled households with children, lone parent households, and single individual households are all significantly more likely to experience food insecurity [64]. Other features of household membership such as age of children or number of children have not consistently associated with odds of food insecurity independent of other factors [83, 84, 86]. Households where no adults have a secondary school diploma have been found to have higher odds of food insecurity in comparison to households with a postsecondary graduate [64]. Households with a respondent who identifies as Aboriginal have also consistently been found to have higher odds of food insecurity, independent of other sociodemographic risk factors [87] .

Recently, an analysis of CCHS data showed that the odds of food insecurity increased with presence of an increasing number of chronic health conditions among adults [64]. Health conditions also were particularly potent for distinguishing between moderate and severe food insecurity, where households were more likely to experience severe food insecurity in comparison to moderate food insecurity if the survey respondent had two or more health conditions after adjustment for income and other sociodemographic variables. While limited by the cross-sectional nature of these findings, as chronic health conditions could also be a consequence of food insecurity, these findings are aligned with longitudinal studies from the United States that have found transitions into poor health to associate with transition into food insecurity [50].

The characteristics that associate with food insecurity independent of income indicate financial vulnerability not captured by an annual income variable and add insight into why at equivalent household incomes, some households are food insecure but others are food secure. Specifically, income from social assistance represents divestment from savings as a requirement of eligibility for programs across provinces [88] and a lack of employment also likely means reduced access to credit. Those who are non-working poor in Canada are significantly more likely to be in low income persistently, which also determines ability to save and access credit [89]. Other characteristics that associate with food insecurity also are indicative of persistent of low income, as households who are more likely to be persistently in low income in Canada include single individuals, Aboriginal people, and lone parents [89]. Receipt of income from Employment Insurance indicates recent loss of employment, and may capture an acute income shock that

occurred in the past 12 months that is not reflected in an annual income measure. In contrast, income from pensions and seniors income is indicative of a level of stability of income provided by the Old Age Security program, which guarantees a stable minimum income to all adults over the age of 65 [90]. Home ownership is also indicative of wealth and ability to borrow against home equity [91]. Partnership can also provide greater financial security. Lastly, some characteristics could also mean higher household expenditures, as in the case of the high prevalence of food insecurity in the Territories, where cost of living is substantially higher[3], or in the case of chronic health conditions, which could require medical treatments not covered by health insurance in Canada (e.g. prescription medication) [64].

Household savings, access to credit, income volatility, and interactions between these variables have not been able to be specifically examined in Canada, but have been examined in the United States. Using data from the Survey of Income and Program Participation, Leete and Bania observed that negative deviations in the month of observation from mean monthly incomes over the past 12 months were associated with food insecurity for that month [94]. Length of time having low income has been found to associate with food insecurity [79]. Persistence of low income could mean higher debt and low ability to save, whereas households that are experiencing a new reduction in low income may have savings from previously higher income periods that may buffer from the experience [94]. Analyses using data from the Survey of Program Dynamics and the Panel Study of Income Dynamics have shown that households without liquid assets were more likely to be food insecure than households with liquid assets in multivariate adjusted models [95, 96]. In the latter study, only 21% of food insecure households had savings in comparison to 60% among food secure families. Further, when the analysis was limited to low income families alone, having savings as well as mutual funds/stocks were important variables in explaining difference in likelihood of food insecurity among households classified as below the poverty line [95].

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[3] There has been little empirical analysis of how the cost of food relates to household food insecurity. A recent study from the United States showed that variation in food cost was associated with food insecurity (92. Zhang, Q., et al., *Higher food prices may threaten food security status among American low-income households with children.* J Nutr, 2013. **143**(10): p. 1659-65.) In Canada, food prices are inflated in remote communities and in the Territories. This may partially explain elevated odds of food insecurity associated with living in the Territories observed in CCHS and the severely elevated prevalence of food insecurity observed in some studies of remote First Nations communities (93. Power, E.M., *Conceptualizing food security or aboriginal people in Canada.* Can J Public Health, 2008. **99**(2): p. 95-7.)

In addition to studies of vulnerability to food insecurity at the national level, smaller-scale surveys of high-risk groups have been conducted in Canada. These studies have provided insight into factors that influence the sufficiency of household incomes for food security and explain some of the variation in vulnerability to food insecurity among low income groups. For example, Kirkpatrick and Tarasuk [36] examined how housing expenses related to food insecurity among low income families in Toronto. They documented that among families living in market rent housing, as the proportion of income allocated to shelter rose, odds of food insecurity rose (though the relationship was curvilinear). Households paying more than 30% of their income in rent were also at significantly greater risk. Of note, however, was that living in subsidised housing where rent is fixed to 30% of income was not associated with reduced odds of food insecurity in comparison to market rent households; the observed reason for this was that after-shelter income was equivalent for subsidized and non-subsidized groups, highlighting the importance of considering income available to be spent on food after non-negotiable expenses are paid.

Important to highlight are that studies that examine dynamic relationships between financial factors and food insecurity are relatively rare. In Canada, the ability to examine factors that associate with changes in food insecurity status has been hampered by a lack of longitudinal data, leaving outstanding questions about what causes change in household food insecurity status. Prospective studies examine the likelihood of being food insecure conditional on not being food insecure at baseline, offering temporal evidence of conditions that precede food insecurity. Statistical models that use fixed effect analyses are particularly strong because they examine how changes in household characteristics are dynamically related to changes in food security status. Being able to establish temporal and dynamic relationships between factors that appear to put households at greater risk of food insecurity are important to inform intervention.

Longitudinal studies based in the United States have allowed comparisons of characteristics of households transitioning in or out of food insecurity to those that remained food secure or food insecure. Ribar and Hamrick [97] observed that in comparison to households who remained food sufficient at a baseline interview and follow-up interview three years later, those who became food insufficient at follow-up were those with characteristics that associate with disadvantage: identified as Black race, disability, and single-mothers. They observed that higher education, higher incomes, and higher asset income at baseline were protective from entering food

insufficiency. Change in household composition indicated by moving, household dissolution or re-formation was also associated with entry into food insufficiency [97]. In the exit model, they observed that in comparison to households that remained food insufficient, those that had transitioned out of food insufficiency three years later had higher incomes and education and were not single-mother households at baseline [97]. Similarly, in their analysis of adult food insecurity in the Early Childhood Longitudinal Study-Birth Cohort, Hernandez and Jacknowitz [98] compared households that were persistently food secure to those that remained food secure and those that transitioned into or out of food insecurity between time points separated by two years. They observed that in households where mothers had less education or were older, there was greater likelihood persistent food insecurity. Additionally, households with lower income at baseline or who had a decreasing income over the time period were more likely to experience persistent food insecurity compared to those who were food secure over the period [98]. These factors also differentiated persistent food insecurity households from those that transitioned in or out during the study period [98].

A limitation of the latter two studies is that they did not show the acute changes that happened within a household that could be considered a cause for the change in food security status observed over the follow-up period. While the characteristics associated with persistent food insecurity reinforce the consistency of the relationships between food insecurity and indications of financial vulnerability, the models utilized do not explain why at the time of follow-up, the household had newly transitioned to a new food security status. Researchers have elected to use fixed effect models to examine the within household effects of change in predictor variables. As discussed by Heflin, Corcoran, and Siefert [50], a fixed effects model only considers the effects of time-varying variables on change in the outcome variable of interest within observations. Thus, the associations between change in predictor variables and change in food security status within households can be examined. The strength of this model is that the intrinsic restriction to within-household change controls for unobserved heterogeneity between households that could underlie propensity to change food security status. By restricting the analysis to within-household effects, unobserved factors specific to the households are intrinsically adjusted for in the model, reducing the likelihood of confounding by other variables not captured in the analysis. Using data from a sample of 484 households receiving cash assistance in Michigan, USA, Heflin et al.[50] used a conditional fixed effects logistic regression model to model the changes

associated with a change in food sufficiency status; they observed that negative changes in mental health status or declining household incomes were associated with increased odds of food insufficiency over the 5 waves of interviews.

In addition to explaining household food insecurity from a financial resource perspective, researchers have sought other explanations for the lack of a one-to-one relationship between income and food insecurity. These include studies that have posited that poor financial management skills or food skills may increase risk of household food insecurity [99, 100]. The cross-sectional nature of these studies highlight the need to examine these factors longitudinally, as assumptions that these factors precede food insecurity may be misguided. For example, in an analysis of families from the Survey of Household Finances and Childhood Obesity based in the United States, Gundersen [100] used self-reports of "paid bills on time", "always pay credit card in full to avoid interest" and "confidence in financial management ability" as indicators of a construct named "poor financial management". It is likely that the experience of food insecurity would make one doubt their ability to manage their household finances, however, and delaying bill payments is one resource augmentation strategy families use in the face of running out of money for food [101]. Interestingly, reported "use of a budget", one measure that could conceivably impact the amount of food that households can purchase with available finances, did not significantly differ between food secure and food insecure households in this study [100]. Similarly, studies documenting lower complexity of at-home meal preparation among food insecure individuals likely reflect limited resources available for complex meal preparation [102], rather than poor skills leading to food insecurity. Studies of the experience of food insecurity have highlighted the importance food insecure individuals place on careful budgeting, looking for sales and using coupons, and cooking from scratch to make their limited finances stretch farther [6, 102, 103], though these skills do not make up for the insufficiency of their finances for food, nor do they protect individuals from feeling anxiety about their household food supplies.

2.4.2. Food Availability and Food Insecurity

In Canada, food is readily available and abundant, and for most households, all household food supplies are acquired food through financial transactions. In the 1990s, studies were published that documented low concentrations of supermarkets in some high-poverty neighbourhoods in

the United States and United Kingdom [104]. These observations led to the hypothesis that socioeconomic patterns of food intake were in part a function of the nature and availability of food in high poverty neighbourhoods, over and above individual-level finances. These ideas have been extended to household food insecurity, where food availability is proposed to influence one's ability to acquire it beyond individual level income [105]. "Food deserts" refer to the reduced availability of healthy food in an area defined as local and are characterised as neighbourhoods that lack supermarkets within a defined radius or neighbourhoods that have only shops that sell food at higher prices or of limited quality and variety [104]. Dwelling in a food desert has been hypothesized to relate to household food insecurity by requiring travel to supermarkets, therefore restricting access to food by imposing physical inability to obtain it, or by requiring money for transportation to reach it. Reliance on local shops which may sell food for higher prices is also thought to reduce the amount of food that households can acquire. Limited availability of food in one's local environment has been identified as a cause of food insecurity in Canada (e.g. [106]), though there is an absence of empirical evidence linking food insecurity with measures of food availability in Canada [105].

Studies mapping food access in high poverty neighbourhoods in Canadian studies have generally not found a low density of grocery stores or distance to grocery stores to be a consistent characteristic of high poverty neighbourhoods [36, 107-110]. The observation that rural versus urban living location is associated with a lower likelihood of food insecurity suggests that distance to grocery stores is not a primary driver of food insecurity in Canada [19], though in the context of low incomes, requiring travel to reach food retailers may put strain on household financial resources. One study that tested the relationship between grocery store proximity and food insecurity in among low income Toronto families did not observe a relationship between grocery store proximity and food insecurity [36]. In fact, almost all survey families, most of whom were food insecure, lived within two kilometers of a discount supermarket, and correspondingly reported adequate food retail access.

Despite a lack of evidence relating food insecurity at the individual level to area level food availability, the idea that people are food insecure because they do not live within close physical proximity of healthy, affordable foods is often used as justification for the nature of food-based interventions aimed at improving access to food in low income communities. In the next section, these interventions are discussed.

2.5. Food Insecurity Interventions in Canada

2.5.1. Social Policy and Food Insecurity

In contrast to publically funded programs in the United States which explicitly aim to reduce food insecurity for low income households by providing funds for food purchasing (e.g. SNAP), Canada does not have public programs that target food insecurity. Instead, the social safety net in Canada developed through the mid-1900s to provide a system of income supports intended to ensure that individuals had the means to afford basic necessities [111]. Beginning in the mid-1970s, these programs have undergone a series of reforms intended to reduce government spending, which have served to reduce the amount of support available and the ability to access this support [111-113]. Nonetheless, these programs are intended to improve the financial well-being of Canadians and thus, may have a role in protecting individuals from food insecurity and could be strengthened to reduce food insecurity. Social policies intended to support some low income households include child tax benefits, working income tax benefits, sales tax returns, and marginal tax rates. Eligibility and tax rates are determined by net household income. In addition, there are various in-kind programs in provinces and municipalities, which include subsidized housing and subsidized childcare. Availability of these programs to low income families is limited by capacity, and many cities document multiple year long waiting lists. Additionally, across provinces, there are income programs of last resort for those who are permanently unable to work (Disability Support) and those considered able to work (welfare), broadly referred to as Social Assistance. Federally funded Employment Insurance provides income support for individuals in periods following work loss, though eligibility is contingent upon number of hours worked in the period preceding job loss and the amount of financial support is calculated as a fraction of earnings in the period preceding job loss, which could mean little support for some recipients [114]. Other aspects of the social safety net include universal healthcare, though this does not include dentistry, eye care, or prescription drug coverage, and the Old Age Security and the Guaranteed Income Supplement federal programs, which provide a guaranteed annual income to individuals over the age of 65 [90, 115]. With relevance to the problem of food insecurity, it is of note that most income support programs are not designed to provide a minimum income level evaluated against a household's ability to meet household needs.

Suggestion that social policies impact household food insecurity comes from historical examination of how the rise of charitable food provisioning and visibility of hunger in Canada

followed after cuts in social welfare programs in the 1970s and 1980s [113, 116, 117]. There has been little examination how social policy relates to household food insecurity in Canada, however, and the ability to track trends in relation to shifts in social policy or other macro-economic factors has been limited by a lack of consistent monitoring and longitudinal data in Canada. Further, the household characteristics associated with risk of food insecurity suggest that current income support programs are not sufficient to eliminate food insecurity, nor are there programs in place for households facing acute financial shortages in resources for food.

In the absence of programs targeted toward ensuring food security for individuals in Canada, various organizations and non-profit groups have made it their mandate to provide food for individuals facing food shortages and provide low cost or no cost alternative ways to access food. In this thesis, these programs are broadly called community food programs, since they first originated at the community level, and though some are part of larger networks, still largely function autonomously and independently at this level. Two categories of programs representing different approaches to addressing food insecurity at the household level are described below, as is the research relating these programs to food insecurity.

2.5.2. Food Banks

In terms of function, a food bank is a place where individuals can go to receive a hamper of food free of charge. The first food bank opened in Canada in 1981. The initiation of this form of charitable activity aligned with spending cuts to social programs as well as high levels of unemployment during a time of recession [113, 117, 118]. Increasing numbers of people seeking financial assistance from community groups (e.g. churches) motivated a community action to respond to what was identified as a need for food among newly unemployed families and individuals [113]. Although originally framed as a temporary measure in response to a time of crisis (e.g. recession, funding cut-backs), the number of food banks operating in Canada continued to grow through the 1980s and 1990s and recent charting of the activity has suggested that growth in the number has not plateaued (V. Tarasuk, unpublished analysis, 2013). Contributing to food bank activity through volunteering time or donations of food has become a widely accepted and encouraged way for the public to participate in what, prior to the 1980s, had come to be a function of the state- ensuring the means to access to goods and services deemed as basic necessities [111]. As highlighted, the timing of the rise of charitable food assistance

aligned with a shift in social policy in Canada toward neo-liberal approaches to social welfare, which emphasized workforce participation and individual responsibility, with little attention on the actual ability of market participation to meet basic needs or assistance when it failed to so [113]. Further, those unable to participate in the labour force saw their income supports greatly reduced to amounts that remain well-below low income thresholds and calculations of costs of living [113, 119-121]. Against this backdrop, food banks have attempted to fill a gap between the amount of money available for food purchasing and the amount of money needed to meet food needs, by providing food directly. While they have remained extra-governmental organizations, their fixture in the Canadian landscape and informal interface with government funds and endorsement from politicians (elaborated upon in Chapter 6) suggest they have become de facto public policy for insufficient finances for food in Canada.

In Canada, while networks of food banks exist, food banks are operated by a diversity of agencies, ranging from faith groups, schools, community centres, health centres, and other community groups. Thus, the specific nature of operations is determined at the level of the group running the food bank. Common features include a predominant reliance on donated food, with few organizations having funds to purchase food directly (V. Tarasuk, unpublished analysis of study of food banks operating in five Canadian cities; [122, 123]). Most organizations offer food assistance as a peripheral function to their primary functions, as in churches or health centres. For others, food banks are part of one program offered by a centre that provides multiple services to low income people. Food banks are extra-governmental and do not receive allocated government funding. Although the national association of food banks, Food Banks Canada, coordinates a food sharing program that allows large quantities of industry donated food to be transported to food banks across Canada, each food bank is essentially independent, responsible for recruiting volunteers and/or providing staff, choosing operating hours, and soliciting financial and food donations (V. Tarasuk, unpublished analysis)

In response to the rising prominence of food banks, in the 1990s, a number of researchers began to examine the nature of food banks with the objective of evaluating their potential to meet their goal of reducing hunger [124]. Findings from an in-depth study of food banks operating in Toronto highlighted that the functioning of food banks was highly contingent upon donations, resulting in assistance that was highly variable and unresponsive users' needs [125]. Food banks restricted the number of days and times they were open and rationed the amount they gave away

to make food supplies stretch farther, thereby further disassociating client need from what was received [125]. Studies across Canadian cities have similarly documented serious limitations in the amount of food and quality of food distributed, including foods that were past best before dates, highly-processed and superfluous, and quantities that would only provide for 1-3 days' worth at most [122, 126-129].

Studies among food bank users have documented feelings of shame and degradation about having to use food banks [130, 131], yet studies have also reported that users view the assistance they provide as an important part of their resource augmentation strategies [6, 121, 132, 133]. Though the latter observations may be true, it was among studies of food bank users that the severity of the problem of food insecurity among Canadians was first highlighted. Tarasuk and Beaton [130] conducted interviews with 153 women with children and observed that despite regular food bank use, there was a high prevalence of severe food insecurity among study participants (70%). Over a 30 day period, experiences of hunger were reported by 57% of participants, even in the context of food bank use. Although these studies importantly provide insight into the views and experiences of food bank users, they may also only capture those that derive the most benefit from food banks, or alternatively, those in the most need. Thus, to evaluate how food banks interface with the problem of food insecurity from a population intervention perspective, it of interest to examine food bank use in wider population surveys.

Early data on charitable food assistance usage in the Canadian population came from the 1998-1999 National Population Health Survey, which showed that that even among families reporting a severe level of food poverty, only just over 30% of families had used food banks [83]. A similar low prevalence of use was reported in the 1994 sample population from the National Longitudinal Survey of Children and Youth [134]. Since the time of that survey, food bank operations in Canada have further expanded, evidenced in part by the increase in number of Food Banks Canada member food banks and also the amounts of food reported to be distributed through their operations [124]. Given the evidence of increasing food bank operations, it was surprising that a 2005/2006 survey of 484 low income families living in high poverty neighbourhoods in Toronto, places where food banks were highly prevalent, found that only 28% of food insecure families had used a food bank in the past year [101]. Similarly, in the 2006 panel from the National Longitudinal Survey of Children and Youth, food bank was equally as low among families experiencing child hunger as it had been in 1994 [135].

Cumulatively, research on food bank function and prevalence of use highlight some key disconnects between the problem of food insecurity in Canada and food assistance offered through food banks. In light of recent attention on expanding and improving food bank efforts [136, 137], there is a need to better evaluate how food banks impact the problem of food insecurity in Canada.

2.5.3. Alternative Food Programs

In the early 1990s, concerns about the charitable nature of food assistance converged with ideas in health promotion, including promotion of empowerment, nutrition and food skills, and community cohesion [116] and resulted in programs that dually sought to increase access to food and promote health. These programs are one aspect of an umbrella of actions aimed at improving "community food security", which is defined as a "condition in which all residents obtain a safe, culturally appropriate, nutritionally sound diet through an economically and environmentally sustainable food system that promotes community self-reliance and social justice" [138]. In contrast to the definition of household food insecurity, the community food security construct emphasizes a food systems approach, which includes attention in four areas: affordability of food, availability of food, physical and financial access to food, and appropriateness of food [138]. Some community food security activities have been positioned as sustainable alternatives to charitable hunger programs like food banks, which were viewed as "treatment" and "social welfare" [138]. Community food programs are also envisioned to be prevention initiatives and lasting solutions to inequities in food access [138]. Two areas of program focus are improving food availability and improving food skills. For example, reflecting the concept of food deserts, programs focus on providing alternative places for people in low income areas to buy or acquire food by establishing mobile, low cost fruit and vegetable markets, fruit and vegetable box drop-off programs, or community or allotment garden spaces for people to grow food [139]. Other programs offer food through community kitchen programs, where individuals prepare large amounts of food together and take home the meals prepared, while simultaneously teaching skills intended to stretch food dollars [140].

In Canada, these programs are run out of community health centres, churches, public health units, and non-profit organizations. Initiatives are often supported by federal, provincial, or municipal grants or may be arms-length programs funded under a specific government initiative

(e.g. programs offered as part of the Canada Prenatal Nutrition Program; programs run by public health units), and over the past two decades, have featured as part of provincial, municipal, or federal strategies aimed at improving the health and well-being of low income people and reducing health disparities (e.g. [141, 142]). The relevance of these programs to the problem of household food insecurity is two-fold: one, food insecurity is a potent indicator of material poverty, and thus, as a population that is poor and more likely to experience poor health, food insecure populations are included in target populations of these types of programs; and two, as community food security initiatives, improving the household food supplies of food insecure individuals is the purpose of these programs, even if they are accompanied by other health promotion goals [143].

Researchers have raised concerns about these programs being positioned as initiatives to address food insecurity because they focus on skills, behaviour, and physical food access, which have not been empirically documented as drivers of household food insecurity, and focus in these areas may serve to draw attention away from systemic drivers of insufficient finances for food [140, 144-147]. Additionally, the actual ability of these programs to impact food insecurity has been questioned because of their limited capacity of programs with regard to the amount of food that can be acquired through participation and the potential unsustainability of initiatives reliant on grant funding [140]. Based on an evaluation of the experience of people using a community kitchen program, Engler-Stringer noted the tenuous nature of any benefits provided to program users since program availability was subject to holiday schedules, funding constraint, and time allotment of staff [148]. A similar finding emerged from a study of community garden participants in Toronto, where participants experienced anxiety about the insecurity of their garden tenure, which was out of their control [149]. Thus, features of community food programs have raised questions about their ability to address household food insecurity.

Nonetheless, evaluations of programs often emphasize their positive benefits. Evaluations most often have included self-reported feelings about participation and self-reported changes experienced attributed to participation. Named benefits have included improved social interaction [149, 150], enjoying the foods acquired through participation in the programs [151], more frequent consumption of fruits or vegetables, or learning new skills [151]. In relation to food security, researchers have highlighted that programs can meet some of the objectives in the broader definition of community food security, such as enhancing the dietary quality of

participants diets and, because positioned as alternatives to food bank use, offering participants a more dignified way to acquire food, therefore addressing social acceptability [148]. Largely absent from evaluations of these types of programs are objective, pre- and post- test evaluations of how programs relate to household food insecurity, though even this type of evaluation can be biased to retain participants who derive the most benefit if people who discontinue use are not followed. A recent examination of the impact of a subsidized fruit and vegetable box program (i.e. Good Food Box program) compared the food insecurity and dietary quality of individuals participating in the program to those not participating and those who had dropped out of the program [152]. It was found that those enrolled in the program had a lower prevalence of food insecurity than those not participating at baseline, and there was a non-significant increase in food insecurity among those who discontinued use of the program over the follow-up period was reported [152]. Rather than highlight the effectiveness of program use for reducing food insecurity, these findings may indicate that those with deteriorating circumstances were not able to remain in the program. Further, over the 8 month follow-up period, the prevalence of food insecurity among the 46 individuals that remained in the program and completed both questionnaires was unchanged [152].

While alternative food programs can have diverse goals, they are continually positioned in reference to the problem of household food insecurity in Canada [106, 153-156]. They feature in municipal, provincial, and national strategies as ways to improve food access in low income communities. In light of ongoing investment in these programs as ways to address the food needs of low income Canadians, there is a need to examine how these programs interface with the problem of food insecurity in low income communities.

2.6. Summary and Conceptual Frameworks

Food insecurity can manifest in different ways, but at its core, is the experience of not having the financial resources required to ensure that a household's food needs are met. Manifestations can include stress and anxiety, compromises in the quality and quantity of foods consumed, and hunger. Variation in duration and severity of food insecurity likely explain why compromised nutritional status and other health outcomes and indicators of compromised well-being are associated, but not perfectly aligned with the measure, but these aspects of household food insecurity are rarely captured in studies of consequences or determinants.

In **Figure 2.1**, these ideas are summarized in a conceptual model of the food insecurity experience, which highlights the potential manifestations of food insecurity and some of the potential health and well-being outcomes that have been associated with the condition. That severity and duration of experiences may have a role in determining the association with potential outcomes is highlighted. Key concepts in this diagram are the separation of the core construct from potential manifestations, and similarly, the separation of vulnerability to potential compromise in well-being and health from the construct and potential manifestations.

Figure 2.1 Household food insecurity construct, potential manifestations, and potential consequences.

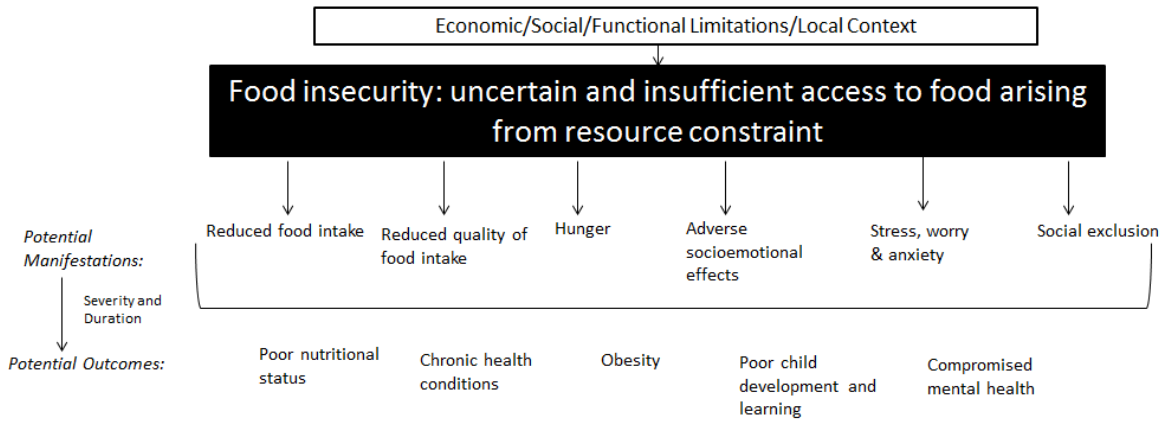
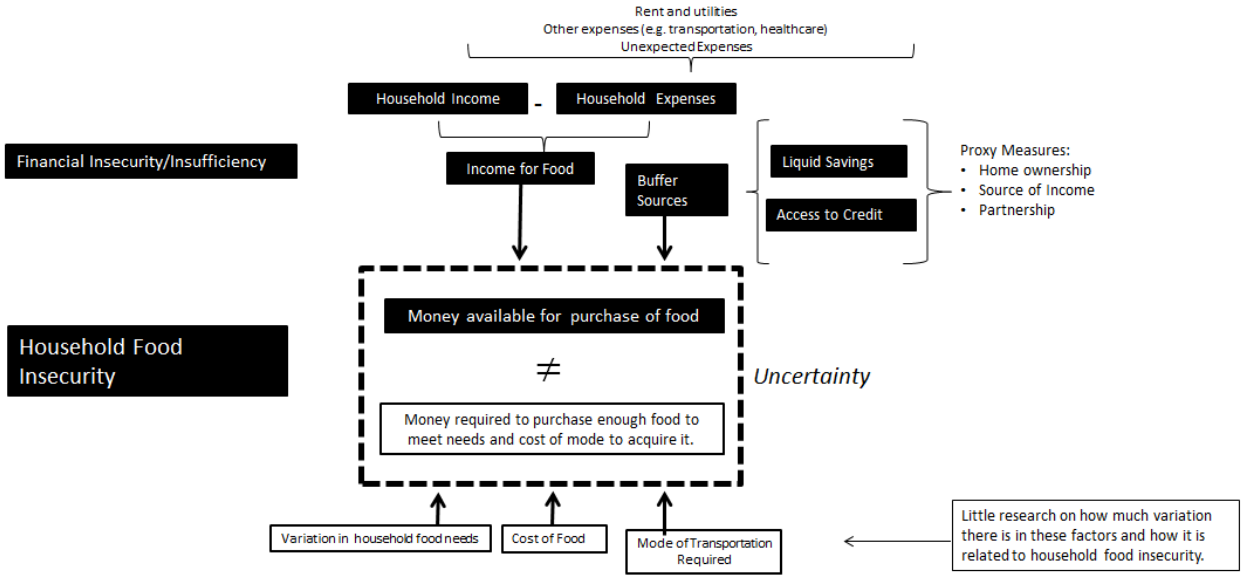


Figure 2.1 highlights determinants of household food insecurity that were initially proposed by Habicht et al. [3]. Drawing from the literature reviewed in Section 2.4, a model for determinants of household food insecurity is presented in **Figure 2.2**. In this model, the construct captured by the HFSSM module is presented as the mismatch of financial resources available for food with the amount of financial resources required to meet food needs, or the uncertainty that financial resources will be sufficient to meet needs. Thus, determinants of food insecurity can be delineated into two components: drivers of the financial resources available for food, and drivers of the amount of money needed for food. The focus on financial resources reflects the Canadian economic and food landscape, namely that food is acquired through direct purchase from food retailers, and food availability and costs are determined by the free market. Thus, to be food secure is to be able to acquire food within these norms of Canadian society.

Figure 2.2 Determinants of Household Food Insecurity Framework.



The amount of money a household has to spend on food is not directly captured in studies of household food insecurity, but the consistent associations with household income highlighted in the literature review indicate that this is a key determinant of resources available for food purchasing. As discussed, annual income measures may not capture within the year temporal variation in the amount of income available for food if households experience job loss or unstable hours of employment. In this model, the amount of income that can be allotted to food spending is reduced by fixed household expenses such as housing costs, healthcare costs, and transportation costs, and also unexpected household expenses. There has been little research directly charting how expenses in other domains influence the amount of money available to be spent on food, however, studies have highlighted that low income households prioritize spending on housing [103]. One national study of household expenditure among low income Canadian households showed that as the proportion of income spent on housing and utilities increased, likelihood of food spending being adequate relative to a set Nutritious Food Basket cost of food decreased [157]. As already reviewed, Kirkpatrick and Tarasuk showed that as rent and utility expenses increased relative to household incomes, the odds of food insecurity rose [69]. This study also highlighted the importance of considering after-shelter income in relation to household food insecurity.

Also reviewed, was that having access to buffer sources such as savings may protect households from the impact of income and expense shocks. Figure 2.2 nets an idea of both financial security and sufficiency within a year and over time, as income volatility can lead to transient reductions in resources available for food, and persistence of low income reduces capacity to save.

On the other side of the equation are factors that may lead to variation in how much households need to spend to meet household needs, which includes the cost of transit to acquire food and the cost of food. There has been little empirical examination in how much variation there is in these factors and how much these factors offset the sufficiency in amount of income available for food purchasing. In terms of the standard of what type and amount of food is needed for households, it is to some extent subjectively determined as it is operationalized on the HFSSM, though the focus on experiences of quantitative depletion of food supplies, feelings of hunger, and reducing food intake, mean that in this context of household food insecurity measurement, the amount of money needed to meet food needs would reflect a basic quantitative sufficiency of the household food supply. The balanced meal question and question referencing reliance on low cost food to feed children add a qualitative component to the types of food that would be defined as meeting needs, but specific standards for a diet are not named by the HFSSM.

Variation in household food needs is to some extent biologically determined, with caloric intake requirements being higher for some life stages, particularly adolescence. This could mean that households with children in particular life stages could be under additional strain in comparison to households of the same size and incomes. Other determinants of the amount and type of food needed are disease status: individuals with chronic conditions may be prescribed particular dietary regimes that are more costly. This may contribute to the higher risk of food insecurity among individuals with chronic conditions.

Other determinants of the amount of money for food needed must include cost of food and cost of transportation needed to acquire food, but the extent to which there is variation in these factors in Canada has not been well-documented. Understanding the role of these factors is not a focus of this thesis, but they are acknowledged since they could have a role in determining the sufficiency of a household’s available financial resources to meet needs.

The frameworks outlined in Figures 2.1 and 2.2 summarise the literature reviewed and provide an orientation to the research objectives of the studies that make up this thesis, outlined in the next chapter. These frameworks are also returned to in the final discussion chapter of results.

3 OBJECTIVES AND SURVEY METHODS

3.1. Objectives

The aim of this thesis was to contribute to the knowledge base needed to inform interventions aimed at reducing food insecurity. The studies have three areas of focus: examining how household financial circumstances dynamically relate to change in food insecurity within households; furthering understanding of the needs of food insecure households; and examining how community food programs, the current models of intervention in Canada, reach and affect food insecure populations.

Theme One: Financial determinants of food insecurity.

Though the household characteristics that associate with food insecurity in Canada highlight a profile of financial vulnerability, there is little evidence to support propositions that improving incomes or other aspects of financial vulnerability can ameliorate the problem of food insecurity. In **Study 1**, to address this research gap, the dynamic relationship between household income and employment was examined in relation to severity of household food insecurity. This study tests the model provided in Figure 2.2, which suggests that income is a key determinant of the amount of money a household has to spend on food, and therefore, a determinant of severity of household circumstances, and also, indirectly, the role of other financial resources that may be provided through employment, in relation to severity of household food insecurity.

Study 1, "Severity of household food insecurity is sensitive to change in household income and employment status among low income families.", had the objective:

1. To examine how changes in income and indicators of financial security related to changes in severity of household food insecurity.

Theme Two: Needs of food insecure households in other material and health domains.

Understanding how other hardships relate to the experience of food insecurity along the scale of severity is important for informing the nature of interventions needed to address the needs of food insecure households. **Study 2** entitled "What does increasing severity of food insecurity indicate for food insecure families? Relationships between severity of food insecurity and indicators of material hardship and constrained food purchasing", was conceived to contribute to

the knowledge base of what it means to be food insecure by examining experiences of hardship along the food insecurity continuum. Further, understanding the relationship between severity of food insecurity and other indications of financial hardship is important for understanding the financial vulnerability that underpins experiences of food insecurity households. Specifically, the objectives of **Study 2** were to:

1. To examine the probability of experiencing household hardships and constrained food purchasing rises with severity of food insecurity as denoted by the number of affirmative responses on the HFSSM.
2. To examine differences between marginally food insecure and fully food secure households in relation to these measures, adding to the emerging literature exploring differences between these groups.

Understanding co-occurring health issues among food insecure populations in Canada is important for understanding appropriateness of current interventions and for shaping future interventions. Central among concerns has been the potential for food insecurity to relate to obesity, given evidence of an association among women in study populations in the United States and recognition of this population health problem in Canada. Food insecurity is conflated with the problem of unhealthy dietary patterns, obesity, and a problem of food availability, even though, as depicted in Figure 2.1, these are not part of the core construct of food insecurity, but rather potential consequences. There is little evidence to suggest that these factors characterize the experience of the majority of food insecure individuals, but in Canada, much of governmental attention on food insecurity is couched in health promotion efforts to improve healthy eating and reduce obesity, where grant funds are allocated to projects that aim to increase healthy food availability for low income populations (e.g. Innovation Strategy to Achieve Healthy Body Weight [141]).

As reviewed in Chapter 2, early studies on the experience of food insecurity highlighted that it is a multi-faceted experience that varies in severity and its manifestations, including the extent to which the quality or quantity of nutritional and energy intake and psycho-emotional health are affected. How food insecurity is experienced may also depend on gender and family roles. Incorporating this complexity into the study of food insecurity and health is important, as generalizing the experience of food insecurity into a uniform construct with assumed health

outcomes could lead to ineffective or misplaced interventions. The objectives of **Study 3**, "Family status and diagnosed mood disorders affect the observed association between obesity and food insecurity among women." were:

1. To examine the consistency of a gender pattern in association between food insecurity and obesity in the Canadian adult population.
2. To explore two hypotheses, specifically, whether the association between food insecurity and obesity may be restricted only to women with children and/or in partnership, and whether diagnoses of mood disorder may account for associations among women.
3. To examine whether stress and compromised fruit/vegetable intake are more strongly associated with food insecurity among women with family members in comparison to other food insecure women and assess the potential mediating role of these variables in observed food insecurity-obesity associations.

Theme Three: Effectiveness of community food programs in addressing household food insecurity.

Food banks, non-profit groups or organizations that redistribute donated or purchased food for no cost to individuals who seek this assistance, have been a part of the Canadian landscape of charitable programming since the 1980s. They emerged in response to recognition that individuals in Canada could not always obtain adequate amounts of food, and focus on the potential manifestation of food insecurity, hunger relief (Figure 2.1). Though they were first construed to be a temporary response to an acute emergence of hunger in Canada, food banks are now an entrenched component of the social safety net. In the absence of other programs or policies, food banks are essentially intended to function as de facto social protection against hunger in Canada. And yet, there has been little evidence that food banks are able to ameliorate the problem of hunger among the people that use them, but they also do not appear to reach or be used by the majority of households that face food insecurity. Despite this evidence, food bank efforts continue to expand and recent proposals before federal and provincial legislatures suggesting a system of tax credits for food bank donations further legitimize this charitable response to the problem of insufficient household financial resources for food. Evaluating the effectiveness of food banks vis a vis the problem of food insecurity provides insight into whether these efforts should be expanded or improved, and can also inform development of other

interventions by highlighting what characteristics are required for interventions to be able to address food insecurity. Thus, the objectives of **Study 4**, "The Relationship between Food Banks and Household Food Insecurity among Low-Income Toronto Families.", were:

1. To examine the household characteristics that associated with food bank use.
2. To understand the reasons why food insecure families were not using food banks.

Often framed as alternative programs to food banks, community food programs have the unifying characteristics of targeting low income individuals and focusing on food access and availability. In relation to the framework defining the construct of household food insecurity, Figure 2.1, these programs focus on the potential manifestations of food insecurity, seeking to influence dietary quality and reduce social isolation, through improving availability of fruits and vegetables, prepared healthy meals, and being participatory activities that foster social interaction. Positive evaluations of these programs can be found in grey literature, however, most exclusively focus on the perspective of program users or program operators. Given evidence from a sample of low income families in Toronto that program users made up only a small fraction of the families [101], there is reason to be concerned that evaluations have not captured the broader views of those the programs are targeted toward, and therefore do not provide insight into the potential effectiveness of these programs for the broader food insecure population. Thus, the objective of Study 4, "Perspectives on community gardens, community kitchens and the Good Food Box program in a community-based sample of low income families.", was:

1. To understand reasons for non-use of community kitchens, community gardens, and the Good Food Box program among low income, food insecure families.

To meet these objectives, secondary data analyses were carried out using data from two surveys. The design of each survey is described below.

3.2. Survey Design: Low Income Families in Toronto

This survey was originally conceptualized to study the relationship between subsidized housing and area-level variables in relation to household food security in a low income sample of families with children [158]. Among neighbourhoods identified by Statistics Canada as "very high poverty neighbourhoods", defined as more than 40% of residents living below the pre-tax Low Income Cut-Off, 12 of 23 were randomly selected as sites for recruitment. Within

neighbourhoods, building and housing units were identified as containing subsidized rental units based on information from the Toronto Community Housing Corporation. In some buildings, there was a mix of subsidized and non-subsidized housing units, allowing for the same site to be used for recruitment of both subsidised and non-subsidized housing families. Otherwise, recruitment took place from market rental units and housing within close proximity of subsidized housing buildings [158].

Study interviewers who themselves had experiences of poverty and who were comfortable working with this target population were hired to conduct recruitment and interviewers. This approach reflected methods used in other studies which had shown it increased likelihood of participation [158]. Interviewers went through extensive training on recruitment and interviewing. Quality checks were routinely performed by lead investigators [158].

The study interviewers went door-to-door in identified buildings and to rental units, approaching with a letter describing the study and inviting individuals to participate in screening. When the door was not answered, the letter was left in a mailbox or under the door when possible. When no contact was made, interviewers returned to households until contact or a total of five attempts were made.

When contact was made, individuals were screened for inclusion. Inclusion criteria reflected the research questions of the original study proposal and reflected characteristics associated with higher risk of food insecurity to increase likelihood of having a sufficient number of food insecure families in the sample. They included: 1) At least one child $\leq$ 18 years of age living in household; 2) Living in rental accommodation; 3) Living in the current dwelling for at least one month; and 4) Gross household income at or below the middle income sufficiency category formally used to categorize household incomes in the CCHS Cycle 2.2. Respondents also had to have sufficient fluency in English to be able to complete an oral interview.

The income threshold for eligibility was selected to allow for inclusion of both working and non-working low income households. It was slightly higher than the Low Income Cut-Off for the year of the study [158]. In addition to eligibility criteria, a quota sampling strategy was used so that equal numbers of families living in subsidized and non-subsidized housing were recruited. Some families screened were therefore ineligible if there was no longer a need for families living either subsidized or market rental accommodation. Within households, the person who had

primary responsibility for food shopping and management was sought to complete the interview, but not being able conduct an interview with this individual was not part of the exclusion criteria. All participation was voluntary and confidential and written informed consent was obtained from all participants [158]. An honorarium of $20 was given to all participants.

The target sample size was 500 families. It was originally calculated based on the prevalence of food insecurity in the CCHS and ability to detect a significant difference in food insecurity between those in subsidized housing and those not. It was further inflated to account for the sampling design of clustering within neighbourhoods and to account for anticipated loss to follow-up for the second interview conducted with households [158].

Figure 3.1 depicts the recruitment flow of the study. The final recruitment rate was 62% based on a calculation of those who completed the survey relative to those who were potentially eligible to participate (i.e. those who declined initial screening, those who declined after screening). Reasons for exclusion among the 1390 households that were screened but ineligible are shown in **Table 3.1**. Most households were ineligible because they did not have children in their households.

One year after initial interviews were conducted, families were re-contacted to complete a second interview. Contact was able to be made with 430 households, of whom 46 declined to participate in a second interview. A total of 71 families were unable to be located or reached by telephone. The overall return rate was 76.7%.

All interviews were conducted in the homes of study participants. The survey instrument was a paper questionnaire that was administered orally by the study interviewer, with all answers recorded by the interviewer. This mode of data collection was chosen to reduce potential literacy issues. The instrument was originally pilot tested among individuals recruited from a drop-in centre, and subsequently modified to increase clarity and reduce respondent burden [158], and further tested in pre-sample group of families recruited from a high-poverty census tract not included target study area.

Figure 3.1 Participant recruitment and follow-up study participation flow diagram (November 2005- January 2008).

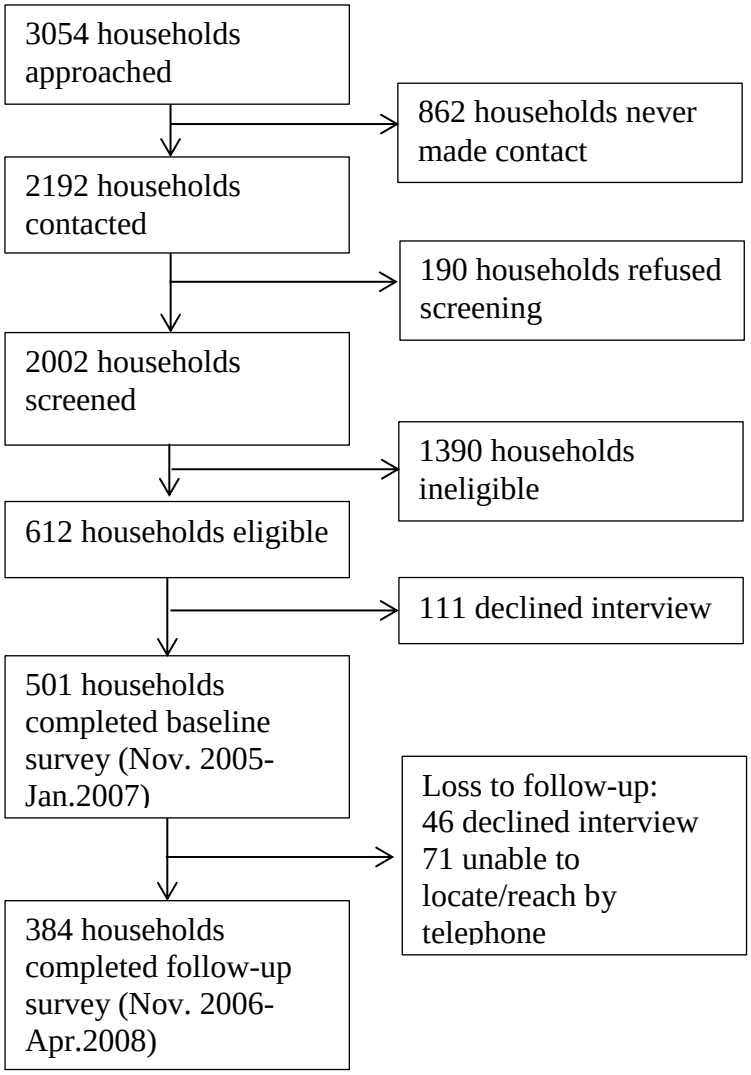


Table 3.1 Reason for ineligibility among households screened and not included in study population (n=1390).

Reason for Ineligibility	**n**	**%**
No children in household ≤ 18 years of age	1003	72.1
Insufficient English fluency[1]	219	15.8
Above income threshold	115	8.3
Lived in current dwelling < 1 month	13	0.9
Not a tenant	5	0.4
Lived in subsidized/non-subsidized after quota reached	31	2.2
Other (e.g. living in a group home)	4	0.3
Total	**1390**	**100**

[1] Ineligibility by other criteria was not necessarily assessed if a language barrier did not permit screening.

Demographic information was collected on all household members living in the dwelling who were part of the household unit. Other information included current employment for all household members, income over the past 12 months from each source of income, monthly rent amount and utility costs, where applicable. Information was also collected on hardships: current rent arrears, current bill arrears, and current housing conditions. Separately, a series of questions asked whether families had to use various resource augmentation strategies in the past 12 months because they were running out of money for food. These included delaying bill payments, delaying rent payments, terminating phone services, television services, or Internet services, pawning possessions, and sending children elsewhere for meals. Other questions asked whether respondents had used community food programs in the past 12 months, specifically, food banks, community kitchens, community gardens, or meal programs. Some information collected only referenced a 30 day window and was not used in the studies conducted, with the exception of food bank use in the past 30 days among those who reported using a food bank in the past 12 months.

The HFSSM was used to collect information on household food security. The questionnaire was modified to only include 17 of the 18 questions, excluding the question about children not eating for a whole day given the sensitive nature of this question. As a most severe dimension of food insecurity, the omission of this question would not have altered classification of families' food insecurity status.

Questionnaires were almost identical between baseline and follow-up except that additional questions were added at follow-up. These included a question about the Good Food Box program

use. Additionally, each question about use of community food programs was followed up by a question asking why respondents had not used the program in the past 12 months. For food bank users, a lack of use in the last 30 days was also followed up with a question asking why a food bank had not been used in the past 30 days.

3.3. Survey Design: Canadian Community Health Survey, Cycles 2009, 2010, 2011

The CCHS is an annual cross-sectional survey of Canadians aged 12 and over. The survey is designed to be representative of 98% of this population, exclusive of all Aboriginal Canadians living on First Nations reserves or Crown lands, individuals living in institutions or who do not have a residence, residents of some remote regions, and individuals who are full-time members of the Canadian Forces [159]. Since 2007, data collection has occurred annually. The target sample size is 65 000 individuals to allow for reliable estimates to be produced at the health region level. Three sampling frames are used: one area frame, one list frame from a list of telephone numbers, and one Random Digit Dialing frame (1% of sample). A respondent from each household is selected using selection probabilities based on age and household composition. Interviews are conducted in person (area frame) or over the telephone, through the use of computer-assisted interviewing [159]. Individual sampling weights allow for calculation of estimates that reflect the distribution of characteristics in the population. All variance estimates must take into account for the complex survey design. Statistics Canada provides 500 bootstrap weights, which are used to estimate standard errors and confidence intervals. Participation in the CCHS is completely voluntary and respondents are not compensated. Informed consent is obtained from all participants. Response rates for 2009/2010 and 2011 cycles ranged from 78-81% [159, 160].

3.4. Ethics Approval

The survey of low income families in Toronto underwent extensive ethics review through the Ethics Review Board at the University of Toronto. Ongoing analyses of the data has been subject to renewed approval years since original approval was obtained.

Analyses of the CCHS occurred in a secure Canadian Research Data Centre (RDC) based at the University of Toronto. All survey data is de-identified and all analyses released from the RDC undergo approval by a Statistics Canada analyst to ensure that the information released could not

allow for identification of a participant. Permission to work with CCHS data was granted by the Research Ethics Board at the University of Toronto.

4 STUDY 1: SEVERITY OF HOUSEHOLD FOOD INSECURITY IS SENSITIVE TO CHANGE IN HOUSEHOLD INCOME AND EMPLOYMENT STATUS AMONG LOW INCOME FAMILIES.

Reproduced from: Loopstra R., Tarasuk V. Severity of Household Food Insecurity Is Sensitive to Change in Household Income and Employment Status among Low-Income Families. Journal of Nutrition. 2013. 143 (8): 1316-1323.

Abstract

Cross-sectional studies have established a relationship between poverty and food insecurity, but little is known about the acute changes within households that lead to changes in food insecurity. This study examined how changes in income, employment status, and receipt of welfare related to change in severity of food insecurity over one year among low income families. In 2005-07, 501 families living in market and subsidized rental housing were recruited through door-to-door sampling in high poverty neighbourhoods in Toronto. One year later, families were re-interviewed. The final longitudinal analytic sample included 331 families. Within-household change in income, employment, and welfare receipt were examined in relation to change in severity of food insecurity. Severity was denoted by the aggregate raw score on the Household Food Security Survey Module (HFSSM). Analyses were stratified by housing subsidy status owing to differences in characteristics between households. Food insecurity was a persistent problem among families; 68% were food insecure at both interviews. Severity was dynamic, however, as 73.4% answered more or fewer questions affirmatively on the HFFSM between baseline and follow-up. Among market-rent families, a $2000 gain in income over the year and gain of fulltime employment were associated with a 0.29 and 1.33 ($p<0.01$) decrease in raw score, respectively. This study suggests that improvements in income and employment are related to improvements in families' experiences of food insecurity, highlighting the potential for income- and employment-based policy interventions to impact severity of household food insecurity for low income families.

4.1. Introduction

Household food insecurity is increasingly being recognized as a serious public health problem in high income countries. In Canada, most recent estimates from 2011, show that 12.3% of households experienced a marginal, moderate, or severe level of food insecurity [2]. Food insecurity has been associated with higher rates of self-reported poor health and chronic health conditions [24, 25, 44, 49, 63, 67, 161] and nutritional vulnerability among adults [29, 30], and greater risk of poor health among children [76, 162-164]. Importantly, there are indications that health risks are heightened with level of severity of food insecurity [161, 163, 165] as well as duration of the experience [81, 82]. The prevalence of household food insecurity and indications of serious consequences associated with the condition highlight the need for targeted intervention, but there has been little examination of the factors that mitigate the experience of food insecurity among vulnerable households.

While different measures have been used, cross-sectional, population-based surveys in the United States [96, 166, 167], Canada [86, 87, 134], the United Kingdom [162, 168] , and Australia [169] have generated an understanding of the household characteristics associated with food insecurity, namely, low household income, lack of home ownership, receiving welfare, and single motherhood. Lack of savings and investments have also been associated with greater odds of food insecurity [95, 96]. While these characteristics point to an underlying condition of financial vulnerability and suggest that interventions aimed at increasing income and financial security would improve access to food for food insecure families, little is known about how changes in income within households relate to amelioration or deterioration of food insecurity. Two studies have examined income changes and availability of liquid assets in the month before food sufficiency status was observed and found that households that experienced negative income shocks in the month preceding measurement were more likely to be food insufficient at the end of the period, but these studies did not track a change in status [91, 94]. Ribar and Hamrick [97] observed characteristics associated with likelihood of households transitioning in or out of food insufficiency and highlighted that households without asset income and lower income-to-poverty ratios were more likely to transition into food insufficiency, but they did not examine changes in income in relation to transition into or out of food insufficiency.

Because unmeasured characteristics that make households more susceptible to both food insecurity and financial vulnerability could underlie associations between negative income shocks and low income and assets with risk of becoming food insufficient, examining within household changes in financial circumstances in relation to changes in food insecurity is important for providing insight into dynamic associations [50]. To our knowledge, only one study has examined the dynamic relationship between income changes and employment changes with changes in food sufficiency status [50]. In their study population of mothers receiving cash assistance in Michigan, Heflin et al. [50] used a fixed effects model to examine change in food sufficiency status over 5 waves of interviews, and observed that changes in household monthly income and changes in food insufficiency status were inversely related [50].

This study builds on the literature that has highlighted a relationship between income changes and risk of food insufficiency by using the HFSSM to examine how changes in household income and employment relate to change in raw score on the 18-item scale, and thus amelioration or deterioration in severity of food insecurity. Our objective was to examine the dynamics of severity of food insecurity from one year to the next among a sample of low income families in Toronto and determine how changes in available household financial resources related to changes in severity.

4.2. Methods

4.2.1. Sample

The data for this analysis come from a study of low income families in Toronto, Canada, designed to examine relationships of household characteristics, subsidized housing, and neighbourhood factors with food insecurity [36, 69, 101]. Protocols for the baseline and follow-up study were approved by the Human Subjects Research Ethics Board at the University of Toronto. A total of 501 families were recruited into the baseline study population (62% recruitment rate) through door-to-door sampling in high poverty census tracts in Toronto from November 2005 to January 2007 (**Supplemental Figure 4.1**) [101]. Eligible families were tenants with least one child 18 years of age or younger, able to complete an interview in English, and had a gross income at or below the mid-level of Statistics Canada's five category income adequacy scale (≤ $29 999, $39 999, or $59 999 for household of 1 or 2 people, 3 or 4 people, or ≥5 people, respectively). Original interest in the relationship between housing subsidy and food

insecurity meant a quota sampling strategy was used to recruit equal numbers of families living in subsidized housing and market-rent housing. A structured oral interview was conducted with the household member primarily in charge of household food shopping and management.

Of the 501 families recruited at baseline, 384 families were contacted and re-interviewed approximately one year after the baseline interview (Supplemental Figure 4.1). Thus, 117 families (23%) were lost to follow-up or declined to participate in a second interview. Baseline household characteristics associated with odds of completing a follow-up interview were examined by multivariate logistic regression in samples stratified by housing subsidy receipt. Baseline household characteristics were not predictive of completion of the follow-up interview among market rent households, but among subsidized rent families, severe food insecurity and lack of employment at baseline were associated with higher odds of completing the follow-up study visit.

In addition to families lost to follow-up, thirteen families were excluded from the longitudinal analytic sample because closer examination of their baseline incomes deemed them ineligible according to original criteria. Due to the potential for intra-household variability in reporting of food insecurity [170], we also excluded 17 families from the follow-up sample because a different representative from the household was interviewed at follow-up than baseline. Comparison between baseline and follow-up data led to the further exclusion of 23 families due to missing information for key variables of interest between baseline and follow-up that compromised classification of change within a household (e.g. not all HFSSM questions answered, income missing from some sources). A total of 331 families are included in the final longitudinal analytic sample used in this study. In a sensitivity analysis, the main analytic models were run using all households that returned at follow-up. Results were attenuated, but remained significant. We report the results for the analytic longitudinal sample of 331 families because these results were less biased by random error in the outcome and predictor variables.

4.2.2. Outcome Variable

The survey questionnaire included the HFSSM used by Health Canada [17], modified to include only 17 of the 18 items due to concern held by a research partner that report of a child ever having gone a whole day without eating may warrant report to child welfare authorities. For descriptive purposes, a household was classified as food insecure if any questions were answered

affirmatively on the HFSSM scale in alignment with current thinking about the vulnerability of marginally food insecure households [15, 171]. Severe food insecurity was defined according to Health Canada's classification schema, which considers the number of affirmatives on the child and adult scales separately [17]. To examine changes in severity of food insecurity, the raw score on the HFSSM (i.e. aggregate number of affirmative responses) was used as a continuous variable ranging from 0 to 17.

4.2.3. Predictor Variables

Predictor variables of interest focused on those related to available financial resources as reflected by household income, employment, and receipt of welfare. These variables reflect income flow into the household as well as access to credit and assets. Specifically, new receipt of welfare is indicative of low liquid assets, owing to entry rules that require applicants to divest themselves of liquid assets to qualifying levels (e.g. Ontario liquid asset exemption level for lone parent and one child family in 2006 was $1487.00) [88]. Loss or gain of employment was predicted to be associated with changes in food insecurity independent of changes in income because it could alter access to credit and other financial benefits such as prescription drug insurance.

Information on household income over the past 12 months from all contributing household members and sources was collected and adjusted for household size using the Organisation for Economic Co-operation and Development (OECD)-modified scale to account for differences in consumption of household resources [172], thus, this variable implicitly controls for changes in household composition, though few households experienced changes in household size over the follow-up period.

Respondents were asked to report all employment currently held by household members at the time of the survey and asked to specify whether the position was part-time or fulltime (defined as ≥30 hours a week). The number of adults with fulltime employment was considered separately from number with part-time employment, as it was hypothesized that a stronger relationship would be observed for fulltime employment because it would more likely include additional benefits beyond income. Receipt of welfare was made into a dichotomized variable denoted by 1 vs. 0 for households that reported welfare income at any time in the past 12 months compared to households that did not receive any welfare income.

4.2.4. Statistical Analysis

All analyses were carried out using SAS 9.2 (SAS Institute, Cary, NC) and values were considered significant at $p \leq 0.05$.

Subsidized and market rent families were expected to differ with respect to a number of household characteristics due to an *a priori* hypothesis that families living in subsidized housing would have more vulnerable status because this housing program gives priority to victims of domestic abuse, homeless individuals, and families whose members are separated due to a lack of housing. Additionally, given the dynamic relationship between income and rent for subsidized housing families (i.e. tenants pay 30% of their income in rent, with rent amounts fluctuating throughout the year relative to income fluctuations), changes in household finances were not anticipated to have the same effect for subsidized and non-subsidized families. To test these hypotheses, differences in household characteristics by housing subsidy status were tested by chi square test of proportions for categorical variables and t tests for continuous variables. Second, the interaction between change in income and subsidy status was tested in an initial regression model and approached significance (p=0.08); thus, regression analyses were stratified by housing subsidy receipt.

The primary analysis was an examination of how change in predictor variables of interest related to change in severity food insecurity as measured by a change in raw score on the HFSSM between baseline and follow-up interviews. The analysis followed the method for a fixed effect analysis for a two-period case shown by Allison using difference scores and PROC REG [173]. In this model, time invariant characteristics are implicitly controlled for. The model tested whether within household change in severity of food insecurity was related to within household changes in OECD-adjusted income, number of adults with fulltime employment, number of adults with part-time employment, and receipt of welfare payments. To account for the truncated nature of the continuous severity variable (i.e. 0 affirmatives and 17 affirmatives), dummy variables were included in the model to denote if a household answered zero questions affirmatively at baseline and if a household answered 17 questions affirmatively at baseline. This was necessary because if households with a score of 0 experienced improvements in predictor variables, no change in severity would be reflected in number of affirmatives since they already had scores at the minimum, and similarly, deterioration in predictor variables could not result in

a worsening score for households who answered the maximum number of questions affirmatively at baseline.

Information on household expenses in the past 12 months was not collected at either interview, nor was direct information on access to credit, household savings, or other financial benefits tied to employment, thus these variables were not included in models. The selection of a fixed effect model means that unchanging household expenses and access to credit and assets were intrinsically adjusted for, but the impact of a change in these variables within a household could not be accounted for. Similarly, a potential buffering effect of having access to savings, credit, or unemployment insurance on impact of job and income losses could not be tested.

Subsequent to these analyses, baseline household characteristics were examined in relation to change in income and gains in employment to examine if there was a patterning of propensity to have experienced change in the study population. The former involved a multivariate regression analysis to examine the change in household income by household characteristics. The latter were logistic regression analyses for gain of fulltime work and gain of part-time work.

4.2.5. Sensitivity Analyses

While use of the continuous raw score on the HFSSM allows for change in severity of food insecurity to be observed, in using the continuous variable, two major issues arise: i) the raw score is not linear at the extreme ends of the scale [14]; and ii) the truncated nature of the scale means restricted movement in change values for households close to the thresholds. Inclusion of dummy variables denoting households with minimal and maximal scores at baseline only partially accounted for these problems. To account for these limitations, in a series of sensitivity analyses, households with no affirmative responses were coded at different interval distances to test the robustness of the linear regression findings (i.e. were given values of -1, -2, -3, -4, -5, -6 in different models). This meant that the difference scores for households that crossed the 0/1 threshold (specifically, 34 market rent households and 26 subsidized rent households) were allowed to be greater relative to the one unit changes for households on the scale. Results were robust across the successive models. Increasing the interval improved model fit and increased the magnitude of coefficients, suggesting that not accounting for potential discrepancy in the 0/1 interval biased the model toward the null. The most conservative results are reported (i.e. using score of 0), but results from the successive models are available upon request.

To account for the potential bias introduced due to characteristics associated with loss to follow-up in the subsidized housing sample, the Heckman method was applied, which included the predicted log-odds of participation in the follow-up study in the main regression model for subsidized housing families [174]. Inclusion of this variable did not alter the findings (data not shown).

4.3. Results

Only 13.6% of families reported no experience of food insecurity in the past 12 months at both baseline and follow-up interviews, and most families were food insecure at both interviews (68.3%), including 22.4% of families who were severely food insecure at both interviews. **Table 4.1** displays the dynamics of household characteristics for families between interviews, stratified by housing subsidy status. Only 24 market-rent families and 15 subsidized-rent families transitioned to food security by the follow-up interview, though fewer families were newly food insecure at follow-up. Fulltime and part-time job losses and gains were experienced by a total of 27% of families. Most families did not experience changes in household composition, partner status, or receipt of welfare between interviews.

Differences between subsidized and market-rent families were reflected by the higher prevalence of welfare receipt, single motherhood, and lack of fulltime employment over both periods among subsidized households. Subsidized rent families also experienced a higher prevalence of persistent severe food insecurity than market rent households, though this likely reflects the bias introduced by the greater likelihood of families with severe food insecurity remaining in this sample. Subsidized rent families remained at significantly lower income levels over both years, as reflected by the high proportion of families below the low income cut-off [172] at both interviews, lower magnitude of change in income, and lower proportion of households that experienced a gain of $2000 in income over the follow-up period.

Although only 18.2% of families in the study population transitioned into or out of food insecurity (Table 4.1), an examination of the change in number of affirmative responses to questions on the HFSSM between baseline and follow-up (Supplemental Figure 4.2) showed that 73.4% experienced changes in the severity of their experiences, with 47.7% of families answering two more or fewer questions affirmatively at the follow-up interview than they had at baseline.

Among market-rent households, change in income was significantly inversely associated with change in severity of food insecurity (**Table 4.2**), indicating that the greater the change income, the greater the change in severity of food insecurity, where a gain of $2000 in household income was associated with a decrease of 0.29 in reported number of affirmed responses on the HFSSM. Changes in number of adults with fulltime and part-time employment were also independently inversely associated with change in severity of food insecurity. Specifically, a gain of an adult with full-time employment was associated with 1.3 fewer affirmative responses being reported at follow-up in comparison to baseline. Change in receipt of welfare was not associated with change in severity of food insecurity, but few families were newly receiving welfare or no longer receiving welfare at follow-up, thus the estimate for the change variable was unstable.

Changes in income, employment, and welfare explained little of the variation in change in severity of food insecurity among subsidized housing families (adjusted R^2=0.06 for the regression model). Change in income, fulltime employment, and welfare were not associated with change in severity of food insecurity, but a change in part-time employment was inversely associated with a change in severity (Table 4.2).

Households with only one adult experienced a significantly smaller change in income in comparison to households with more adults, and households with a respondent who had less than high school education or only high school education also had a significantly smaller mean change in income in comparison to households with a respondent who had post-secondary education (**Table 4.3**).

In the logistic regression analysis, baseline characteristics associated with lower odds of gaining fulltime work were single adult households, less education, receipt of welfare, and already having fulltime employment in household at baseline (**Table 4.4**). Households with three or more adults or with only high school education were significantly more likely to have gained part-time work (Table 4.4).

4.4. Discussion

This study uses the full range of the HFSSM scale to examine the dynamic relationship between changes in severity of food insecurity and income and employment, uniquely providing an examination of the dynamics of food insecurity in a low income Canadian study population over

a one year period. We observed a significant association between income change and change in severity of food insecurity among market rent families, suggesting that greater income gains led to greater improvements in severity of food insecurity, and that conversely, greater income losses, led to greater deterioration. While a dynamic relationship between income changes and a change in food sufficiency status has been observed among welfare families in Michigan [50], this study builds on this finding by documenting that over a short follow-up period, changes in income and employment related to changes in severity of household experiences of food insecurity as measured by the HFSSM. The aggregate number of affirmative responses on the HFSSM module has been used as an outcome variable in other studies [95, 96, 166], one of which utilized longitudinal data [166], but to the best of our knowledge, none have focused on within household change in relation to within household changes income and household employment status over a short time frame. One exception was a study based in Burkina Faso [175], which used a similar scale instrument to measure household food insecurity, and related change in food insecurity score to other household changes over time intervals of 6 months. This study also provided validation that a change in household food insecurity scale score is reflective of economic changes within households. Observations of a dynamic relationship between these variables within households suggests that introductions of policies that raise household incomes and employment would improve the situations of food insecure households and that protections against income losses may prevent deterioration for households experiencing food insecurity.

As discussed by Leete and Bania [94], the responsiveness of food insecurity to negative income shocks must be affected by a household's access to resources that protect households from feeling the impact of these changes, such as liquid assets and access to credit. Similarly, benefits of income gains may be offset by debt. We did not specifically measure debt, savings, or access to credit so could not evaluate interactions with income changes in our sample, therefore our estimates could be biased towards null. However, since most families in the sample were already food insecure, this could indicate that protective financial resources were already exhausted, since households that are food insufficient or food insecure have been observed to lack these resources [91, 95, 97]. In spite of a lack of information on other financial resources, the findings suggest that income flow was central in determining the severity of experiences among vulnerable households.

The lack of association among subsidized-rent households may relate to the above discussion in that income gains in this group would have been partially off-set by concomitant increases in rent. An alternate explanation is that while some families experienced income changes, families in this group were less sensitive to change given the greater depth of poverty and severity of food insecurity.

We observed that changes in number of household members with employment, particularly full-time employment among market-rent households, were associated with changes in severity of food insecurity independent of income change. The independence of these relationships could reflect improvements in financial resources available for food not captured in income, such as improved access to credit and prescription drug and dental insurance, which would free up money for food if these were a source of household expense. Studies of low income Canadians have shown that compared to unemployed low income Canadians, employed low income households report greater ability to use lines of credit or credit cards to cover unexpected expenses [176] and almost half of low income employed households have access to employment-related dental insurance coverage [70]. Information on access to credit and employment-related benefits was not collected in this study, however, so we could not examine whether a change in access to these resources was underlying the association observed between change in employment status and severity of food insecurity. There is a need to examine how these types of material resources relate to household food insecurity in Canada, as these could be important levers for policy intervention for working and non-working households alike. The relationship between a gain in employment and reduction in severity of food insecurity observed in this study provides support for improving availability of secure employment opportunities and incentives and support for transition from welfare to work as highlighted as key priorities in a recently commissioned review of social assistance in Ontario [177]. This said, we are cautious to make conclusions about the sufficiency of employment as an antidote for food insecurity, since employment is not coincident with food security in Canada, where over 50% of food insecure households receive their main source of income from employment (author calculation from [178]). A recent study of food insecurity among households with employment highlighted that working households with only one waged worker, single mothers, larger household sizes, and low incomes were more likely to be food insecure [84].

Further, the patterning of income changes and fulltime job changes in the sample suggests that particularly vulnerable households are disadvantaged in potential to experience improvement in food insecurity if improvement is contingent on employment. Households with only one adult (namely, all single mothers with no adult children) and lower education experienced significantly lower income gains, and fewer of them gained fulltime work. These characteristics could reflect both barriers to gaining work and poorer quality of current employment. Since gaining any or additional employment, increasing work hours, receiving wage increases, or gaining better paid work may not be possible for many households facing food insecurity, particularly single parents with low education levels, there is a need for policy that positively influences availability and security of material resources independent of employment in Canada. Concern about the adequacy of current welfare rates for unemployed Canadians has repeatedly been highlighted [119, 120, 179] and social assistance recipients remain the most vulnerable group to food insecurity in Canada [178]. Improvement to the current tax transfer system for low income working Canadians has also been recommended [180].

The study population provided a unique opportunity for an analysis of dynamics between financial resources and severity of food insecurity because of the relatively high proportion of families who had affirmative responses on the HFSSM. In addition to implications for intervention, the results provide a methodological contribution to the literature on measurement household food security through use of the HFSSM by showing that movement up and down the scale within households was related to changes in household financial circumstances, thus suggesting that the scale can track changes in severity. There has been little assessment of the stability of intra-individual reporting on household food insecurity over time and some movement up and down the scale observed in this study must be due to variation in this regard, but the observation that movement was related to changes in household financial circumstances suggests that movement reflects meaningful changes within households. An inherent assumption of the fixed effect model is that the change is raw scale score is equivalent relative to change in the predictor variables, regardless of where the movement occurred on the scale and what changes in experiences the change in raw score represented. Further research is needed to explore the meaning of changes at different points on the scale.

As discussed, this study was limited by a lack of information about other factors that could have explained the unaccounted for variation in severity of food insecurity between baseline and

follow-up, particularly for subsidized housing families, and also by a lack of detail on the timing of changes within the household. The associations observed could have been attenuated by the temporal mismatch between predictor variables of interest and the outcome variable. By design, the HFSSM captures the most severe circumstance that occurred at any time in the past year, so conceivably the severity of food insecurity could reflect a time before gains in income or employment occurred, which would lead to an attenuation of parameter estimates.

It is possible that the stability of household characteristics observed for most study participants over the study period was over-represented if more significant changes, either positive or negative, influenced ability to re-contact households (i.e. re-location due to gain of employment or loss of housing). In many cases, the loss to follow-up was due to an inability to re-contact participants because they had moved or phone numbers were disconnected, rather than refusal to participate in the follow-up study (Supplemental Figure 4.1). The generalizability of our findings is potentially limited, as the sample was limited to low income, tenant families with children living in Toronto, however, the characteristics of vulnerability to food insecurity in the sample [36, 101] were consistent with findings from nationally representative data [17], and findings are consistent with other studies that have suggested a dynamic relationship between income and food insufficiency [50, 91, 94].

In conclusion, this study shows that income and employment changes within households are associated with changes in severity of food insecurity, highlighting the sensitivity of food insecure households to changes in their financial circumstances. These findings suggest that improvements in income and employment of food insecure households would improve their situations, whereas a lack of protection from negative changes may lead to worsening circumstances for households that experience declines in income and employment. These results provide evidence to support development of public policy aimed at improving the material resources of food insecure households to ameliorate the severity of their experiences. Given the magnitude of the problem of food insecurity, there is an urgent need for development and evaluation of policy targeted toward food insecure households in Canada, where currently there is no public policy targeted toward amelioration or prevention of this problem.

Table 4.1 Dynamics of household characteristics between baseline and follow-up study visits by housing status (n=331).

	Market rent households (n=145)	Subsidized rent households (n=186)	P
Household food security			0.11
Fully food secure at both visits	19 (13.1)	26 (14.0)	
Food insecure at both visits	92 (63.5)	134 (72.0)	
Transitioned to fully food secure	24 (16.6)	15 (8.1)	
Transitioned to food insecure	10 (6.9)	11 (5.9)	
Severe food insecurity			0.0029
Not severe at both visits	108 (74.5)	102 (54.8)	
Severe food insecurity at both visits	21 (14.5)	53 (28.5)	
Transitioned out of severe food insecurity	6 (4.1)	13 (7.0)	
Transitioned into severe food insecurity	10 (6.9)	18 (9.7)	
Baseline number of affirmative responses on HFFSM	4.2 ± 4.0	5.9 ± 4.9	0.0007
Change in number of affirmative responses between baseline and follow-up	-0.2 ± 3.2	-0.3 ± 3.5	0.84
Single mother household			<0.0001
Neither study visit	89 (61.4)	42 (22.6)	
Baseline and follow-up	50 (34.5)	134 (72.0)	
Gained a partner	2 (1.4)	5 (2.7)	
Lost a partner	4 (2.8)	5 (2.7)	
Number of adults			0.81
Same number at both visits	129 (89.0)	162 (87.1)	
Fewer than at baseline	6 (4.1)	11 (5.9)	
More than at baseline	10 (6.9)	13 (7.0)	
Children 18 years of age and younger			0.0187
Same number at both visits	128 (88.3)	176 (94.6)	
Fewer than at baseline	4 (2.8)	6 (3.2)	
More than at baseline	13 (9.0)	4 (2.2)	
Number of fulltime jobs in household			<0.0001
None at baseline and follow-up	45 (31.0)	115 (61.8)	
Same number at both visits	67 (46.2)	46 (24.7)	
More than at baseline	25 (17.2)	17 (9.1)	
Fewer than at baseline	8 (5.5)	8 (4.3)	
Number of part-time jobs in			0.91

household			
None at baseline and follow-up	102 (70.3)	136 (73.1)	
Same number at both visits	16 (11.0)	19 (10.2)	
More than at baseline	13 (9.0)	17 (9.1)	
Fewer than at baseline	14 (9.7)	14 (7.5)	
Received welfare payment in past year			0.0089
None at baseline and follow-up	96 (66.2)	90 (48.4)	
Baseline and follow-up	37 (25.5)	78 (41.9)	
Only baseline visit	7 (4.8)	9 (4.8)	
Only follow-up visit	5 (3.5)	9 (4.8)	
Income below low-income cut-off[2]			<0.0001
Not at baseline or follow-up	32 (22.1)	8 (4.3)	
Baseline and follow-up	72 (49.7)	155 (83.3)	
Only baseline	27 (18.6)	14 (7.5)	
Only follow-up	14 (9.7)	9 (4.8)	
Baseline income[3], *$*	13 000 ± 3300	10 700 ± 3500	<0.0001
Change in income[3], *$/year*	2300 ± 4900	800 ± 3200	0.001
Experienced income gain > $2000 over time to follow-up	64 (44.1)	53 (28.4)	0.0031

[1] Values are n (%) for categorical variables or mean ± SD for continuous variables.
[2] Relative to after-tax low income cut-off thresholds published by Statistics Canada for 2006 [172].
[3] Baseline and follow-up income divided by OECD modified scale for household size. Change in income is difference between adjusted values.

Table 4.2 Change in severity of household food security module over time to follow-up in relation to changes in financial vulnerability for market rent and subsidized rent households.

	Market rent households		Subsidized rent households	
	Change in number of affirmative responses		Change in number of affirmative responses	
	β ± SE	P	β ± SE	P
Change in household income (per $2000)	-0.29 ± 0.10	0.0057	0.03 ± 0.16	0.85
Change in number of adults with full-time employment	-1.33 ± 0.44	0.0028	-0.46 ± 0.65	0.48
Change in number of adults with part-time employment	-1.14 ± 0.56	0.0438	-1.29 ± 0.59	0.0286
Change in receipt of welfare payments	-0.29 ± 0.93	0.76	1.15 ± 0.85	0.18
Minimal score at baseline				
0 affirmative responses	1.82 ± 0.63	0.0046	1.88 ± 0.65	0.0041
≥1 affirmative responses	Reference		Reference	
Maximal score at baseline				
17 affirmative responses	-3.81 ± 2.18	0.08	-1.52 ± 3.53	0.67
≤16 affirmative responses	Reference		Reference	

[1] Data are from linear regression models adjusted for all other variables in table.

Table 4.3 Change in income over time to follow-up in relation to baseline household characteristics (n=331).

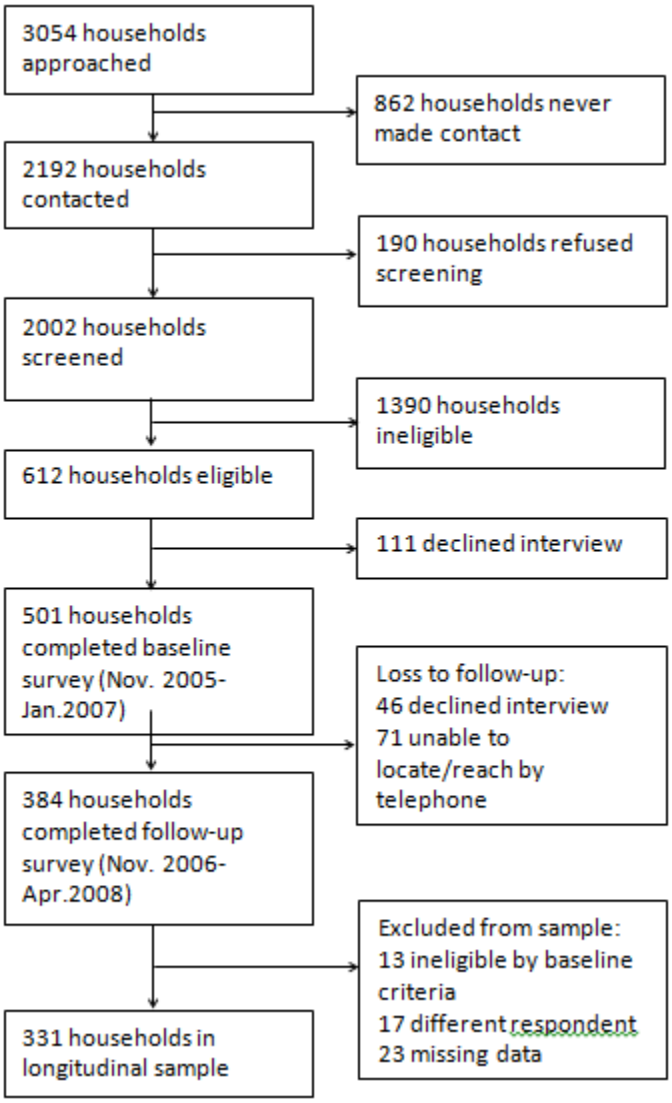
	Households, *n*	Change in income ($/year)	
		β ± SE	P
Adults living in household, *n*			
1	169	-1100 ± 500	0.0398
2	133	Reference	
≥3	29	-100 ± 800	0.94
Children living in household, *n*			
1	123	900 ± 500	0.09
2	106	400 ± 600	0.44
≥3	102	Reference	
Respondent education			
Less than high school	73	-1900 ± 600	0.0045
Completed high school	117	-1100 ± 500	0.0387
Post-secondary	141	Reference	
Years since immigrated			
<10	93	800 ± 700	0.28
≥10	167	600 ± 500	0.31
Born in Canada	71	Reference	
Highest work status			
None	143	-800 ± 600	0.20
Part-time	48	-100 ± 700	0.90
Full-time	140	Reference	
Received welfare			
No	200	-300 ± 600	0.60
Yes	131	Reference	
Received disability support			
No	304	-400 ± 900	0.65
Yes	27	Reference	

[1] Data are from linear regression model adjusted for all variables in table.

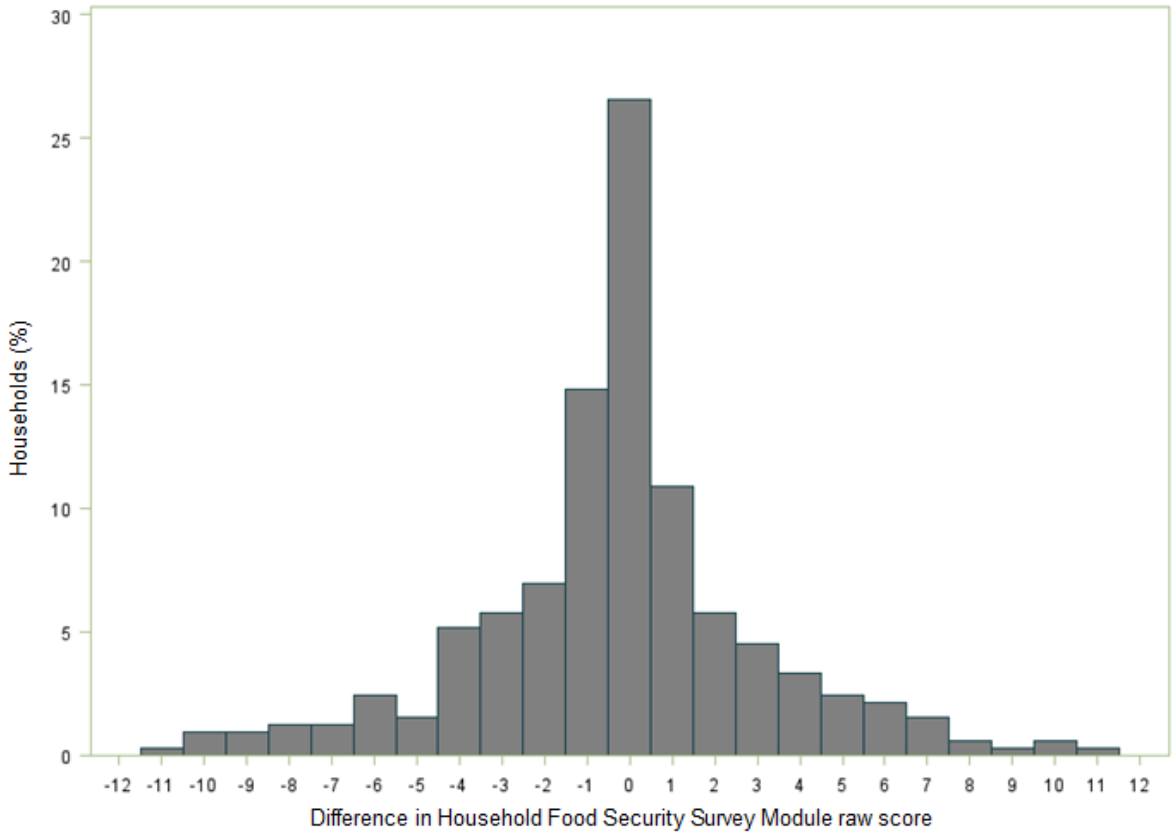
Table 4.4 Gain of fulltime employment and gain of part-time employment over time to follow-up in relation to baseline household characteristics (n=331)[1].

	Gained fulltime work, *%*	AOR (95% CI)	Gained part-time work, *%*	AOR (95% CI)
Adults living in household, *n*				
1	9.5	0.44 (0.19-0.998)	7.7	0.64 (0.23-1.80)
2	15.8	Reference	8.3	Reference
≥3	17.2	1.12 (0.34-3.67)	20.7	4.02 (1.20-13.45)
Children living in household, *n*				
1	11.4	0.67 (0.29-1.58)	7.3	0.93 (0.33- 2.59)
2	10.4	0.73 (0.30-1.77)	11.3	1.44 (0.54-3.85)
≥3	16.7	Reference	8.8	Reference
Respondent education				
Less than high school	9.6	0.42 (0.15-1.17)	9.6	2.43 (0.67- 8.80)
Completed high school or GED	8.6	0.38 (0.16-0.91)	14.5	4.61 (1.56-13.59)
Post-secondary	17.7	Reference	4.3	Reference
Years since immigrated				
<10	12.9	Reference	7.5	Reference
≥10	12.0	1.25 (0.52-2.96)	10.8	1.08 (0.40-2.94)
Born in Canada	14.1	2.39 (0.80-7.20)	7.0	0.71 (0.19-2.64)
Highest work status				
None	14.7	7.32 (2.76-19.38)	11.2	1.36 (0.45-4.12)
Part-time	20.8	6.71 (2.35-19.20)	2.1	0.13 (0.01-1.24)
Full-time	7.9	Reference	9.3	Reference
Received welfare				
No	15.5	Reference	9.0	Reference
Yes	8.4	0.27 (0.11-0.66)	9.2	1.05 (0.37-2.96)
Received disability support				
No	13.2	Reference	8.2	Reference
Yes	7.4	0.27 (0.05-1.33)	18.5	2.13 (0.62-7.35)

[1] Data are from logistic regression models adjusted for all variables in table.



Supplemental Figure 4.1 Participant flow diagram (November 2005- January 2008).



Supplemental Figure 4.2 Distribution of difference scores between baseline and follow-up responses to the Household Food Security Survey Module in the longitudinal study population (n=331).

5 STUDY 2: WHAT DOES INCREASING SEVERITY OF FOOD INSECURITY INDICATE FOR FOOD INSECURE FAMILIES?

Reproduced from: Loopstra, R., Tarasuk, V. What does increasing severity of food insecurity indicate for food insecure families? Relationships between severity of food insecurity and indicators of material hardship and constrained food purchasing. Journal of Hunger and Environmental Nutrition. 2013. 8 (3): 337-349.

ABSTRACT

Understanding how increasing severity of food insecurity relates to other measures of material hardship and food purchasing is important for understanding the experience and its associated consequences. Data from a study of 501 low income families in Toronto, which included food security measured by the Household Food Security Survey Module (HFSSM) and questions about material hardships and food purchasing constraint, were used to examine how odds of experiencing hardships were related to severity of food insecurity. Differences between fully food secure families and marginally food insecure families were also examined. The odds of experiencing rent and bill hardships, giving up services, pawning possessions, and constrained purchasing of milk, vegetables, and fruit, increased along the continuum of severity of food insecurity. In comparison to fully food secure families, marginally food insecure families had significantly higher odds of experiencing bill and rent hardships and having given up household services. The increasing burden of other hardships with greater severity highlights the increasing vulnerability of household circumstances, which has implications for understanding consequences of food insecurity and interventions aimed at ameliorating its effects.

KEY WORDS: food security, low income, material hardship, dietary quality

5.1. Introduction

Household food insecurity, as it is operationalized by measurement through the Household Food Security Survey Module (HFSSM), is defined as "the uncertainty and insufficiency of food availability and access that are limited by resource constraints, and the worry or anxiety and hunger that may result from it." [3] The HFSSM is used to monitor household food insecurity in Canada and the United States. It consists of 18 questions referencing the past 12 months and asks the respondent to affirm whether he/she or other household members experienced the conditions described, which range in severity from experiences of anxiety that food will run out before household members have money to buy more, to modifying amount of food consumed, to experiencing hunger, and at greatest extremes, going whole days without eating. The ordering of the questions reflects the conceptualization of food insecurity as a continuum of increasingly severe circumstances [20] that emerged from qualitative studies with food insecure families [4]. One of the strengths of the scale is its ability to distinguish between different levels of severity of household food insecurity based on the number of experiences affirmed [14], but there has been limited exploration of this feature in the literature on household food insecurity [18, 181].

The HFSSM has been widely taken up in research, where food insecurity has been studied in relation to numerous health conditions and child development measures. As noted by Gundersen, Kreider, and Pepper [18], many studies that have examined potential causes or consequences of food insecurity have used a dichotomous classification of food insecurity, where a threshold based on the number of affirmative responses is used to designate a household as food insecure or not. These classifications presume that the experience of food insecurity as it relates to the predictor or outcome variables of interest is equivalent within these groups, potentially masking important differences between households that relate to where they are located on the food insecurity continuum. There is a growing body of literature that indicates that the prevalence of health conditions may increase with severity of food insecurity. Compared to fully food secure individuals, marginal food insecurity has been associated with increased indications of poor psychosocial health and depression[22, 26] , metabolic syndrome [24], and poor health among children [163], and in some studies, the prevalence of health conditions has been shown to increase further among individuals in more severe categories of food insecurity [22, 25, 63, 161].

While some studies have attributed differences in health outcomes among food insecure individuals to dietary compromise [24, 25] or greater stress burden [25, 63], another possible explanation of the rising health burden with severity of food insecurity is that it could reflect additional experiences of household hardships, such as poor living conditions and housing insecurity, which could independently negatively impact health. Studies have examined the continuous food insecurity scale in relation to markers of financial vulnerability such as income and savings [95, 96, 166], but to our knowledge no studies have examined whether increasing severity of food insecurity signals compromise in other domains of hardship.

The objective of this study was to examine what severity of food insecurity suggests for other indicators of household well-being. First, we examine if the probability of experiencing household hardships and constrained food purchasing rises with severity of food insecurity as denoted by the number of affirmative responses on the HFSSM. Second, we examine differences between marginally food secure and fully food secure households in relation to these measures, adding to the emerging literature exploring differences between these groups [15, 16].

5.2. Methods

5.2.1. Study Population

The data for this analysis came from a study of low income families in Toronto originally designed to examine relationships of neighbourhood characteristics and subsidized housing with household food insecurity [36, 69, 101]. Details on the study sampling strategy and recruitment rates have been previously published [101, 182]. The overall target sample size was 500 families [158]. Survey interviewers went door-to-door in 12 of 23 randomly selected high poverty census tracts in Toronto, specifically targeting pre-identified buildings and dwellings that contained subsidized housing units, and market rent buildings and dwellings within close proximity of these. Eligibility criteria included families with children 18 years of age or less, tenancy in a rented dwelling, gross household incomes at or below the Statistics Canada mid-income adequacy cut-off (≤ $29 999, $39 999, or $59 999 for household of 1 or 2 people, 3 or 4 people, or 5+ people, respectively), and sufficient fluency in English to complete an interviewer-administered oral questionnaire. Recruitment continued until approximately equal numbers of families were recruited from each neighbourhood and from both subsidized and market-rental accommodation.

A total of 501 families were recruited into the sample, reflecting a recruitment rate of 62% of eligible families/families who refused screening [101]. Closer examination of household incomes deemed 16 of the 501 families ineligible to participate because incomes exceeded eligibility criteria. Thus, 485 families make up the sample.

5.2.2. Variables

Information on current household characteristics was collected by an interviewer-administered questionnaire. Families were asked to report income from all household sources and demographic characteristics of household members. Household income was adjusted for household size by comparing income to Statistics Canada Low Income Cut-Off (LICO) values for 2006, which are household-size adjusted [172].

Household food insecurity was measured using the HFSSM, modified to include only 17 of the 18 items because of concerns expressed by a research partner that report of a child going a whole day without eating would warrant report to child authorities. Households with no affirmative responses were considered fully food secure [15]. Cut-points used by the USDA were used to denote a marginal food insecurity category (i.e. 1-2 affirmative responses) [167]. The aggregate number of affirmative responses to questions on HFFSM was used as a continuous, linear variable ranging in value from 1 to 17 and indicates increasing severity of food insecurity [14].

Household hardship indicators were self-reported. Indicators of rent hardship were: 1) current rent arrears or report of delaying a rent payment in the past 12 months to free up money for food; or 2) report of borrowing money from friends or relatives in order to pay rent in the past 12 months. Expense hardships were indicated by report of current bill arrears for utilities, telephone, television, or Internet, and/or delayed bill payments in the past 12 months to free up money for food. Poor living conditions were indicated by report of housing being in need of major repair (e.g. structural decay) or minor repair (e.g. broken or malfunctioning fixtures) beyond regular maintenance. Indicators of material deprivation, meaning having to go without services or possessions, were: 1) report of giving up telephone, television or internet services to free up money for food in the past 12 months; or 2) selling or pawning personal possessions in the past 12 months so that there would be money for food.

Inadequacies in household food supply were reported inability to usually buy the amount of milk, amount of vegetables, or amount of fruit needed to meet the needs of household members. Focus on these food groups was informed by research documenting significantly lower intakes of them by food insecure households in national survey data [30].

5.2.3. Analyses

SAS version 9.2 (SAS Institute, Cary, NC) was used to carry out logistic regression analyses that examined the odds of household hardships and food supply inadequacies associated with level of severity of food insecurity as indicated by the raw score (i.e. number of affirmative responses) on the HFSSM. The number of affirmative responses on the HFSSM can be used as a linear, continuous variable, but the zero value (i.e. no questions are answered affirmatively) is not part of the scale. A score of zero is undefined, as it cannot be known how food secure a household is relative to households that answered questions affirmatively and the distance between the 0 and 1 is not consistent with the interval differences between raw scale scores [14]. Researchers advise not treating scores of 0 as continuous with the raw scores [96]. Thus, logistic regression analyses using the continuous raw score were restricted to households that had at least one affirmative response on the HFFSM. The predictor variable was the continuous number of affirmative responses, and the odds ratios reported are for a two unit increase in number of affirmative responses. For ease of presentation in the table, the prevalence of hardships by severity of food insecurity is displayed for increments of two affirmative responses, except for households with 15, 16, or 17 affirmatives, which are grouped together due to the few households at the high end of the scale.

The odds of hardship and food supply inadequacies were also specifically examined for the marginally food insecure category compared to the fully food secure category, thus allowing for the difference in prevalence of hardships over the food insecure/food secure threshold to be examined. (Differences between Health Canada's categorical classifications of moderate and severe food insecurity and food security were already examined for some of the measures in this study population [101]).

Odds ratios are presented in tables before and after adjustment for LICO-adjusted income. All models were adjusted for income to test the independence of severity of food insecurity as an indicator of other hardships independent of a conventional measure of low income in Canada.

5.3. Results

Table 5.1 shows characteristics of families in the baseline analytic sample. Most families had incomes below the after-tax Low Income Cut-Off [172] and were 'working poor', as more than 50% had their main source of income from employment in the past year. Almost four in five households in the study population had experienced food insecurity in the past 12 months.

The prevalence of experiences of hardship and inadequate food supplies are presented by severity of food insecurity in **Table 5.2**. Among households who answered 13 or more questions affirmatively, the prevalence of hardships and reported inadequacies in food supply was greater than 50% for most indicators, and specifically, almost all households reported delaying bill payments and living in a home in need of repair. In general, the results of the logistic regression analyses showed that the probability of households experiencing other household hardships and inadequacies in their food supply rose with incremental increases in severity of food insecurity. After adjusting for income, for every two more responses answered affirmatively on the HFSSM, the odds of borrowing for rent rose by 19%, the odds of delaying rent payments rose by 33%, the odds of delaying bill payments rose by 46%, and the odds of living in a home in need of repair rose by 15%. The odds of a household giving up services rose by 23% for every two more responses answered affirmatively and odds of a household having pawned or sold possessions rose by 46%. The odds of reporting an adequate supply of milk, vegetables, and fruit was rose by 30-50% for every two more responses answered affirmatively.

In comparison to fully food secure families, marginally food insecure families were more vulnerable to a number of hardships (**Table 5.3**). They were more likely to have borrowed money for rent and to have delayed bill payments. They were also significantly more likely to have reported cancelling services in order to free up money for food. The only food group reported to be inadequate at a significantly higher rate among marginally food insecure families was fruit.

5.4. Discussion

This study examines how household hardships and reports of inadequate food supplies relate to severity of food insecurity, enhancing understanding of what severity of food insecurity indicates for household circumstances. We observed that marginal food insecurity is indicative of greater vulnerability to rent and bill hardship as well as with reported need to give up services to free up money for food, which supports recent arguments that households in this category be considered separately from households in the fully food secure category [15]. Second, we observed that odds of household hardship and food inadequacies increased in a linear manner with the food insecurity scale. This finding adds to the conceptualization of food insecurity as a continuum of increasingly difficult household circumstances, providing further validation of the measurement scale. The differential risk of other household hardships and reported inadequacies in the food supply observed along the scale also has implications for understanding the experience of food insecurity, as simple categorizations mask important differences between households on the scale.

Few studies have explicitly examined the joint frequency of household food insecurity and other measures of household hardship [71-73]. Two of these studies used a dichotomous measure based on sampling of questions from the HFSSM or food sufficiency question, and one study decomposed food insecurity into USDA categorical designations of any food insecurity and food insecurity with hunger. The overall findings from these studies are consistent with findings from the present study, highlighting that food insecure households are at greater risk of other types of hardships than the food secure population. These studies also highlighted that while hardships occurred at higher frequency among food insecure households, the experience of food insecurity did not necessarily mean hardships were experienced in other domains (i.e. prevalence of hardships among food insecure families generally below 50%) [71-73]. Newly observed in this study, however, is that as severity of food insecurity increases, the likelihood of also experiencing other hardships increases, where in the highest end of food insecurity spectrum, hardship in other domains appears to inevitably accompany the experience.

Multiple hardships among food insecure households likely have additional consequences for their health and well-being. As laid out theoretical frameworks by authors that have examined multiple indicators of material hardships in relation to health outcomes of children [39, 75], different material hardships may have independent associations with health outcomes depending on how they impact material health-promoting resources, but material hardships can also have

cumulative impacts on generalized indicators of well-being and socioemotional health through their impact on stress within households [26, 39, 73, 75, 76, 171]. Therefore, observations of an increased burden of health outcomes among households experiencing greater levels of severity of food insecurity could be partially attributable to experiences of other hardships. While there is emerging evidence of distinct and cumulative effects of different types of hardships on the health and development of children [39, 74-76], taking into account severity of food insecurity may be important for understanding these relationships. Research is also needed among adults.

The conjoint experience of food insecurity with other hardships has implications for food insecurity interventions focused solely on food provisioning. Poverty has been recognized as a key determinant of household food insecurity in Canada, but responses to food insecurity have concentrated at the community-level and have focused on food provisioning in the form of charitable food distribution and community food programs such as bulk purchasing programs, community gardens, and community kitchens [140]. While there is little evidence that use of these programs prevents food insecurity [183, 184], programs that solely focus on food can also do little to address the multiple manifestations of poverty that food insecure families are at greater risk of experiencing. In recognition of the multitude of needs among food program clients, there are examples of organizations that provide both food assistance alongside referral services or services on site for government income assistance, employment, dental and health, rent and utility assistance, and other government and community-based programs [185], but there is a need for systematic evaluation of these efforts in relation to material hardship measures. These activities can depend on volunteers, which must limit their capacity and scope, but even on a small scale, the potential for referrals to help families transition out of the material hardships hinges on the availability of adequate, effective, accessible community, municipal, provincial, and federal programs to which clients can be referred. The ability of the current patchwork nature of programs aimed at addressing material needs of low income people lacks comprehensive evaluation to assess how well they function as a whole to address the material well-being of Canadians. Of note is that measures of material hardship have rarely been considered in evaluation of poverty reduction strategies in Canada.

This study was limited by the few measures of other types of hardship captured in the questionnaire. Information on other indicators such as utility shut-offs and medical hardships would have enhanced the examination of the intersection between food insecurity and other indicators. Further, all measures were self-reported, but this is consistent with measures used in other studies to date. Finally, the generalizability of these findings to other low income, food insecure families in Canada is unknown; all families in this sample were urban, Toronto families, half of whom lived in subsidized housing.

The vulnerability of food insecure families to multiple hardships was highlighted in this study, and this risk increased linearly along the food insecurity continuum. This research supports previous recommendations that the full spectrum of the food insecurity scale be utilized when studying both causes and consequences of food insecurity. Importantly, this work suggests that interventions to address the needs of food insecure households must also address the material deprivation households experience in other domains.

Table 5.1 Baseline characteristics of study population (n=485).

Baseline Characteristics	n	%
Live in subsidized housing		
No	237	48.9
Yes	248	51.1
Single mother household		
No	226	46.6
Yes	259	53.4
Number of children, %		
1	177	36.5
2	165	34.0
3	92	19.0
4+	51	10.5
Income below after-tax low income cut-off		
No	85	17.5
Yes	400	82.5
Highest source of income in past 12 months		
Employment	262	54.0
Welfare	111	22.9
Disability Support	22	4.5
Unemployment Insurance/Workers Compensation	25	5.2
Other government transfers	39	8.0
Senior Pension/Other sources	26	5.3
Household Food Security		
Number of Affirmative Responses on HFFSM	Median: 4	IQR: 1-8
USDA-coded food security status, %		
Fully food secure (0 affirmatives)	106	21.9
Marginally food insecure (1-2 affirmatives)	85	17.5
Low food security (3-7 affirmatives)	146	30.1
Very low food insecurity (8+ affirmatives)	148	30.5
Indicators of Household Hardship in Past 12 months		
Delayed rent payment/current arrears		
No	359	74.0
Yes	126	26.0
Borrowed money for rent		
No	382	78.8
Yes	103	21.2
Delayed bill payment/current arrears		
No	206	42.5
Yes	279	57.5
House/apartment in need of repair		

Regular maintenance	191	39.4
Minor or major repair	294	60.6
Gave up telephone, TV, or Internet services		
No	335	69.1
Yes	150	30.9
Sold or pawned possessions		
No	423	87.2
Yes	62	12.8
Inadequate milk supply		
No	384	79.8
Yes	97	20.2
Inadequate vegetable supply		
No	360	74.2
Yes	125	25.8
Inadequate fruit supply		
No	30	63.8
Yes	175	36.2

Table 5.2 Prevalence of household hardships in past 12 months and inadequate food supplies by severity of household food insecurity[a].

	Number of Affirmative Responses on HFSSM									
	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-17	OR (95% CI)	AOR (95% CI)
n	85	73	49	54	48	34	17	19	379	379
Borrowed for rent, %	14.1	26	20.4	25.9	37.5	35.3	23.5	47.4	1.20 (1.08-1.34)	1.19 (1.07-1.33)
Delayed rent payment/current arrears, %	11.8	28.8	30.6	35.2	35.4	41.2	52.9	57.9	1.31 (1.18-1.46)	1.33 (1.19-1.49)
Delayed bill payments/current arrears, %	42.4	65.8	59.2	79.6	79.2	76.5	88.2	94.7	1.44 (1.27-1.63)	1.46 (1.29-1.66)
Home in need of repair, %	52.9	67.1	63.3	55.6	60.4	67.7	76.5	89.5	1.14 (1.03-1.27)	1.15 (1.03-1.27)
Gave-up services, %	21.2	46.6	30.6	29.6	43.8	52.9	47.1	79.0	1.25 (1.13-1.38)	1.23 (1.10-1.36)
Pawned/sold possessions, %	4.7	11	10.2	14.8	14.6	44.1	23.5	52.6	1.50 (1.31-1.72)	1.46 (1.27-1.68)
Inadequate milk supply, %	3.5	15.3	22.5	32.1	41.7	48.5	62.5	47.4	1.55 (1.37-1.76)	1.52 (1.34-1.72)
Inadequate vegetable supply, %	7.1	24.7	42.9	37	35.4	50	64.7	57.9	1.42 (1.27-1.59)	1.39 (1.24-1.56)
Inadequate fruit supply, %	16.5	30.1	53.1	57.4	59.6	64.7	76.5	84.2	1.54 (1.37-1.73)	1.50 (1.33-1.69)

[a] Odds ratios are for 2-unit increase in number of affirmative responses. Adjusted Odds Ratio is adjusted for LICO-adjusted household income.

Table 5.3 Prevalence of hardships in past 12 months among fully food secure and marginally food insecure families [a].

	Fully Food Secure	Marginally Food Insecure	OR (95% CI)	AOR (95% CI)
n	106	85	191	191
Borrowed for rent, %	4.7	14.1	3.32 (1.12-9.84)	3.31 (1.11-9.86)
Delayed rent payment/current arrears, %	9.4	11.8	NS	NS
Delayed bill payments/current arrears, %	24.5	42.4	2.26 (1.22-4.19)	2.25 (1.21-4.18)
Home in need of minor or major repair, %	53.8	52.9	NS	NS
Gave-up services, %	4.7	21.2	5.43 (1.92- 15.32)	5.41 (1.92-15.28)
Pawned/sold possessions, %	0.9	4.7	NS	NS
Inadequate milk supply, %	0	3.5	NS	NS
Inadequate vegetable supply, %	3.8	7.1	NS	NS
Inadequate fruit supply, %	2.8	16.5	6.77 (1.88- 24.42)	6.77 (1.87-24.52)

[a] Odds ratios are for marginal group in comparison to fully food secure. Adjusted Odds Ratio is adjusted for LICO-adjusted household income.. AOR is for marginal group in comparison to fully food secure.

6 STUDY 3: FAMILY STATUS AND DIAGNOSED MOOD DISORDERS AFFECT THE OBSERVED ASSOCIATION BETWEEN OBESITY AND FOOD INSECURITY AMONG WOMEN.

ABSTRACT

Studies have shown a positive association between food insecurity and obesity for women but not men. There has been little examination of this gender pattern. The association could be due to a confounding effect of diagnoses of mood disorders, which are strongly associated with both food insecurity and obesity among women. The association may also be limited to women who are partners or mothers. Because caregiving and food provisioning falls to women in these roles, potential outcomes of food insecurity, namely qualitative food compromises and stress, could be exacerbated, which could contribute to obesity. This study investigated these proposed explanations. Data from men and women of ages 25 to 55 in the Canadian Community Health Survey, 2009-11 were used. Adult food insecurity was classified into a 4-level severity variable. All measures were self-reported including obesity derived from height and weight, physician diagnosis of mood disorders, life stress, and frequency of fruit and vegetable consumption, used to indicate dietary quality. Moderate and severe food insecurity were not significantly associated with obesity among men. The patterning of association by severity of food insecurity differed by whether women were single, partnered, single mothers, or partnered mothers. There was little evidence that differences were due to stress or food compromises. Severe food insecurity was initially associated with obesity among single women and partnered women, but adjustment for mood disorders attenuated associations to non-significance. After multivariate adjustment, no association was observed for single mothers, but partnered mothers who were severely food insecure had the highest odds of obesity. Among both partnered mothers and single women robust associations between moderate food insecurity and obesity were also observed. The findings suggest mood disorders may be important to consider in discussion of association between food insecurity and obesity and highlight that food insecurity does not uniformly associate with obesity among women.

6.1. Background

Household food insecurity, is a potent measure of financial hardship, capturing an experience where households do not have sufficient finances to ensure adequate access to food [3]. Intrinsic to the concept, is possible, but not necessary, qualitative or quantitative compromises in dietary intake, feelings of anxiety and worry, feelings of social isolation or exclusion, and engaging in resource augmentation strategies in order to maintain the household food supply [4, 6, 7, 11, 53]. Thus, food insecurity could lead to compromised physical and mental health because it is a chronic stressor, an isolating experience, or because it compromises dietary intakes.

Numerous observational studies, mostly based in the United States, have examined the co-occurrence of obesity and household food insecurity. Recent reviews [58, 62], and additional studies since their publication [60, 186, 187], have confirmed that there is fairly consistent evidence food insecure women have a higher burden of obesity or higher BMI than food secure women, but that there is not an association among men. Suggested explanations for a relationship between obesity and food insecurity have mostly focused on a pathway through food intake, where low availability of funds for food is thought to promote consumption of low cost, high-energy foods, possibly leading to overconsumption of calories [e.g. 31, 55, 62, 187, 188]. There is a lack of consistent evidence to support the notion that food insecurity associates with higher energy intakes or higher dietary energy-density [30, 32], but this hypothesis also does not explain why food insecurity would associate with obesity in women and not men, as presumably dietary choices would be similarly restricted for both food insecure men and women.

In this study, we consider two proposed explanations for the gender difference [60, 189]. First, we consider whether a disproportionate burden of mood disorders for food insecure women could underlie the association with obesity. Mood disorders are more prevalent among women than men [190, 191], and these conditions have been found to be highly associated with food insecurity in studies of women [22, 40, 51, 52, 192, 193]. Though there has been some evidence that food insecurity and mood disorders are also associated among men [64], other population data from Canada [23] and the United States [189] have suggested that relationships may be stronger among women than men. Importantly, mood disorders predict obesity [194], and cross-sectional associations between obesity and depression are stronger among women than men [195].

Second, we consider whether food insecurity could lead to more severe dietary compromise and stress for some women, specifically those in familial situations [55, 60, 186]. Others have proposed that because women continue to bear more responsibility for childcare and food provisioning within households [60], they could be more susceptible to negative consequences of food insecurity. Researchers [60, 186] draw on qualitative evidence from mothers who report compromising their own diets in attempt to protect children from food insecurity to support this hypothesis [4, 6, 196] and have suggested that the positive association between food insecurity and higher body weight could be limited to women with children [60, 186]. Tests of this hypothesis have found contradictory results, however [60, 186]. Others have proposed a similar mechanism to explain an observation in the NHANES study population, where food insecurity was associated with obesity among women who were married, common-law or widowed, but not among women who were single or divorced [197]. These authors attributed these findings to the possibility that women may compromise their diets for their partners and that they also may derive less social support from marriage arrangements, especially in times of stress [198].

The idea that the food insecurity-obesity relationship may be limited to women with family members rests on the premise that food insecurity could more strongly associate with compromises in dietary quality or stress among these women than other food insecure women. However, we know of no studies that have examined the premise that food insecurity may associate differently with these outcomes depending on the family status of women.

The aims of this study were threefold. First, we examine the consistency of a gender pattern between food insecurity and obesity in the Canadian adult population. Second, we explore two hypotheses, specifically, whether diagnoses of mood disorder may account for associations among women and whether the association between food insecurity and obesity may differ by parenthood and/or partnership. Third, we examine whether potential consequences of food insecurity, namely, stress, mood disorders, and compromised fruit/vegetable intake, which are also risk factors for obesity, are more strongly associated with food insecurity among women with family members in comparison to other food insecure women and assess the potential mediating role of these variables in observed food insecurity-obesity associations.

6.2. Methods

Study Population

Data are from the Canadian Community Health Survey (CCHS), an annual cross-sectional survey of Canadians aged 12 and over. The survey is designed to be representative of 98% of this population, exclusive of all Aboriginal Canadians living on First Nations reserves or Crown lands, individuals living in institutions or who do not have a residence, residents of some remote regions, and individuals who are full-time members of the Canadian Forces. Full details of the sampling strategy are available from Statistics Canada [199].

To allow for sufficient sample sizes for stratified groups of the population, specifically by partnership and parenthood status, as well as examination of different levels of severity of food insecurity, data from the three most recently available CCHS survey cycles (2009, 2010, and 2011) were combined. Two provinces elected not to include the Household Food Security Survey Module (HFFSM) in 2009/10, so survey participants from these provinces were excluded (New Brunswick and Prince Edward Island). Adults in this exclusion group accounted for <4% of the study population of interest. Because patterns by parenthood and partnership were of key interest in this study, the study population was limited to adults in an age range where the greatest distribution of childbirth and childrearing occurs, specifically 25-55 years of age. The rationale for this limitation was that comparisons between individuals with and without children will be limited to more comparable groups with respect to age, education level, and independence. With regard to the latter, individuals who were living with parents were excluded from the sample to increase likelihood that only adults who are most likely to manage household resources were included. Respondents whose relationships to others in the household could not be ascertained were also excluded, as were pregnant and breastfeeding women.

Survey respondents meeting the inclusion criteria resulted in a sample size of 66292 from the combined datasets. The final sample was reduced to 62079 individuals with full information for household food security status and other key sociodemographic and health variables of interest.

Variables

BMI is derived from self-reported heights and body weights in the CCHS. To gain a sense of how body weight pattern varies across food insecurity in the population, we examined the unadjusted distribution underweight, normal weight, overweight, and obesity, defined as <18.5, <25, <30, and 30+ kg/m^2 respectively. For logistic regression analyses, the outcome variable of

interest was obesity, as this was the weight category that showed the greatest variation by food insecurity status in the population.

Food insecurity classification was derived from the 18-item HFSSM regularly used to monitor food insecurity in the United States and Canada [14]. Classification of food insecurity was limited to the ten questions in the module that do not reference children, as this allows for greater comparability of food insecurity status between households with and without children [3]. The ranking of severity of food insecurity was based on USDA cut-offs: fully food secure (0 affirmatives), marginal (1-2 affirmatives), moderate (3-5 affirmatives), and severe (6+ affirmatives). Severity of food insecurity is important to consider because it could relate differently to potential consequences food insecurity in terms of impact on dietary intake and negative psychological consequences. Households that are marginally food insecure have given indication of concern or experiences of shortage in household food supplies, but are unlikely to have indicated qualitative or quantitative changes to their food intake, whereas moderate food insecurity indicates that these changes have occurred [200]. Severe food insecurity means that respondents affirmed multiple experiences of altered eating patterns and reduced food intake [200].

Designations of partnership and parenthood were made from a variable that described the survey respondent's relationship to others currently living in his/her household. Thus, partnership refers to respondents currently living with a married or common-law partner, and parenthood refers to respondents currently living with children. Combining these designations, a four-level variable was made specifying single without children, partnered without children, single with children, and partnered with children. Among women, these groups are specified as single, partnered, single mothers, and partnered mothers.

Report of physician diagnosis of a mood disorder (e.g. depression, bipolar disorder, mania or dysthymia) came from the CCHS module on long-term (6+ months) physician-diagnosed chronic health conditions.

Reports of high levels of life stress were subjective, coming from responses to a question that asked respondents to rank their days as extremely stressful, quite a bit stressful, a bit stressful, not really stressful, or not at all stressful; extremely stressful and quite a bit stressful were grouped into one category.

Fruit and vegetable consumption is the only dietary information routinely collected in the CCHS. Respondents report how frequently they eat fruit, greens salad, potatoes (excluding fried or potato chips), carrots, and other vegetables. These responses were summed to give an estimate of frequency of consumption. This assessment has been shown to provide an adequate estimate of relative fruit and vegetable consumption in a population, though it underestimates amount of fruit and vegetable consumption [201]. While it does not provide a fulsome picture of dietary quality or dietary intake pattern for individuals, fruit and vegetable consumption is closely associated with dietary quality scores, and thus gives indication of the nature of respondents' diet and dietary compromise [202]. Quintiles of intake based on intakes among men and women were used in the table of descriptive characteristics (Table 8.1), but for stratified analyses by gender, quintile category was based on the gender-specific distribution of intake.

Sociodemographic variables that vary both with food insecurity status and measures of body weight [64, 87, 203, 204] were included in the models. In the case of socioeconomic status and obesity, gender differences in associations have consistently been observed in high income countries [205], and thus could underlie gender differences in association between food insecurity and obesity. Variables included in models were recent immigration status, Aboriginal status, province and territory of residence, age and age-squared (to account for the non-linear relationship between age and obesity), and socioeconomic status. Household education level was a five level variable denoting less than secondary school, a secondary school diploma, some post-secondary education, completion of a college or technical trade degree, or completion of a university degree. Because only approximately 70% of respondents report their household income, imputed income values provided by Statistics Canada were used for missing values [199]. Values were divided by the square root of household size according to the method used by the OECD, then quintiles for survey year were constructed before any study population exclusions were made. Thus, households are in ranked income quintiles based on the income distribution in the study population for their survey year.

Statistical Analyses

All analyses were conducted in the Toronto Statistics Canada Research Data Centre with Master CCHS files and were adjusted for survey design through use of 500 bootstrap weights using survey commands in SAS version 9.3 (SAS Institute, Cary, NC). Normalized population weights

were used so that population prevalence rates and central tendency measures were representative of the population distribution.

In a preliminary analysis, we tested the interaction between gender and food insecurity in relation to obesity and also confirmed a number of gender interactions with other sociodemographic correlates of obesity consistent with other literature from Canada [203]. Based on these results, the population was stratified by gender to allow for closer examination of patterns of association among women. The effect of step-wise addition of mood disorders to the model was examined, followed by adding the interaction of parenthood/partnership status with food insecurity to models. The population of women was then stratified into parent/partner groups based on the significance of the interaction term. Nested logistic regression models were used to examine changes in the estimates of association between food insecurity and obesity among stratified groups of women, allowing the step-wise effects of adding mood disorders, stress, and fruit and vegetable consumption to the models to be examined.

In separate analyses, the premise that mood disorders, stress, and/or compromised fruit and vegetable consumption could be differently associated among women with family members and explain a disproportionate burden of obesity for some women and not others, was examined by regressing these variables on household food insecurity. Fruit and vegetable consumption was modeled as a continuous variable in these models. These analyses are presented for stratified groups of women, but in analyses conducted among all women, the interactions between family status and food insecurity in relation to these outcomes were tested.

6.3. Results

Characteristics of the population are presented in **Table 6.1**. The distribution of body weight classification differed between genders, with men being more likely to be overweight or obese and more women falling into the normal weight category. Household food insecurity was more prevalent and more severe among women. Women had a higher prevalence of diagnosed depression, were more likely to have rated their life stress as quite a bit or extremely stressful, but had higher fruit and vegetable consumption.

In a logistic regression model constructed to test if there was an interaction between gender and food insecurity in relation to obesity, there was a significant interaction between gender and food

insecurity (Wald Chi square: 8.6; p= 0.0345). In unadjusted models, all levels of food insecurity were associated with significantly higher odds of obesity among women, but odds ratios were not significant at any level of severity for men (**Supplementary Table 6.1**). Adjustment for sociodemographic characteristics reduced associations among women, but strengthened associations among men, resulting in a borderline significant association for marginal food insecurity among men. Adding diagnoses of mood disorders to the regression models after adjustment for covariates attenuated odds ratios between food insecurity and obesity by 10 and 16%, respectively, for moderate and severe food insecurity among women, but associations remained significant. When an interaction term between parenthood-partnership status with food insecurity was added to the model, it was significant at a level of $p<0.1$ (Wald Chi square: 16.2; p=0.06), so analyses were carried out in stratified groups of women. Parent-partnership status did not interact with food insecurity in relation to obesity among men (Wald Chi square: 7.0; p=0.63), and from here forward, analyses focus on associations among women. Descriptive statistics for women stratified by parenthood and partnership status with respect to food insecurity and obesity are available in **Supplementary Table 6.2**.

Among women, the patterning of obesity by severity of food insecurity differed by parenthood and partnership status (**Figure 6.1**). Contrary to the hypothesis that associations would be limited to women with family members, all levels of food insecurity were associated with obesity among single women in minimally adjusted models. This was not the case when models were adjusted for mood disorders, however, which attenuated the association for severe food insecurity to non-significance. The association between moderate food insecurity and obesity was robust in all models.

Among partnered women, there was little evidence that food insecurity associated with obesity. Only severe food insecurity was associated with obesity after sociodemographic characteristics were adjusted for (**Table 6.2**), and this association was attenuated to only borderline significance after mood disorders were adjusted for.

The pattern was different for single mothers, where there was not a relationship between moderate and severe levels of food insecurity with obesity, but marginal food insecurity was associated with increased odds of being obese. This relationship was not explained by diagnosis of mood disorder (Table 6.2). In contrast, among partnered mothers, marginal food insecurity

was not associated with obesity, but obesity was significantly elevated among women who were moderately and severely food insecure in comparison to food secure women in this group.

In Models 3 and 4 (Table 6.2), the potential for stress and fruit/vegetable consumption to be mediating observed associations was examined. Adjustment for stress attenuated the association between severe food insecurity and obesity among partnered women, while among single mothers, adjustment for fruit and vegetable consumption attenuated the association between marginal food insecurity and obesity. However, there was no evidence that these factors explained the strong associations observed between moderate and severe food insecurity and obesity among partnered mothers, or between moderate food insecurity and obesity among single women.

Moreover, the premise that stronger associations between food insecurity and mood disorders, stress and dietary compromise could explain a disproportionate risk of obesity for some women and not others was not supported. Regardless of family status, there was evidence of lower fruit and vegetable intake (**Table 6.3**) and elevated stress and mood disorder (**Table 6.4**) by food insecurity, suggesting that women with family members were no more vulnerable to these potential outcomes of food insecurity than women who were not living with family members. Interactions between food insecurity and parenthood/partnership status among women were not significant for any of these outcomes.

6.4. Discussion

After adjustment for sociodemographic covariates, there was evidence that marginal food insecurity was associated with elevated odds of obesity among both men and women, but a strong gender difference in association between moderate and severe food insecurity and obesity was evident, with no association among men and strong associations among women. These associations were not consistent across parenthood and partnership status, however, and for some women, were explained by presence of mood disorders. Contrary to the hypothesis that associations between food insecurity and obesity would be driven by women with children and/or partners, we observed associations among single women and little evidence of association among single mothers or partnered women. We did observe that for women who were both parents and partners, moderate and severe food insecurity were strongly associated with obesity.

Stress and fruit and vegetable consumption did not explain these associations, and contrary to the hypothesis that food insecurity may mean greater compromise to diets and greater stress burden for women with family members, these outcomes were fairly ubiquitous across food insecurity for all women. This leaves open a question as to what could uniquely explain the extraordinarily high prevalence of obesity among women with children and partners.

As a measure of material deprivation, household food insecurity can lead to many possible, but not necessary, negative outcomes in multiple domains of health and well-being [53]. Food insecurity does not necessarily result in chronic compromises in food intake, either quantitative or qualitative, that could cause changes in body weight (either gain or loss). Indeed, research on associations between food insecurity and dietary intakes has not indicated that food insecurity is associated with either excessive energy intake or insufficient energy intakes [30, 32]. Prospective studies that have examined change in body weight over follow-up periods of 2-3 years have also not provided evidence that food insecurity promotes body weight gain or that new experiences of food insecurity result in weight gain [59-61]. However, food insecurity marks a profound state of financial vulnerability. The experiences that lead to food insecurity could be due to disadvantages that also accumulate in risk of obesity over time. These include variables accounted for in this study, specifically, low socioeconomic status and diagnoses of mood disorders, but other possible factors are likely outstanding. The different patterning of obesity observed by severity of food insecurity across women of different household structures indicates a need to better understand if these classifications indicate different experiences for women with respect to chronicity and severity, or other hardships that could relate to weight gain. Our reason for examining differences by parenthood and partnership status was that other authors have speculated that these roles could mean greater hardship associated with food insecurity for these women that would manifest in dietary changes or stress [55, 60]. Instead, we observed that higher stress and lower fruit and vegetable consumption were not differently associated with food insecurity for women by family status. The idea that the experience of food insecurity is intensified or manifests differently for women with children needs further examination in comparative studies, as the studies that have given rise to these hypotheses have only been conducted among mothers with children [4].

As with other studies on the relationship between food insecurity and obesity, this study is limited by the cross-sectional nature of associations. Changes in body weight are generally

incremental across the life course, whereas the food insecurity captured in annual surveys is reflective of household circumstances over the past year. The measures used to capture mood disorders and stress were limited, with the former requiring physician diagnosis, which could underestimate prevalence of these conditions, and the latter being only a simple ranking of intensity of stress that did not include reference to a length of time. The indicator of dietary quality is also limited, though fruit and vegetable intake has been closely linked to both food insecurity and obesity, and is a marker of dietary quality [202]. The limited ability to measure stress and fruit and vegetable consumption could explain the modest mediation effects observed, but associations observed with food insecurity suggest that these were capturing the intended constructs. BMI values derived from self-reports from height and weights are underestimated in the CCHS, and the underestimation of BMI is more pronounced for women [206]. This would not affect the relative differences between women of different food insecurity status, unless accuracy of reporting height and weight differs by this variable. Lastly, the possibility that gender aligns with caregiver and/or food provider roles is based on research that has highlighted the persistence of these gender patterns in Canada [207], but the interactions of these constructs with food insecurity were not able to be directly tested.

6.5. Conclusions

This study highlighted a potential confounding effect of mood disorders in the association between food insecurity and obesity for women, and also highlighted variation in associations across severity of food insecurity and parenthood and partnership status. Understanding the complexity of factors that align with food insecurity and obesity is important for informing intervention, as generalizing the experience of food insecurity into a uniform construct associated with higher body weight could lead to misplaced intervention.

Table 6.1 Study population characteristics among men and women (n=62079).

	Men (n=29108)	Women (n=32971)	P value[1]
Age, mean (sd)	41.1 (0.1)	41.2 (0.1)	0.28
Province of Residence[2], %			<0.0001
Maritime (NL, NS)	4.26	4.68	
Quebec	24.78	24.77	
Ontario	38.66	38.63	
Prairie (MB, SK, AB)	18.91	17.35	
British Columbia	13.08	14.26	
Territories (YT, NT, NU)	0.31	0.31	
Highest level of Education in Household, %			<0.0001
< High School	8.6	6.9	
High School Diploma	15.2	15	
Some post-secondary	5.9	5.7	
College Diploma/Certificate	38.2	36.2	
University Degree	32.2	36.2	
Household-size adjusted income quintile, %			<0.0001
Low	12.39	16.18	
Mid-low	15.12	16.96	
Middle	18.83	19.81	
Mid-High	24.87	23.06	
High	28.79	23.99	
Recent Immigrant, %			0.70
No	94.3	94.4	
Yes	5.7	5.6	
Identified as Aboriginal, %			0.07
No	96.82	96.43	
Yes	3.18	3.57	
Weight Classification, %			<0.0001
Underweight	0.7	3.4	
Normal Weight	36.3	55.1	
Overweight	42.3	25.4	
Obese	20.7	16.0	
Household Food Insecurity Status, %			<0.0001
Food Secure	89.9	87.2	
Marginal	5.1	6.1	
Moderate	2.7	3.6	
Severe	2.3	3.1	

Diagnosed with Mood Disorder, %			<0.0001
No	94.9	90	
Yes	5.1	10.0	
Life rated as quite a bit or extremely stressful, %			<0.0001
No	72.3	69.8	
Yes	27.7	30.2	
Quintile of fruit/vegetable intake, %			<0.0001
Missing	1.8	1.3	
≤ 2.6 servings	28.0	14.5	
≤ 3.7 servings	22.9	17.1	
≤ 4.9 servings	16.9	17.1	
≤ 6.4 servings	16.9	22.3	
> 6.4 servings	13.5	27.7	

[1] P value is for tests of difference between gender: chi-square comparison of frequencies for categorical variables and ANOVA comparison for continuous variables.
[2] NL: Newfoundland; NS: Nova Scotia; MB: Manitoba; SK: Saskatchewan; AB: Alberta; YT: Yukon Territory; NWT: Northwest Territories; NU: Nunavut.

Table 6.2 Nested logistic regression models[1] for relationship between severity of food insecurity and obesity among women stratified by parent and partnership status (n=32971).

	Single Women without children	Women with partner, no children	Single women with children	Women with a partner and children
n	8492	9666	2911	11902
Unadjusted Model				
Marginal	**1.68 (1.20-2.36)**	1.40 (0.97-2.02)	**2.32 (1.29-4.19)**	1.18 (0.85-1.64)
Moderate	**2.54 (1.80-3.59)**	**2.07 (1.21-3.53)**	**2.00 (1.22-3.26)**	**2.75 (1.85-4.07)**
Severe	**2.15 (1.49-3.09)**	**3.15 (1.89-5.25)**	1.32 (0.75-2.32)	**4.16 (2.51-6.89)**
Model 1: Covariate adjusted[2]				
Marginal	**1.52 (1.08-2.14)**	1.18 (0.81-1.74)	**1.94 (1.05-3.60)**	1.04 (0.75-1.45)
Moderate	**2.05 (1.45-2.89)**	1.70 (0.90-3.23)	**1.69 (1.03-2.77)**	**2.26 (1.47-3.49)**
Severe	**1.66 (1.08-2.57)**	**2.12 (1.22-3.70)**	0.94 (0.51-1.75)	**3.29 (1.85-5.84)**
Model 2: Adjusted for mood disorders[3]				
Marginal	**1.42 (1.01-1.99)**	1.15 (0.78-1.70)	**1.92 (1.02-3.61)**	0.99 (0.72-1.37)
Moderate	**1.85 (1.29-2.67)**	1.42 (0.75-2.66)	1.59 (0.97-2.62)	**2.08 (1.36-3.17)**
Severe	1.38 (0.91-2.09)	1.75 (1.00-3.06)	0.86 (0.48-1.55)	**2.91 (1.63-5.20)**
Model 3: Adjusted for Stress[4]				
Marginal	**1.40 (1.00-1.97)**	1.14 (0.77-1.69)	1.90 (0.99-3.63)	0.98 (0.71-1.35)
Moderate	**1.83 (1.27-2.62)**	1.38 (0.73-2.63)	1.58 (0.95-2.63)	**2.05 (1.34-3.15)**
Severe	1.33 (0.88-1.99)	1.69 (0.96-2.97)	0.84 (0.44-1.57)	**2.85 (1.59-5.09)**
Model 4: Adjusted for Fruit/Vegetable Intake[5]				
Marginal	1.39 (0.99-1.96)	1.14 (0.77-1.68)	1.79 (0.94-3.41)	0.96 (0.70-1.33)
Moderate	**1.80 (1.25-2.59)**	1.38 (0.73-2.62)	1.55 (0.92-2.62)	**2.05 (1.33-3.15)**
Severe	1.31 (0.87-1.97)	1.69 (0.96-2.98)	0.81 (0.42-1.56)	**2.78 (1.55-4.99)**

[1] Values are Odds Ratios (95% CI). Reference category is fully food secure. Odds ratios that are significantly different than fully food secure are bolded.
[2] Adjusted for age, age-squared, income-quintile, education, recent immigrant status, Aboriginal status, province of residence.
[3] Additionally adjusted for diagnosed mood disorder.
[4] Additionally adjusted for stress.
[5] Additionally adjusted for quintile of fruit and vegetable consumption.

Table 6.3 Associations between severity of food insecurity and fruit and vegetable consumption among women stratified by parenthood and partnership status (n=32345).

	Single women			**Partnered women**			**Single Mothers**			**Partnered Mothers**		
	Mean	β (SE)	p	Mean	β (SE)	p	Mean	β (SE)	p	Mean	β (SE)	p
Outcome: Servings fruit/vegetables/day [2]												
Food secure	4.4	Ref		4.7	Ref		4.5	Ref		4.9	Ref	
Marginal	3.8	**-0.40 (0.17)**	**0.0222**	4.2	-0.15 (0.25)	0.55	3.5	**-0.49 (0.18)**	**0.0077**	4.3	-0.29 (0.16)	0.06
Moderate	3.8	-0.34 (0.2)	0.08	3.8	-0.45 (0.32)	0.16	3.9	-0.27 (0.24)	0.25	4.1	-0.28 (0.23)	0.23
Severe	3.4	**-0.65 (0.22)**	**0.003**	3.1	**-1.11 (0.24)**	**<0.0001**	3.7	-0.34 (0.31)	0.27	3.8	**-0.60 (0.27)**	**0.0283**

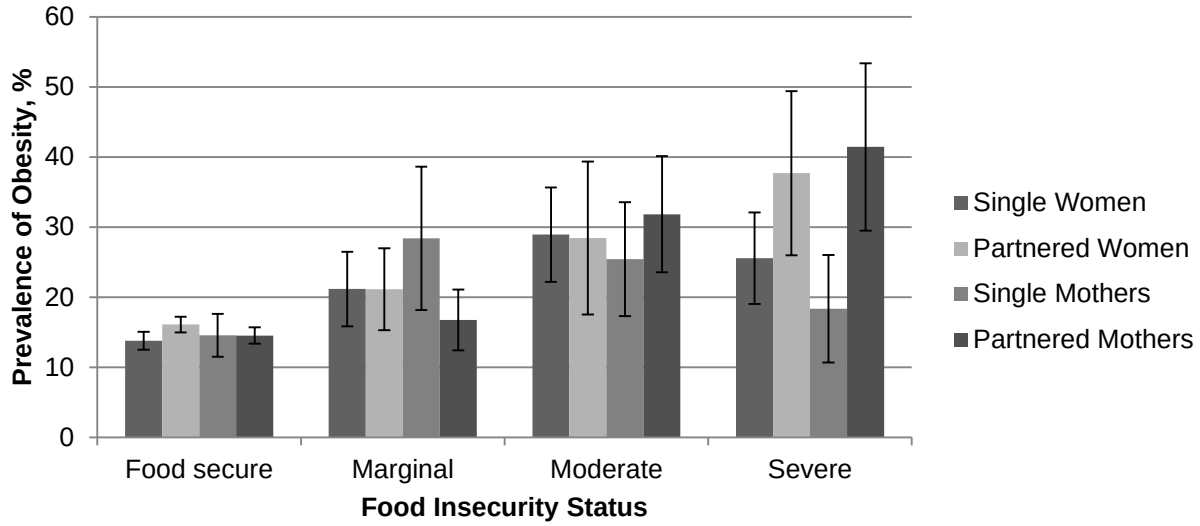
[1] Sample sizes were 8286, 9490, 2861, and 11708 across categories owing to missing data for fruit and vegetable consumption.
[2] Data are unadjusted mean intakes and adjusted beta estimates from a linear regression model adjusted for age, income-quintile, education, recent immigrant status, Aboriginal status, and province of residence.

Table 6.4 Associations between severity of food insecurity and stress burden and diagnosis of mood disorder among women stratified by parent and partnership status (n=32971).

	Single Women		Partnered Women		Single Mothers		Partnered Mothers	
	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)
Outcome: Ranked Life As Stressful [1]								
Food secure	28.8	Ref	27.1	Ref	36.8	Ref	27.1	Ref
Marginal	39.4	**1.83 (1.30-2.56)**	30.1	1.38 (0.94-2.03)	42.7	1.46 (0.88-2.42)	42.2	**2.48 (1.86-3.31)**
Moderate	41.2	**1.90 (1.37-2.63)**	41.3	**2.69 (1.52-4.75)**	45.7	1.54 (0.95-2.48)	37.3	**2.26 (1.56-3.28)**
Severe	56.3	**3.72 (2.61-5.29)**	49.7	**3.73 (2.15-6.49)**	59.8	**2.85 (1.62-5.01)**	53.1	**4.17 (2.55-6.83)**
Outcome: Diagnosed with Mood Disorder [1]								
Food secure	10.6	Ref	8.2	Ref	9.7	Ref	6.8	Ref
Marginal	21.5	**2.15 (1.52-3.04)**	14.3	1.56 (1.00-2.44)	15.8	1.56 (0.91-2.66)	13.5	**2.33 (1.55-3.5)**
Moderate	31.9	**2.93 (2.01-4.27)**	33.6	**4.31 (2.19-8.48)**	23.3	**2.51 (1.41-4.49)**	19.6	**3.56 (2.14-5.92)**
Severe	48.6	**5.18 (3.51-7.62)**	38.4	**4.38 (2.44-7.87)**	30.7	**3.35 (1.92-5.86)**	25.8	**5.00 (2.80-8.93)**

[1] Data are unadjusted prevalence of outcome by food insecurity category and adjusted odds ratios (95% CI) from logistic regression models adjusted for age, income-quintile, education, recent immigrant status, Aboriginal status, and province of residence.

Figure 6.1 Prevalence[1] of obesity among women stratified by parenthood and partnership status (n=32971).



[1] Data are unadjusted prevalence of obesity (95% CI).

Supplementary Table 6.1 Logistic regression models for obesity stratified by gender (Canadian Community Health Survey, 2009-11; adults ages 25-55).

		Women (n=32971)	**Men** (n=29108)
		OR[1] (95% CI)	OR[1] (95% CI)
Unadjusted Model			
	Marginal	**1.49 (1.21-1.83)**	1.22 (0.95-1.56)
	Moderate	**2.34 (1.89-2.90)**	1.11 (0.86-1.43)
	Severe	**2.16 (1.73-2.70)**	0.93 (0.72-1.21)
Model 1[2]			
	Marginal	**1.32 (1.06-1.63)**	**1.36 (1.04-1.77)**
	Moderate	**1.93 (1.52-2.45)**	1.27 (0.98-1.65)
	Severe	**1.66 (1.29-2.14)**	1.10 (0.83-1.45)
Model 2[3]			
	Marginal	**1.26 (1.01-1.57)**	**1.33 (1.02-1.73)**
	Moderate	**1.74 (1.37-2.21)**	1.20 (0.92-1.57)
	Severe	**1.40 (1.09-1.81)**	1.00 (0.75-1.32)

[1] Reference category is fully food secure. Odds ratios that are significantly different than fully food secure are bolded.
[2] Adjusted for age, age-squared, income-quintile, education, recent immigrant status, Aboriginal status, province of residence..
[3] Additionally adjusted for diagnosed mood disorder.

Supplementary Table 6.2: Prevalence of food insecurity and obesity among women stratified by parent-partnership status (Canadian Community Health Survey, 2009-11; adults ages 25-55). .

	Single women (n=8492)	Partnered Women (n=9666)	Single Mothers (n=2911)	Partnered Mothers (n=11902)
Food Insecurity, % (95% CI)				
Food secure	81.5 (80.0-82.9)	92.4 (91.5-93.4)	70.7 (67.9-73.6)	90.5 (89.6-91.4)
Marginal	6.9 (6.0-7.8)	3.6 (3.1-4.2)	11.2 (9.1-13.3)	5.9 (5.1-6.6)
Moderate	5.1 (4.3-6.0)	2.6 (1.9-3.2)	8.3 (6.6-10.0)	2.5 (2.0-2.9)
Severe	6.5 (5.6-7.5)	1.4 (1.0-1.7)	9.8 (7.9-11.7)	1.2 (0.9-1.5)
Obesity, % (95% CI)				
Not Obese	84.2 (82.9-85.4)	83.1 (82.0-84.2)	82.6 (79.9-85.3)	84.6 (83.5-85.7)
Obese	15.8 (14.6-17.1)	16.9 (15.8-18.0)	17.4 (14.7-20.1)	15.4 (14.3-16.5)

7 STUDY 4: THE RELATIONSHIP BETWEEN FOOD BANKS AND HOUSEHOLD FOOD INSECURITY AMONG LOW INCOME TORONTO FAMILIES

Reproduced from: Loopstra, R. and Tarasuk, V. The relationship between food banks and household food insecurity among low income Toronto families. 2012. Canadian Public Policy; 38 (4): 497-514.

Abstract

In the absence of targeted public policy to address household food insecurity in Canada, food banks remain the dominant response, despite questions about their effectiveness. Interviews with 371 low-income Toronto families revealed that 75 percent had experienced some food insecurity, but only 23 percent had used a food bank; for most food bank users, food insecurity was a severe and chronic problem. Food-insecure families' reasons for not using food banks indicated resistance and in some instances, access barriers. These results draw into question the apparent reliance of federal and provincial/territorial governments on food charity to alleviate food insecurity and highlight the need for a public policy response.

Keywords: food charity, household food insecurity, hunger, food banks, low income

7.1. Introduction

Household food insecurity, popularly referred to as "hunger," is defined as the inadequate or insecure access to food due to inadequate financial resources. This problem is now routinely monitored in Canada, with the most recent estimates indicating that 5.1 percent of households were moderately food insecure and 2.7 percent of households were severely food insecure in 2007–08 [208]. Although research on determinants of food insecurity is limited, household food insecurity is correlated with low income, reliance on social assistance, and renting one's dwelling [86, 209]. Food insecurity is linked to poor dietary quality and heightened nutritional vulnerability [30], increased risk of chronic health problems [49, 82], and exacerbations of health conditions that require special dietary management [25, 210].

Over the past three decades an extensive network of extra-governmental, community-based charitable food assistance programs has developed to help "the hungry," and these efforts are routinely identified in federal government documents as a cornerstone of Canada's response to food insecurity [211, 212]. At the core of community food assistance efforts are food banks—voluntary, community-based initiatives that collect donated foodstuffs from the public and food industry and redistribute it to people "in need." Food banks began to proliferate in the 1980s as communities mobilized to deal with local concerns about "hunger" arising in the context of an economic downturn [118], but these initiatives rapidly became entrenched. Research conducted through the 1990s raised several serious questions about the capacity and effectiveness of food banks to alleviate hunger in Canada,[1] but food charity continued to flourish in the absence of alternative responses.

Although food banks remain the purview of civil society, they receive considerable formal and informal government endorsement and support. People facing food shortages are directed to food banks on municipal government websites[2] and referred by welfare caseworkers, health care providers, and other "front-line" staff. Politicians applaud the work of food banks and issue appeals to the public to donate to food banks to help needy families.[3] There are also some examples of more direct government support for food banks. Food Banks Canada, the national association of food banks,[4] has reported that 30 percent of their member organizations receive some form of government funding [136]. As part of the Quebec government's strategy to reduce poverty and social exclusion, the right to food assistance that is sufficient and nutritious, and that

can be obtained in a manner that maintains dignity was enshrined in law [155], and provincial funds were subsequently committed to improve food assistance programs in that province [213]. The Province of British Columbia, through the Community Gaming Grants program [214] and the Community Food Action Initiative [215], provides grants to individual food banks and emergency food service organizations. The Nova Scotia Department of Natural Resources and the Department of Agriculture partner with hunting organizations to run the "Hunters Helping the Hungry" program, which allows hunters to donate deer and moose meat to food banks in Nova Scotia [216]. In the absence of other deliberate policy interventions to address food insecurity, food banks appear to have become the de facto public policy response to household food insecurity in Canada.

A major disconnect, however, is that food banks do not appear to be used by most food-insecure households in Canada. This was first documented in population health surveys in the 1990s [44, 83, 134]. The most extensive investigation, conducted via a food security supplement in the 1998–1999 National Population Health Survey, revealed that only 22 percent of food-insecure families had used food charity, and even among families reporting severe food problems, use of food charity was only 33 percent [83]. Although more recent population assessments of food insecurity have not included questions about food bank use, in a 2006–07study of 485 low-income families in Toronto, we found that only 28 percent of the 316 families who experienced food insecurity in the past year had received any assistance from food banks during this period [217]. The low rates of utilization could not be explained by issues of geographic proximity because these neighbourhoods were all well served by food banks [218].

In light of the entrenchment of food banks in Canadian society and the apparent reliance of federal and provincial/territorial governments on these organizations to alleviate household food insecurity, research is needed to evaluate the actual and potential role of food banks in relation to problems of food insecurity in Canada. Drawing upon data from a follow-up study of low-income families in Toronto, this paper reports on our analysis of the factors related to food bank use and non-use. We examine household characteristics associated with food bank use and explore the responses given by families to explain why they had not used food banks in the 12 months prior to the interview.

7.2. Methods

7.2.1. Study Design and Population

Analyses conducted for this study used data collected one year after the baseline study by Kirkpatrick and Tarasuk [217]. The study was approved by the Human Subjects Research Ethics Board at the University of Toronto. The baseline study design involved the random selection of 12 of the 23 high-poverty census tracts in Toronto as sites for recruitment. Interviewers, who themselves had experiences of low income, recruited families to participate by door-to-door sampling. Eligibility criteria required that families had at least one child 18 years of age or younger in the household, were living in a rented dwelling and had been there for at least one month, had sufficient fluency in English to complete an oral interview, and had a gross income at or below the mid-level of Statistics Canada's five-category income adequacy scale (≤ $29,999, $39,999, or $59,999 if household 1 or 2 people, 3 or 4 people, or 5+ people, respectively). Quota sampling was used to ensure that approximately equal numbers of families living in subsidized housing and non-subsidized housing were included in the study. Data were collected by means of a structured oral interview with the household member who had primary responsibility for food shopping and management. Respondents from a total of 501 families were interviewed at baseline, reflecting a response rate of 62 percent. Sixteen families were subsequently excluded because their incomes were found to exceed the threshold for eligibility. Thus the final sample was 485. Of these families, 76 percent (N = 371) completed a second interview approximately one year later between November 2006 and April 2008.

Similar to the baseline survey, at follow-up we collected basic demographic information, sources and amount of income, and usage of community food programs in the past 12 months, which included food banks, community gardens, community kitchens, and a subsidized fruit and vegetable box program based in Toronto. Families that reported no use of food banks were asked: "Why didn't you or anyone in your household use a food bank in the past 12 months?" The question was open-ended and responses were recorded verbatim by the study interviewer. Due to the situating of this question within the lengthy survey questionnaire, responses were not further probed.

Families who had used food banks in the past 12 months were asked about their food bank use in the past 30 days, and those who reported no use in the past 30 days were similarly asked an open-ended question probing why they had not done so.

Household food security was assessed over the past 12 months and past 30 days using the Household Food Security Survey Module (HFSSM) [14], which is an 18-item questionnaire. The questions are asked in sequence, as they describe increasingly severe household food circumstances ranging from worry that food would run out before there was money to buy more, to adult or child experiences of not eating for a whole day. All questions ask the respondent whether the experience described in the question occurred in the past 12 months and tie the experience to constrained household finances. Food security status was classified according to Health Canada criteria [17]: moderately food-insecure households have answered enough questions affirmatively to indicate compromises in the quality and quantity of their food intake, and severely food-insecure households have indicated reduced food intake and disrupted food patterns. We additionally used the marginal food insecurity category to recognize the heightened vulnerability of families in this group.[5]

A 30-day measure of food insecurity was incorporated into the scale so that all questions describing food deprivation or reduced food intake also had a subquestion that asked whether the experience happened in the past 30 days and how often in the past 30 days. An affirmative response to any of these questions indicated food shortage in the past 30 days.

7.2.2. Analyses

We constructed a multivariate logistic regression model to examine the relationship between food bank use and characteristics anticipated to influence the decision or ability to use food banks, including household food security status, income, receipt of welfare payments, single motherhood, having young children, education level, and recent immigration. These demographic characteristics have been repeatedly associated with household food insecurity in the Canadian population [208, 209] and were linked to food insecurity in the current study population at baseline [217]. We conducted the logistic regression analysis with SAS 9.2 using survey commands to account for the clustering effect of neighbourhood in the survey design and adjusting for receipt of a housing subsidy to reflect the recruitment quota. The outcome variable was food bank use, dichotomized to indicate whether a family had used a food bank in the past 12 months or not. This variable was chosen as opposed to some measure of the frequency of food bank use because there were only 20 families in the sample who had used a food bank every month or almost every month over the past year. Thus, the logistic regression model relates

household characteristics to a decision/ability to use a food bank at least once in the past 12 months.

We utilized data from the baseline interview to examine how change in food bank use (new use at follow-up or no longer using at follow-up) related to change in severe food insecurity status. The decision to examine change in severe food security status was informed by the results of the multiple regression analysis explained above, which indicated that families in more desperate circumstances were more likely to have used a food bank. Examining change in severe food security status in relation to change in food bank use allowed us to gain an understanding of the temporality of the relationship between severe household circumstances and food bank use.

We conducted a content analysis of participants' responses to the question probing reasons for non-use of food banks. The coding of responses was inductive and iterative, with initial content-based codes repeatedly refined to better capture the range of responses recorded. Where more than one idea was expressed in a response, the response was broken down into sentences to allow more than one code to be assigned. Codes were compared to one another to identify broader conceptual categories and themes within the data. To enhance reliability of the coding scheme, the assignment of codes, categories, and overall themes was reviewed by members of the research team, including one of the survey interviewers.

The results from this analysis yielded six categories, which fit into two mutually exclusive overall themes. Although the responses of all households in the study population were coded, we were primarily interested in the reasons given by households that did not use food banks and that were experiencing food insecurity (i.e., households that were marginally, moderately, or severely food insecure; $n = 199$); thus results are presented for these households.[6] To examine whether the reason(s) respondents gave for not using food banks differed by household characteristics, we conducted chi square analyses after responses were categorized. Responses were examined by household food insecurity, single mother household, dichotomized income (above/below sample median), education, receipt of welfare, and report of food bank use at the baseline interview.

We also examined food bank use in the past 30 days among respondents who indicated they used a food bank in the past 12 months, coding the reasons why families who had previously used a food bank had not done so in the past 30 days and juxtaposing these responses against their food security over the past 30 days.

7.3. Results

7.3.1. Study Population Characteristics

The demographic characteristics of the families in this study are summarized in **Table 7.1**. Most were reliant on income from employment, welfare, or a combination of government transfers (e.g., National and Provincial Child Benefits, GST credits, Employment Insurance), and 75 percent of families had incomes below the after tax low-income cut-off (LICO; [172]. More than half were lone mother households. The majority of study participants were not born in Canada (data not shown), but only 16 percent had immigrated within the past five years.

Consistent with baseline findings, at the time of the follow-up study visit, almost all families expressed concern about meeting food needs or being unable to do so. Specifically, 30 percent of families were severely food insecure, 32 percent were moderately food insecure, and 13 percent were marginally food insecure. Additionally, in response to the question "In order to buy just enough to meet the needs of your household, would you have needed to spend more than you did in the last 30 days, or could you have spent less?", 91 percent of families indicated they would have needed to spend more money.

7.3.2. Food Bank Use and Associated Household Characteristics

Only 23 percent of families (n = 84) reported using a food bank in the past 12 months, and most of these families had used a food bank six or fewer times (n = 54). This low prevalence of food bank use in the follow-up study population was consistent with the baseline study [217], but food bank use had changed for some households: 31 households did not use a food bank at follow-up who reported use at baseline, and 30 households newly reported using a food bank who had not done so at baseline. A total of 54 families reported food bank use at both baseline and follow-up.

Results of the multivariate logistic regression analysis showed that the odds of using a food bank in the past 12 months at follow-up increased with severity of food insecurity (**Table 7.2**). Additionally, independent of food insecurity, decreasing income and receipt of welfare were positively associated with food bank use, and recent immigration was negatively associated with food bank use. These results are consistent with the characteristics associated with food bank use in the baseline study population[101].

Consistent with the results in Table 7.2, we observed that households who reported newly using a food bank at follow-up had a higher prevalence of severe food insecurity over both years and a higher prevalence of new severe food insecurity (**Table 7.3**) compared to families who remained non-users of food banks over two years. It did not appear that discontinuation of food bank use was motivated by a reduction in severe food insecurity, however, as the prevalence of severe food insecurity status remained high among those who reported no use of food banks in the past 12 months at follow-up compared to those who remained using food banks (Table 7.3). Also important to note is the high prevalence of persistent severe food insecurity among food bank users, indicating that continued food bank use did not appear to reduce the likelihood of repeated severe food insecurity.

7.3.3. Reasons for Not Using Food Banks

The reasons participants from food-insecure families (N = 199) gave for not using food banks fell into six categories that could be summarized under two broad themes. Respondents were either "choosing not to use food banks" or they had been unable to use a food bank because of "barriers" (**Figure 7.1**). Although participants from severely food-insecure families were more likely to report barriers than those in less insecure families, most participants' responses fell into the "choosing not to use" theme, irrespective of the level of food insecurity (**Figure 7.2**).

What follows is a detailed examination of the four categories of response that comprise the "choosing not to use food banks" theme, followed by a discussion of the two categories under the "barriers" theme (Figure 7.1). Additionally, when statistically significant, results from the chi square analyses are presented for the examination of category of response in relation to household characteristics (food security status, lone motherhood, receipt of welfare, recent immigration status, education, income, and reported use of food bank at baseline).

Theme One: Choosing Not to Use Food Banks

Unsuitable Food

> "[Food banks] don't give me the food I need—there's no point in going." (Respondent (R) 2225)

Twenty-two percent of families described feeling that their food needs were unmatched with what was provided at food banks, and the poor quality of foods that were offered made it not

worthwhile for them to use food banks. Respondents specified that food banks did not have fresh foods, healthy foods, or foods that met their dietary restrictions (e.g., Halal). They also described receiving rotten fruit/vegetables, "junk food," foods that were past their "best before" dates, and/or only canned foods—in short, foods that they did not want to eat. The following two quotes illustrate the nature of responses in this category:

> "I don't like tinned food and that's what they give out. There are no nutritious foods, and they give out only expired products. My neighbours got sick from eating expired tinned salmon." (R2274)

> "Half the food at the food bank is stuff I don't want. I feel bad being picky, but I would borrow money instead [of going to a food bank]. My children wouldn't eat the food, and the vegetables are not fit to feed an animal. The meats are disgusting and there is too much junk food." (R5176)

This category of response was more often indicated by participants from households headed by a single mother compared to those that were not (26 percent vs. 17 percent; $p = 0.0388$) and from households reliant on welfare compared to those that were not (31 percent vs. 17 percent; $p = 0.0003$). The proportion who gave a response in this category did not differ for other household characteristics.

Identity

A smaller proportion (12 percent) of families described their perceptions of whom or what food banks are for and distanced themselves and/or their need from that person or situation; because they did not feel food banks were for them, they did not go. For example, one respondent said, "I've never used a food bank. It's for people who have more need—I feel more privileged than people who use food bank" (R2251). Others also stated that they felt food banks were for a specific population, for example, people who are homeless, welfare recipients, or unemployed. Some respondents also had the perception that their use of food banks would take away the benefit of doing so from someone in greater need: "Those things are for people who don't have anything. I don't like to take from people who don't have anything" (R3020).

Participants from households that did not receive welfare were more likely to have given a response that fit into this category than those from households that did receive welfare (16 percent vs. 3 percent; $p = 0.001$). No other differences were observed for other characteristics.

Degradation

> "Social customs dictate our behaviour—we cannot think of using a food bank." (R2620)

Eleven percent of families described food banks as something they did not want to use because of feelings of degradation. These feelings seemed to stem from perceptions that using food charity was socially unacceptable or out of line with family values, or from poor past experiences at food banks. For example, one respondent explained, "We don't beg or borrow or steal. These family rules passed [on] from my father. 'Whatever we have, we do with'" (R3778). Others explicitly talked about feelings of shame attached to using a food bank:

> "I'm self-conscious. I would be ashamed of myself to not have it together. I wouldn't want anyone to see me going—it would make me feel awful. I don't want to be seen as facing rock bottom" (R2308).

A response that fit into the "Degradation" category was more often given by participants from households that did not receive welfare compared to participants from households that did receive welfare (13 percent vs. 6 percent; $p = 0.0155$). No differences were observed for other characteristics.

Insufficient Need

> "We don't need the food bank, we manage by ourselves." (R2395)

The most common response, given by 38 percent of food-insecure families, was that they had insufficient need to use a food bank and were able "to manage" without going to one. For example, one respondent said, "We didn't need to use the food bank. We squeak by, we still have enough to eat" (R4267). Another said, "[We] don't go [to the food bank]. We can survive; we still can buy food" (R5064). Respondents also described their lack of need relative to a more desperate point at which a food bank would be necessary: "I don't think it's to the point to need the food bank" (R2663). Additionally, 15 respondents gave a simpler response of "didn't need to." Since these responses were not probed for clarification of meaning, we cannot elaborate on what respondents meant by terms like "need," "enough," or "the point" at which a food bank would be used.

These responses indicate that participants did not view food bank use as a way to alleviate the experiences captured in their responses to survey questions about food insecurity. Implicit in their responses (and explicit in some) was the assertion that food bank use would only occur at a time of greater desperation than respondents had faced. Important to highlight was that respondents were not necessarily indicating a lack of food insecurity, but rather an absence of the need to use a food bank, which seemed to be constructed as a point of desperation where food banks would be turned to as a "last resort" (R1228).

Participants who said they did not need a food bank tended to be from households that were in less desperate circumstances. Households that were marginally or moderately food insecure, had incomes higher than the median, and that were not led by single mothers were more likely to give this type of response than households with opposing characteristics ($p < 0.05$ for all comparisons). While these findings suggest that families who said they did not need a food bank had less severe food problems, it is important to note that all families in this group were, at best, worried about not having enough to eat and, at worst, repeatedly reducing their food intake. Thus, we interpret these findings to indicate greater resistance to food bank use among households with less severe circumstances.

Theme Two: Barriers

Access

Nineteen percent of participants indicated that they had tried to use a food bank in the past or had been interested in doing so, but had been unable. Barriers mentioned were schedule conflicts with limited food bank operating hours, long line-ups, being turned away when food banks were too busy, not being allowed to get assistance because of food bank eligibility criteria, and the lack of transportation necessary to get to a food bank. For example, one respondent said, "Last time I tried to go, I had no money for rent and bills. I had receipts. I was told that I was not eligible because I had just got paid" (R2321). Another said, "I don't have time. They're not open when I am off work" (R4245). Others described the invasive intake and screening process required to use a food bank as a barrier to food bank use: "I went last Tuesday. I was told to make an appointment and to bring all my documents in order to use the food bank. I decided not to 'register' myself" (R2343).

There was a borderline significant difference in the proportion of households that gave this response by welfare receipt: those who received welfare were more likely to have given this response than those who did not receive welfare (25 percent vs. 16 percent; $p = 0.0589$).

Information

> "I don't know where they are and I don't know how to find out about them." (R3538)

Eighteen percent of study participants did not have the necessary information to allow them to use food banks. Some were unfamiliar with what food banks were and how they operated, and others did not know the location of food banks or when they were open. Other respondents questioned whether they would be allowed to use a food bank.

Families who were experiencing severe food insecurity were more likely to have given lack of information as a reason for not using food banks than households that were marginally or moderately food insecure (25 percent vs. 16 and 10 percent; $p = 0.0478$, for comparison of severe vs. moderate and marginal).

7.3.4. Food Bank Use in the Past 30 Days

Of the 84 families who had used a food bank in the past 12 months, 38 (45 percent) had used a food bank in the past 30 days. Of those who did not use a food bank in the past 30 days ($N = 46$), reasons for not doing so fell into three categories outlined above: (a) no need to use a food bank in the past 30 days (37 percent); (b) access barriers in the past 30 days (28 percent); and (c) unsuitable food as the reason for not using in the past 30 days (35 percent). In the latter category, respondents felt that it was not worthwhile to go back to a food bank because of the poor quality and quantity of food given out. For example, respondents stated,

> "When I go, I never see anything I can eat." (R7074)

> "Cans are dented and the food may be spoiled. The food doesn't look edible." (R2677)

> "I don't like to use them because they give me garbage—the food is expired and unhealthy." (R4224)

Access barriers that prevented respondents from using a food bank in the past 30 days were food bank closure, being turned away, and schedule conflicts with limited operating hours.

An important observation was that of the 46 families who had not used a food bank in the past 30 days but who had used a food bank in the past year, almost half had experienced food shortages in the past 30 days: 48 percent of families had cut the size of their meals or skipped meals, 30 percent had experienced hunger but had not eaten, and 39 percent had eaten less than they felt they should. Taken together with the qualitative responses, these findings provide evidence that lack of need was not the salient reason why families who had used a food bank previously did not return in the past 30 days.

7.4. Discussion

This study yields two important insights into the actual and potential role of food banks in relation to problems of household food insecurity. First, most food-insecure families in our study population were not using food banks, either because they did not see use of food banks as way to address their needs or because food banks were not available to them. Though our results suggest that families turned to food banks when their circumstances were desperate (as indicated by severe food insecurity, lower income, and the receipt of welfare), many families with apparently high levels of need were not using food banks. Some identified logistical barriers to food bank use, but many spoke of the mismatch between the assistance food banks offered and their perceptions of their needs. Both were also reasons why families who had used food banks in the past 12 months did not do so in the past 30 days, despite evidence of food shortages in this period.

Second, among families who used food banks, there was no evidence that food bank use alleviated food insecurity. The majority of food bank users were severely food insecure. The fact that 41 percent of households that reported using a food bank at baseline and follow-up study visits also experienced severe food insecurity over both years suggests that their food bank use was insufficient to ameliorate this severe condition. These results are consistent with an earlier study that documented a high prevalence of food insecurity among families using foods banks [130].

Although our study design afforded a rare glimpse at the intersection of household food insecurity and food bank use, this research is not without limitations. The use of an open-ended question allowed study participants to offer their own explanation for not using food banks, but the absence of audio recording and the lack of probing by the interviewer limited the richness of

what was recorded. Additionally, our focus on low-income families in Toronto means that the prevalence of food bank use in our sample is not reflective of the food-insecure population in Canada. Of note, however, is that older studies in Canada with population-based samples have shown a similarly low prevalence of food charity use among food-needy individuals and families [44, 83, 134, 219].

Our study participants' descriptions of food banks reflects their interactions with specific agencies and therefore cannot be generalized to all food banks in the country;[7] however, problems of poor food quality and limited quantity have been documented in other studies that captured low-income individuals' feelings about food banks [6, 112, 131, 220, 221]. These problems have also been identified in studies of food bank operations [123, 125, 129]. Concerns about food quality and quantity reflect the very nature of food banks in Canada and have been documented since their inception. Most food banks rely on voluntary staffing and donated food, which allows for little control over hours of operation and the quality and quantity of food available for distribution. Food Banks Canada [136] has reported that almost half of its member food banks have no paid staff. Most food banks give out five days' worth of food or less and restrict assistance to once a month [222]. Additionally, in 2010, 35 percent of its members reported running out of food, 50 percent had cut back the amount of food they provided to their clients, and 12 percent had turned away clients who had come seeking assistance [222].

Some of the barriers to food bank use identified by our study participants could be addressed by modifying food bank operations. For example, food banks could mount outreach activities to make people aware of their services, increase the accessibility of their services (e.g., by extending food bank hours or providing assistance with transportation), and provide clients with more variety, more choice, and better quality food assistance. Alternative program models could also be developed to provide food assistance to needy families in less stigmatizing ways. However, such changes require resources, and this system is defined by a reliance on donations and volunteer support.

It is common practice for food banks to accept donations of food that cannot be sold from producers, manufacturers, and retailers,[8] resulting in the distribution of foods deemed unacceptable or undesirable by the general public. This practice is enabled by the "Good Samaritan Laws," which were enacted in the 1990s in most provinces and territories and

establish that individuals and corporations that donate food are not liable for any injury or death that result from consumption of such food. Food safety is a concern, as indicated by Agriculture and Agri-Food Canada's recent contribution to Food Banks Canada to support the development of a food safety program,[9] and by Health Canada's publication of a document on food handling for food banks to guide management foods of unknown origin and quality [223]. Thus, food bank volunteers and operators are charged with the enormous task of managing food donations with a diversity of potential risks. A study of food bank operations in southwestern Ontario documented food bank volunteers having to spend considerable amounts of time separating inedible foods from edible ones, repacking foods, and making foods "presentable" [123].

Studies indicate that food bank workers are concerned about the nutritional adequacy of the assistance they provide [125, 224]. Efforts have been made by individual food banks and national and provincial food bank associations to improve the food distributed by partnering with agricultural bodies, expanding the food-sharing system,[10] and increasing efforts to gain monetary donations for food purchasing, but these initiatives are limited by their dependence on the charitable goodwill of donors.

Food bank resources could be augmented by more direct financial or in-kind contributions by the federal and/or provincial governments. Both the United States and the European Union have programs in place that involve the purchase and distribution of market and surplus commodity foods to augment the donated food supplies of domestic charitable food distribution programs.[11] However, studies in the United States have reported that only a small proportion of the food distributed through food banks comes from this program [225, 226], and consistent with the findings from our study, studies of food pantry users in the United States have found a high prevalence of food insecurity among food pantry users [225, 227-229]. The potential for food bank resources to be significantly improved were Canada to implement a surplus-redistribution program is unclear, as is impact that such a program would make on food insecurity in Canada.

Alternatively, the federal government could create tax incentives to stimulate greater charitable contributions to food banks by individuals and corporations. Food Banks Canada [136] has proposed a tax incentive program for corporate food donors and agricultural producers. There are now private member's bills before the Ontario [230] and Nova Scotia legislatures [231] seeking tax credits for donations from farmers in these provinces. Such tax credits could be seen as a

"win-win," potentially improving the quality of food available for distribution by food banks while rewarding food producers and manufacturers for good corporate citizenship. However, we would argue against the direct or indirect investment of public monies in charitable food assistance initiatives in the absence of evidence that this model of intervention can effectively address problems of household food insecurity.

While food bank operations could undoubtedly be improved with a greater investment of public funds, it is important to recognize that the prevalence of household food insecurity in this country is much greater than what the existing infrastructure of charitable food assistance programs can handle. In our study population, for every family who made use of a food bank, there were at least two others with equivalent food needs who did not seek assistance. Moreover, we found no evidence that the families who used food banks received enough help to avoid further hunger even in the short run. These findings suggest that an enormous expansion of operations would be necessary in order for food banks to have any discernible impact on the prevalence and severity of household food insecurity in Canada.

Even if the resources could be found to improve food bank operations, this would not address the resistance that so many families expressed to seeking food charity. Some participants were explicit in their distaste of receiving charity, but the claims of others that they did not need to use a food bank despite having described an inability to meet food needs were also a sign that families were averse to using food charity except perhaps at a time of extreme desperation. In a country where it is the norm for citizens to select and purchase the foods they want to eat, it is unlikely that receipt of food charity will ever be made more palatable through efforts to improve food bank operations.

The results of this study raise serious concerns about the apparent reliance of federal and provincial/territorial governments on food charity as a de facto response for Canadians facing food shortages and argue against further investments in this sector. There is a need for a targeted public policy response to household food insecurity. We would suggest that this response be income based, recognizing that food is one of several unmet needs in food-insecure households.[12] An income-based response also has the advantage of being non-stigmatizing, fostering social inclusion and enabling families to manage their food needs independently. It is imperative, however, that any intervention to reduce the prevalence and severity of food

insecurity in this country be explicitly designed and evaluated against these outcomes. Income transfer programs like the National Child Benefit Supplement, while effective in preventing some households from falling into poverty, have not been designed to impact household food security status and their effects on this outcome remain unknown. Given the depth of poverty associated with severe food insecurity in this sample and the very high prevalence of food insecurity among families reliant on Ontario Works (welfare) [217, 232], any income-based intervention needs to be designed to alter the circumstances of those living on incomes well below conventional poverty thresholds.

7.5. Conclusions

This is one of the first studies to examine the intersection of food insecurity and food bank use in Canada, and it highlights the low prevalence of food bank use among food-insecure families. Without this perspective, there is an illusion that food banks are an available and utilized response for anyone facing food shortages. The expressed reasons for not having used a food bank in our study population showed both resistance and inability to use food banks. Taken together with the evidence of recurrent food insecurity among food bank users, these findings suggest that a food charity model cannot be relied upon to alleviate household food insecurity, raising important questions about the continued positioning of food banks as an available response for food-insecure families and highlighting the need for a public policy response to food insecurity in Canada.

7.6. Notes

[1.] Through the 1990s, studies were conducted to assess the nutritional vulnerability of food bank users [34, 130, 133, 233-235] and to explore issues of stigma associated with obtaining food charity [130, 131]. Examinations of food bank practices raised concerns about the nutritional adequacy of the assistance provided [126, 127, 129, 236] and the disconnect between charitable food provisioning and client needs [125], exposing the limitations inherent in a voluntary, donor-driven system of food assistance largely reliant on industry “surpluses” [123].

[2.] Examples include the *City of Hamilton 2011 Food Access Guide* [237], City of Brantford Food Bank and Food Cupboard Calendar [238], and Region of Peel listing of food banks [239].

[3.] Examples include announcements from Minister of Agriculture Gerry Ritz [240] and Ontario premier Dalton McGuinty [241].

[4.] Food Banks Canada was established to support the work of food banks in Canada. Members include the ten provincial food bank associations and their affiliated members. Food Banks Canada estimates that its member food banks and affiliated agencies serve 85 percent of individuals seeking food assistance in Canada. Food Banks Canada programs include facilitating the donation of large volumes of food from corporate partners, education and awareness campaigns and food safety campaigns, as well as research and policy reports [124]. Of note is that Food Banks Canada is not responsible for coordinating or harmonizing food bank operations.

[5.] Marginal food insecurity is a designation used to distinguish households that have answered no questions affirmatively on the scale (food secure) from those just below the moderate food-insecurity range. Though not used for monitoring food insecurity, there is growing evidence that households that answer one question affirmatively on the HFSSM are significantly different from households that answer no questions affirmatively [242]. They share characteristics with moderate and severe food-insecure households such as low income, and also have poorer physical and mental health.

[6.] As was expected, most households that were food secure simply stated that they did not need to use a food bank in response to the question probing reasons for non-use in the past 12 months.

[7.] It is important to note that though individual food banks and food cupboards can be members of larger food bank agencies, operations tend to be determined at the level of the individual food bank. This results in highly variable operations across food banks. For example, food banks may differ with regard to eligibility criteria, intake process, number of times patrons can use their services, amount of food given out at one visit, and number of hours they are open per month or week.

[8.] Invited donations listed on the Food Banks Canada website include the following: non-perishable food close to the best before date, incorrectly labelled foods, misprinted packaging, damaged and imperfect items, and bulk ends; outdated promotional items, discontinued products, special runs, packs where Purchase Orders have been cancelled, or other inventory to be cleared

out; incorrectly weighed or measured foods that cannot be resold; and product returns or shipping errors that require pick-up [243].

9. On 2 April 2010, Agriculture and Agri-Food Canada announced the investment of more than $850,000 for a food safety training program for Food Banks Canada [244].

10. "Food sharing" refers to the practice of provincial and national food bank associations of collecting large industrial donations and distributing them to food banks regionally.

11. In the United States, the Emergency Food Assistance Plan (TEFAP) is administered through the federal government in conjunction with State Distributing Agencies, who are responsible for the distribution of the food to community-based food organizations [245]. In the EU, the "Food Distribution programme for the Most Deprived Persons of the Community" (MDP) has involved the purchase of surplus stocks and market foods for distribution to member states for local distribution to organizations working directly with the "least fortunate people of our society" [246].

12. In this study population, compromises in housing quality were concomitant with food insecurity. Almost half of families lived in crowded housing and one-fifth lived in housing in need of major repair [232].

Table 7.1 Study Population Household Characteristics (*N* = 371).

	Median	Interquartile Range
Household income ($)	23,672	17,757–32,960
Income as percent of low income cut-off (%)	77.3	60.2–99.8
	n	%
Household type		
Two-parent	151	40.7
Lone mother	208	56.1
Lone father	12	3.2
Highest source of income in past 12 months		
Employment	199	53.6
Welfare	70	18.9
Disability support	22	5.9
Government transfers [a]	62	16.7
Other	18	4.9
Received welfare payment in past year	137	36.9
Recent immigrant (≤ 5 years ago)[b]	60	16.2
Respondent education		
Some or completed post-secondary	166	44.7
High school	125	33.7
Less than high school	80	21.6
Number of children		
0	11	3.0
1	129	34.8
2	120	32.4
3	76	20.5
4+	35	9.4
Food security status		
Food secure	94	25.3
Marginally food insecure	47	12.7
Moderately food insecure	118	31.8
Severely food insecure	112	30.2
Used a food bank in past 12 months	84	22.6
Frequency of food bank use		
1–2 times	31	8.4
3–5 times	23	6.2
6–9 times	10	2.7
10–12 times	20	5.4

[a] Includes national and provincial Child Benefits, Government Sales Tax credits, Unemployment Insurance, and Workers' Compensation.
[b] Respondent, respondent's partner, or both immigrated ≤ 5 years ago.

Table 7.2 Household Characteristics in Relation to Food Bank Use (*N* = 371).

Household Characteristics	Did Not Use Food Bank (n = 287)	Used Food Bank (n = 84)	Adjusted OR [a] (95% CI)
Food security status, *n* (%)			
Food secure	88 (94)	6 (6)	1.00
Marginally food insecure	42 (89)	5 (11)	1.48 (0.30–7.22)
Moderately food insecure	89 (75)	29 (25)	3.21 (1.26–8.18)
Severely food insecure	68 (61)	44 (39)	3.75 (1.18–11.90)
12-month income [b] (mean ± SE)	28,339 ± 631.90	20,843 ± 1,180.78	1.19 (1.11–1.26) [c]
Received welfare**,** *n* (%)			
No	209 (89)	25 (11)	1.0
Yes	78 (57)	59 (43)	3.19 (1.52–6.70)
Immigrated ≤ 5 years ago, *n* (%)			
No	232 (75)	79 (25)	1.0
Yes	55 (92)	5 (8)	0.37 (0.16-0.85)
Household type**,** *n* (%)			
Two-parent or lone father	142 (87)	21 (13)	1.0
Lone mother	145 (70)	63 (30)	0.59 (0.25–1.39)
Baseline education of respondent**,** *n* (%)			
Some or completed post-secondary	142 (86)	24 (14)	1.0
High school	97 (78)	28 (22)	0.86 (0.29–2.57)
Less than high school	48 (60)	32 (40)	1.33 (0.59–3.01)
Have children ≤ 3 years old, *n* (%)			
No	206 (77)	62 (23)	1.0
Yes	81 (79)	22 (21)	0.90 (0.48–1.66)

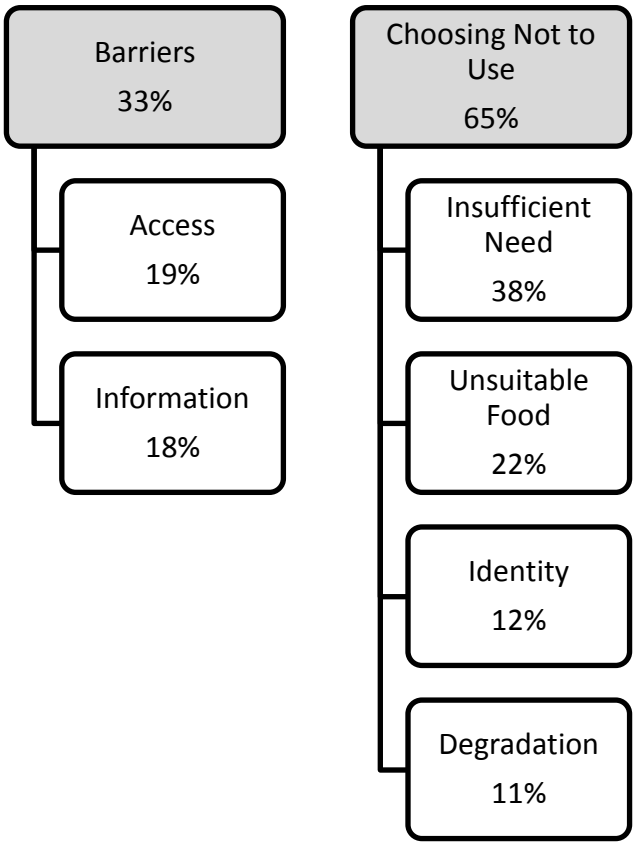
[a] Logistic regression model adjusted for variables in table, number of adults and children in household, receipt of housing subsidy, and clustering effect of neighbourhood.
[b] Income means adjusted for number of adults and children in household.
[c] Income OR refers to a $2,000 decrease in income.

Table 7.3 Relationship between Severe Food Insecurity and Food Bank Use over Two Years (*N* = 371).

	Severely Food Insecure			
	Not at Either Interview	No Longer at Follow-Up	Newly at Follow-Up	At Both Interviews
Food bank in past 12 months				
None at baseline or follow-up (*n* = 256)	74.2%	6.3%	7.4%	12.1%
Baseline, not at follow-up (*n* = 31)	35.5%	6.5%	12.9%	45.2%
Not at baseline, newly at follow-up (*n* = 30)	40.0%	3.3%	13.3%	43.3%
Both interviews (*n* = 54)	37.0%	13.0%	9.3%	40.7%

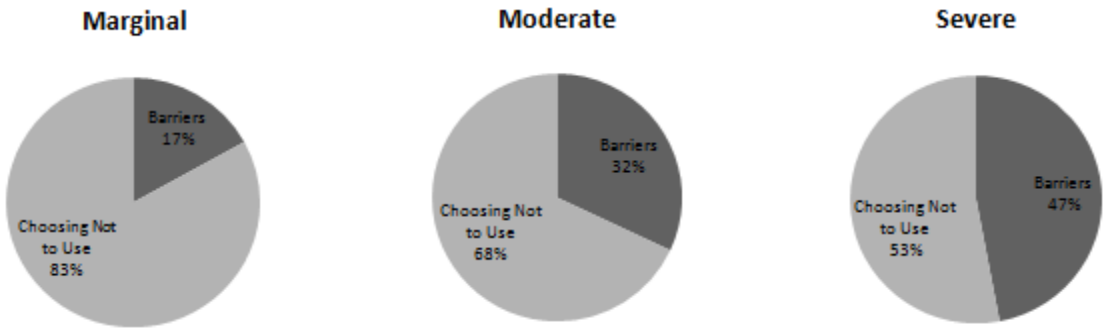
Numbers in brackets are sample sizes for the rows. Cells denote row percentages. Due to rounding, numbers do not sum to 100%.

Figure 7.1 Food Insecure Families' Reasons for Not Using Food Banks (*n* = 199).



Notes: Percentages are mutually exclusive for overall themes but not for underlying categories (i.e., more than one reason provided). Four respondents (2 percent) did not answer the question.

Figure 7.2 Reasons for Not Using Food Banks by Food Insecurity Status.



$\chi^2 = 14.8$ $p = 0.0006$

8 STUDY 5: PERSPECTIVES ON COMMUNITY GARDENS, COMMUNITY KITCHENS AND THE GOOD FOOD BOX PROGRAM IN A COMMUNITY-BASED SAMPLE OF LOW INCOME FAMILIES

Reproduced from: Loopstra, R. and Tarasuk, V. Perspectives on community gardens, community kitchens and the Good Food Box program in a community-based sample of low income families. Canadian Journal of Public Health. 2013. 11(1): E55-E59.

Abstract

Objective: Growing recognition of the problem of household food insecurity in Canada has meant public health practitioners are looking for effective ways to ameliorate this problem in their communities. Community gardens, community kitchens, and food box programs can offer nutritious foods for comparably lower costs, however, the uptake and perceptions of these programs in populations at risk of food insecurity have not been evaluated. Building on a previous finding of low program participation among 485 families living in high poverty neighbourhoods in Toronto, the objective of this study was to understand reasons for non-participation. **Methods:** One year after the baseline study, 371 families were interviewed a second time and were asked to provide their reasons for not participating in community gardens, community kitchens, or the Good Food Box program. Responses were analyzed by inductive content analysis. **Results:** At follow-up, only 12 families had participated in a community garden, 16 in a community kitchen, and four in the Good Food Box program. Reasons for non-participation grouped under two themes. First, families expressed that programs were not accessible because they lacked the knowledge of how or where to participate or because programs were not in their neighbourhoods. Second, programs lacked fit for families, as they were not suited to busy schedules, interests, or needs**. Conclusions:** This study provides unique perspective on participation in community food programs among food insecure families and suggests that these programs may not be effective options for these families to improve their food access.

Key Words: food security; low-income; poverty; Canada; public health

8.1. Introduction

In 2007-2008, 7.7% of Canadian households were moderately or severely food insecure, indicating that they had experienced qualitative and quantitative compromises in their food intake or reduced food intake and disrupted eating due to financial constraints [178]. Household food insecurity has been associated with heightened nutritional vulnerability among adolescents and adults [30], and poor health outcomes among children [82]. Growing recognition of the seriousness of this problem has led to calls for social policy reforms to address the income inadequacy that underlies food insecurity [247, 248], but at the same time public health practitioners struggle to find effective interventions that can be mounted at the community level [156]. In response to an identified need to provide public health practitioners with evidence on strategies to address household food insecurity, the Public Health Agency of Canada recently added food security to their Canadian Best Practices Portal, where they reviewed studies to assess the available evidence on the impact of collective kitchens, community gardens, and the Good Food Box program on household food security [156]. While these programs have other health promotion goals, they are widely promoted by provincial and municipal public health bodies [e.g. 237, 249, 250], community health centres [251], and Dietitians of Canada [154], as programs that people who are facing food shortages can use to obtain healthy food at comparably lower costs.

Program evaluations [e.g. 153, 252] and peer-reviewed publications [140, 148, 149, 151, 253] have provided some insight into the benefits of these programs for participants, however, this work is limited by a lack of objective pre- and post-test measures, low sample sizes, and provision of insight only from the perspective of regular program users and program coordinators [254]. Exclusively capturing feedback from participating individuals and program operators precludes evaluation of program reach and potentially biases samples to only include those that derive the most benefit from participation. Additionally, there remains a lack of rigorous research on the ability of these programs to improve food access [254]. As public health practitioners continue to search for effective ways to ameliorate the food insecurity of people in their communities, it seems imperative to capture perspectives on these programs from people who are experiencing problems of food insecurity to evaluate the potential for this type of programming to reach and impact this population.

In 2005, we initiated a study of low income tenant families in Toronto using a community-based sampling approach to examine the relationships between household and community characteristics and household food insecurity [36, 69, 101, 103]. We found a 65% prevalence of food insecurity in this sample of 485 families, but less than 5% of families participating in community gardens and community kitchens, and no evidence that food insecurity was related to program proximity [36]. These findings prompted the addition of open-ended questions to a second interview conducted one year later to explore reasons for non-use and additional measurement of participation in the Good Food Box program. The analysis of these data extends the baseline exploration of community food program use in high poverty neighbourhoods in Toronto with the objective to understand reasons for non-participation.

8.2. Methods

Families with gross incomes at or below Statistics Canada's mid-income adequacy category, living in subsidized and non-subsidized rental housing, were recruited into the baseline study population through door-to-door sampling in 12 neighbourhoods randomly selected from the 23 'high poverty' census tracts in Toronto [217]. Between November 2006 and April 2008, approximately one year after the baseline interview, families were re-interviewed. The study was approved by the Human Subjects Research Ethics Board at the University of Toronto.

A total of 501 families were recruited into the baseline study population, reflecting a recruitment rate of 62% of eligible families contacted [101]; 384 completed the follow-up interview, a return rate of 77%. Thirteen families were later excluded from the sample because closer examination of their baseline income deemed them ineligible according to original criteria, therefore a total of 371 families made up the follow-up study sample.

Study interviewers, who themselves had experiences of poverty and food insecurity, were trained in interviewing methods and conducted a structured oral interview with the person in the household primarily responsible for household food purchases and management [101]. Data collected in the baseline and follow-up study included household income, demographics, food purchasing, household food insecurity (measured by the HFSSM [17]) as well as information on household participation in community gardens, community kitchens and the Good Food Box program, a subsidized fruit and vegetable food box program particularly focused on providing fresh produce to low income communities in Toronto [255]. Data from the baseline study that

mapped locations of community garden and kitchen programs operating in Toronto relative to study participant addresses [36] were used to provide insight on participation relative to program proximity.

The follow-up questionnaire included three open-ended questions aimed at each food program of interest (i.e. community gardens, community kitchens, Good Food Box program), which asked respondents who reported no use of a program "why have you or anyone in your family not used a [food program] in the past twelve months?" Study interviewers were instructed to record the responses verbatim. Because these questions were posed in the middle of lengthy survey, probing for clarification or further meaning was not part of the interviewing protocol. Thus, the answers provided were short, unprompted statements made by study participants.

Responses to each question were analyzed separately for each type of program by inductive content analysis [256]. This method of analysis was selected because the responses contained limited content, which suited a quantitative summary of the types of reasons provided by respondents. The analysis was done by the lead author, who has training in qualitative research methods. Open coding and multiple passes through the data resulted in the creation of small content categories, which were subsequently grouped under common categories and broader themes. The fit of categorization with the original responses was examined by members of the research team, ensuring that the range of responses was adequately captured.

8.3. Results

The characteristics of the follow-up study population are presented in **Table 8.1** and highlight the low income nature of the study population and disproportionate representation of immigrants and lone parent families in the low income population in Toronto [257]. As found at baseline, there was a very high prevalence of household food insecurity in the study population. The vulnerability in this sample was also underscored by the number of families that reported strategies to increase money available for food, such as delaying bill and rent payments.

Consistent with baseline findings, very few study participants reported participation in community food programs in the past 12 months at the follow-up interview. Of the 371 families in the follow-up study, only 12 families (3.2%) indicated that someone in their household had participated in a community garden, 16 (4.3%) indicated participation in a community kitchen,

and only four families (1.1%) had used the Good Food Box program. The low number of families participating in these programs precluded an ability to analyze food insecurity status and other household characteristics by participation, but we observed that the prevalence of household food insecurity was the same among households participating and not participating in these programs. The rates of participation in community kitchens and gardens were equally low among families living within 2 km of programs compared to those living farther from programs (data not shown).

Comparisons of emergent content categories for the three program questions showed that two common themes summarized the reasons families gave for not participating in programs: 1) Programs not accessible and 2) Lack of program fit. The data are quantitatively summarized into the themes and underlying categories in **Figures 8.1-3**, which show how families responded to each program question. Because families could provide more than one reason for not participating in a program, percentages add up to more than 100%.

The inaccessibility of programs was highlighted by study participants sharing that they had no knowledge of programs, did not know where they were or how to participate in them, or that a program was not offered in their neighbourhood. Most study participants had never heard of the Good Food Box program (Figure 8.3), but community kitchens and community gardens were also unfamiliar to many families (Figure 8.1 & 8.2). Families also indicated they lacked the knowledge of programs details needed to participate. For example, one study participant said "I have heard of the Good Food Box program, but I don't know how to get into it." (Respondent (R) 1343). Another said: "I don't know of any community gardens around here." (R1060). Other barriers to access identified less frequently were program fees, not fitting eligibility criteria, and programs being at capacity. For example, one respondent said in response to the community garden question: "We tried to get involved last summer but it was full; all the plots were taken" (R1437).

The lack of program fit was illustrated by respondents indicating how characteristics intrinsic to programs did not accommodate or encourage participation in them. For example, many families spoke about how community gardens and kitchens were incompatible with their busy lives. This was illustrated in the following quote: "I'm hardly at home. I work five days per week, spend

one day for shopping and chores, and have one day to spend with my daughter" (R1408). Numerous families simply stated that they did not have time to participate.

Programs were also not compatible with the study participants because of health issues. For example, in response to the community garden question, one respondent shared: "I'm in too much pain with arthritis to plant even flowers" (R1484).

Others spoke about program characteristics that made them unappealing and about how programs were misaligned with their interests. They spoke of disliking sharing communal space to garden or cook, having to work alongside strangers or people they did not get along with, and not being interested in gardening or cooking activities. In relation to the Good Food Box program, participants spoke about their dislike of not being able to make their own food choices.

Families did not appear to relate these programs to their food needs, as they rarely expressed a lack of food need driving their non-participation. Rather, they spoke of a lack of need for what the program offered, for example, communal cooking space, communal gardening space, or pre-selected fruit and vegetables. One respondent expressed this as, "I cook in my home; I like my meals at home" (R1184). Another respondent said, "We don't need programs and advice, we need money. We buy for ourselves what we find necessary" in response to the Good Food Box question (R1234).

8.4. Discussion

This study uniquely offers insight into the uptake of community food programs in high poverty neighbourhoods in Toronto, highlighting low rates of participation and two major reasons for non-participation: programs were not accessible and they did not fit with the needs, interests and lives of our study participants. These findings suggest that these types of programs may not be effective ways to reach low income families.

Our findings add support to the concerns about community food program accessibility and impact raised in other studies [140, 149, 153, 248, 254, 258]. Limitations are rooted in the current ad hoc nature of community food programs, in that they tend to be small-scale programs arising at the community-level, with limited and/or short-term funding and reliance on volunteers, and thus are inherently limited in capacity [140]. Participants in our study could have lacked information about programs operating in their neighbourhoods because program operators

were constrained in ability to conduct outreach or expand programs to accommodate more participation. It is also possible that program recruitment and outreach methods used at the time of study were ineffective or targeted toward a different group.

We cannot know whether families who reported a lack of knowledge or absence of programs in their neighbourhoods would participate if these barriers were overcome. There was no relationship between proximity to community kitchen and community garden programs and program participation, suggesting that distance from programs was not a driver of participation. Importantly, we observed that these programs did not resonate with many families in our sample, as indicated by responses that fell into the lack of fit theme. This raises a question about what can be gained by program expansion. When we examined the ratios of families participating in programs to those that described how a program did not fit for them, we observed that for every family participating, there were 12 who expressed that a community garden would not work for them, 9 who expressed that a community kitchen would not work for them, and 9 who expressed that a the Good Food Box program would not work for them. Based on these numbers, we could surmise that if all families in the sample had information and a program available, no more than 10% would participate, though this could be an underestimate if other reasons not expressed were underlying the 'Not accessible' theme (see below).

These findings highlight the importance of designing programs to match the needs and interests of low income, food insecure populations, while taking into account the demands facing these households as they struggle to manage scarce resources [103], plus childcare, single parenting, chronic health conditions, and employment. It is important to recognize that over half of food insecure households in Canada are reliant on wages and almost half of food insecure families are led by single parents (authors' calculation from [178]). With the growing interest in community garden, community kitchen, and Good Food Box programs across Canada, we would caution against assumptions about relevance of these programs to food insecure individuals and families. While these programs aim to offer an alternative to charitable food assistance, something that was equally rejected by families in our study population [183], these findings highlight that community food programming may not be an accessible or efficient way for these families to meet their food needs.

This study captured perspectives on community food programs among a large sample of food insecure families, allowing us to characterize the full breadth of reasons for non-participation and reach saturation in our study population (i.e. no new reasons were emerging by the end of the analysis). However, the short answers provided by participants may not be their only reasons for not participating; in-depth interviews would have provided richer detail and could have resulted in different quantitative balance of reasons for not participating. For example, it is possible that stating a lack of information about programs was an easy response for families to give, but with greater probing, other issues could have been raised. Future in-depth studies on who is reached and not reached by community-based programming are needed to fully understand the impact of these efforts. Another limitation of the findings of this study is that the experiences of families in this study population may be place-specific, reflecting neighbourhood characteristics and organizations running community food programs in Toronto. Having in-depth data on the nature of programs operating in the area and current outreach activities would have provided important contextual information by which to evaluate study participants' responses. Interestingly, a study of a small, purposive sample of food insecure, low income households in Quebec City [220], found that among the households who did not participate in any kind of community food program (including food banks), the reasons for non-participation were consistent with the themes that emerged from this study: accessibility and information barriers and a disconnect of need and interest with what the programs offered.

This study stimulates consideration of program reach, accessibility, efficiency, and equality, for programs aimed at increasing food access for low income families, and importantly highlights the difficulty for public health practitioners to meaningfully address issues of household food insecurity in their communities. Options available for Canadians facing food shortages lie exclusively at the community level: charitable food assistance and community food programs. The limited potential of the former to mitigate food insecurity has been underscored numerous times [183], but similar limitations of community food programs have been highlighted [140, 220, 248], and were reflected in the responses given by study participants in this study. In light of the scale and gravity of household food insecurity in Canada, there is an urgent need for public policy to address the underlying issue of poverty.

Table 8.1 Study population household characteristics (n=371).

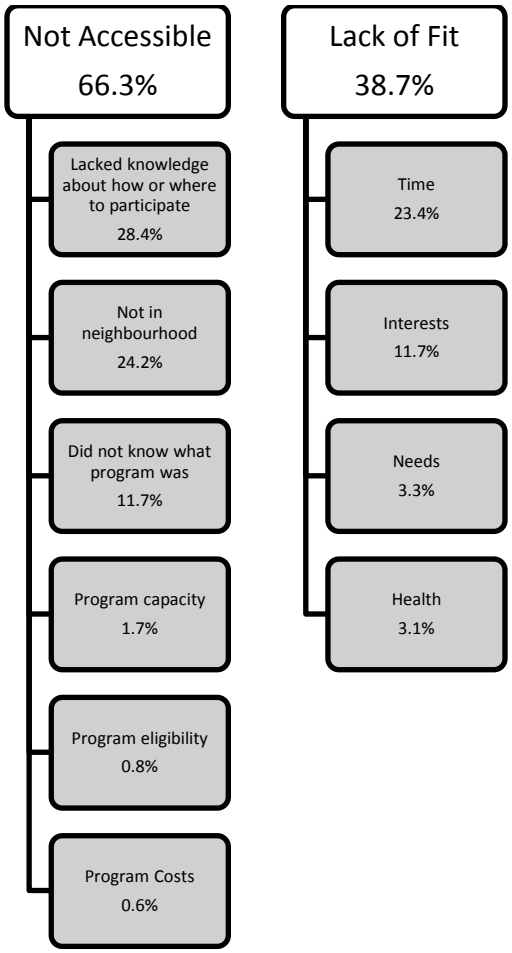
	Median	IQR
Household income ($)	23672	17757-32960
Income as percent of low income cut-off (%)	77.3	60.2-99.8
	n	%
Household type		
Two-parent	151	40.7
Lone mother	208	56.1
Lone father	12	3.2
Number of children < 19 years of age		
0	11	3.0
1	129	34.8
2	120	32.4
3	76	20.5
4+	35	9.4
Highest source of income in past 12 months		
Employment	199	53.6
Ontario Works	70	18.9
Ontario Disability Support Program	22	5.9
Government Transfers†	62	16.7
Other	18	4.9
Immigration‡		
≤ 5 years ago	60	16.2
≤ 10 years ago	77	20.8
≤ 20 years ago	114	30.7
21+ years ago	48	12.9
Born in Canada	72	19.4
Respondent education		
Some or completed post-secondary	166	44.7
High school	125	33.7
Less than high school	80	21.6
Lived within two kilometers of community garden(s)		
No	126	34.0
Yes	245	66.0
Lived within two kilometers of community kitchen(s)		
No	200	53.9
Yes	171	46.1
Food security status		
Food secure	94	25.3
Marginally food insecure	47	12.7
Moderately food insecure	118	31.8
Severely food insecure	112	30.2
Delayed rent to pay for food	108	29.1
Delayed bill payment to pay for food	190	51.2
Gave up phone, TV, or internet services to pay for food	113	30.5

Used a food bank in past 12 months	84	22.6

† Includes National and Provincial Child Benefits, Government Sales Tax credits, Unemployment Insurance and Worker's Compensation.

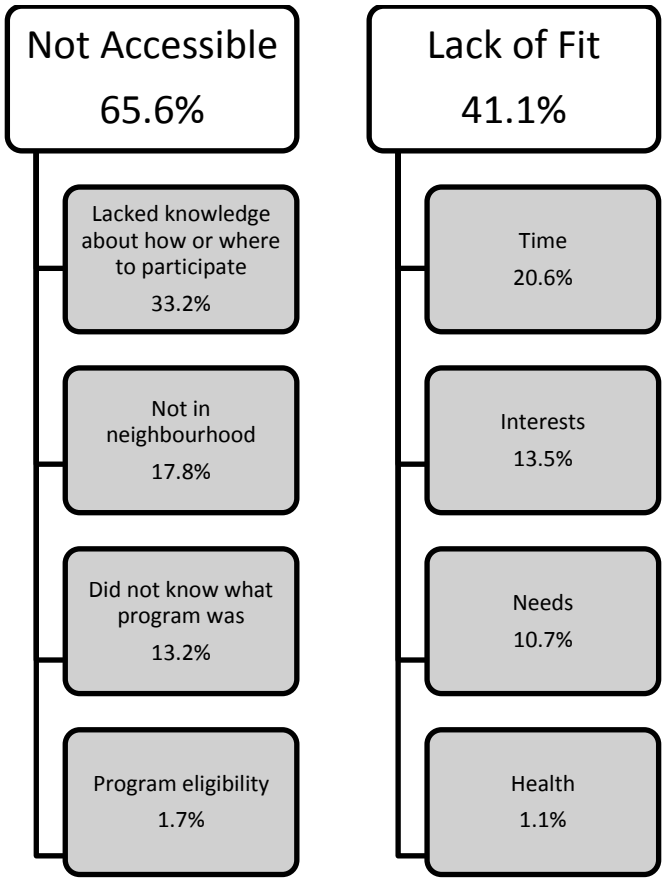
‡ Respondent, respondent's partner, or both immigrated or both partners were born in Canada.

Figure 8.1 Expressed reasons for not participating in a community garden in past 12 months among 359 families not using community garden program*.



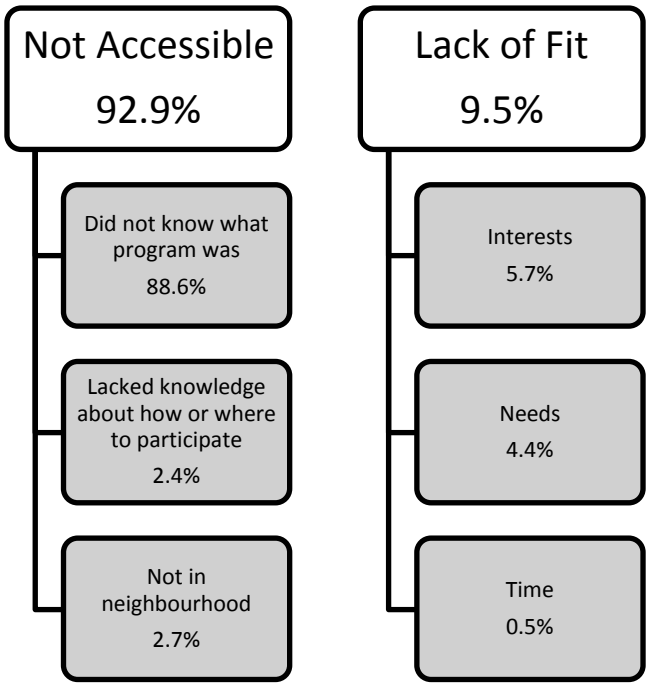
* Of the 359 families, 12 did not provide a reason for not participating in a community garden in the past 12 months.

Figure 8.2 Expressed reasons for not participating in a community kitchen in past 12 months among 355 families not using a community kitchen program*.



* Of the 355 families, 10 did not provide a reason for not participating in a community garden in the past 12 months.

Figure 8.3 Expressed reasons for not participating in the Good Food Box program in past 12 months among 367 families not using the Good Food Box.



9 DISCUSSION

9.1. Summary and Key Findings

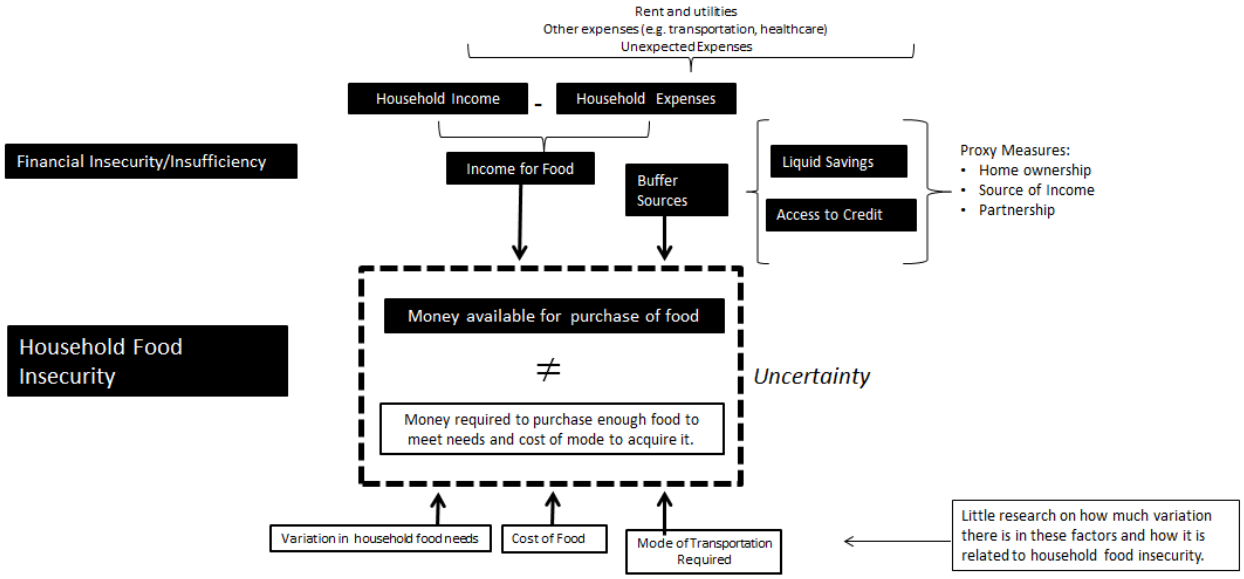
In 2011, 1.1 million children and 2.7 million adults were living in food insecure households. The characteristics that associate with the problem highlight that current public policies that make up the social safety net in Canada are not sufficient to ensure that families and individuals have the financial resources they need to ensure their food needs are met. Despite the magnitude of the problem and acknowledgement of food insecurity as a core determinant of health, reducing household food insecurity has not been the explicit goal of any public policy at the national or provincial level. Where there has been action targeting food insecurity, it has been at the community level, in the form of charitable food assistance and other community food programs. These responses continue to form the mainstay of actions targeting household food insecurity.

The studies contained in the previous chapters had the broad aim to critically contribute to the knowledge base needed to inform interventions aimed at reducing food insecurity in Canada. The frameworks used in Chapter 2 are presented again (Figures 9.1 and 9.2) to illustrate how study findings advance understanding of the experience and its determinants and the limitations of community food programs in relation to the core construct of food insecurity.

Study 1 focused on understanding the impact of income and employment fluctuation on severity of household food insecurity. Though the relationship between low income and other characteristics that indicate financial vulnerability in Canada (i.e. reliance on social assistance, single motherhood, Aboriginal status, renting one's dwelling, and compromised health, as indicators of lack of assets and access to credit, competing household expenses, persistent low income, and income insecurity) have been well-established using cross-sectional data from the CCHS, examining how changes in income and employment translate into changes in food insecurity is important for understanding the potential of interventions in these domains to impact the circumstances of food insecure households. The design of this study is of particular importance. Because of the short follow-up period, it is likely that factors that offset the sufficiency of household incomes highlighted in **Figure 9.1** would have remained constant (e.g. amount of money required to meet household needs, availability of buffer sources, and other household expenses). Whatever these circumstances were for families, changes in income and employment were associated with changes in severity of food insecurity, with positive changes

associated with amelioration, and negative changes associated with deterioration. The independence of employment from income suggests that employment impacted food insecurity beyond income. This could have related to other aspects of financial security and sufficiency outlined in Figure 9.1 such as reducing household expenses if employment included access to extended healthcare and dental care coverage or enhancing ability to save and access credit.

Figure 9.1 Determinants of Household Food Insecurity Framework.

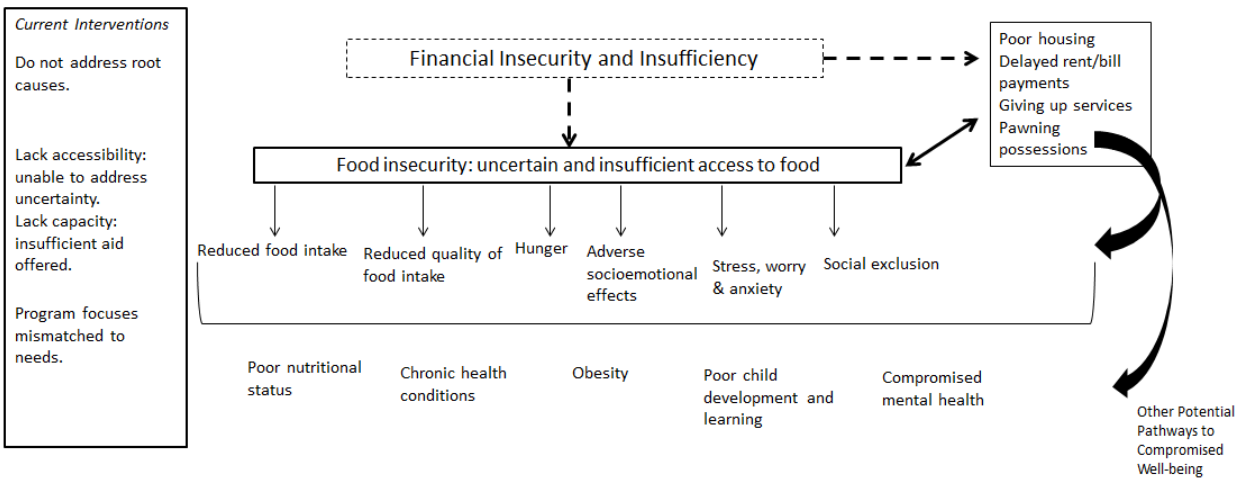


The patterning of who experienced gains of employment and income in Study 1 also informs the framework outlined in Figure 9.1 by suggesting drivers of financial security and sufficiency. The characteristics associated with gains in income and employment suggested that the presence of only one adult in a household disadvantaged households' ability or chances of increasing income or gaining more (or any) fulltime employment, as did having less than post-secondary education. Given the role of the market in determining who gains employment and the wages awarded for different types of work, these findings suggest an important role for government in ensuring that earned incomes are sufficient and secure and providing sufficient incomes for individuals who are not able to work or unable to garner enough work.

Study 2 focused on developing a better understanding of what it means to be at different points along the food insecurity spectrum. The findings provided validation that the food insecurity scale captures increasing hardship for families, highlighting that food insecurity should not be

considered a uniform experience. This has implications for the research community with respect to understanding potential consequences, but also for the design of interventions because the potential for an intervention to impact the well-being of food insecure individuals will depend on the broader context within which food insecurity occurs and the severity of their experiences. In **Figure 9.2**, the framework for the construct of food insecurity is presented with the findings from Study 2 added. It highlights that the relationship between severity of food insecurity and other indicators of financial hardship is indicative of a context of financial insecurity and insufficiency, as this underlying factor can manifest in hardship in domains other than food. As the experience of food insecurity became more severe, suggesting more profound financial lack, the probability that households reported delayed rent and bill payments, having to give up services, and an inability afford enough fruit, vegetable, and milk to meet household needs, rose. Figure 9.2 also indicates how intervention focused on amelioration of possible outcomes of food insecurity may not lead to reduction in potential outcomes associated with food insecurity if these outcomes arise from or operate through pathways other than food consumption, arising from financial insecurity directly manifesting in worry and anxiety and in hardship in other domains that compromise health.

Figure 9.2 Construct of household food insecurity with overlay of study findings.



Study 3 examined food insecurity in relation to obesity, one of the most prominent public health issues in Canada. Evident in public health literature is an emphasis on overlapping problems of poverty, food access, poor dietary intakes, and obesity, and programs framed to simultaneously

address these issues feature as part of public health strategies. However, the actual overlap between these problems has undergone little examination in the Canadian population. The counterfactual findings of this study are of particular importance for characterising the experience of food insecurity: obesity was not a co-occurring problem for most food insecure individuals. This observation reinforces the presentation of the construct in Figure 9.2, where health outcomes could potentially arise from the manifestations of food insecurity, but do not define the experience. Interventions focused on conjointly addressing food insecurity and obesity tend to be community food programs aimed at improving diet quality. Insofar as obesity may be a hardship that co-occurs with food insecurity because of association with mood disorders, as suggested by the study findings, these interventions may be misplaced. Further, the other ways that food insecurity can manifest (i.e. in feelings of stress and anxiety) suggest multiple ways food insecurity can lead to poor health outcomes, highlighting a need to address root causes of the experience. Since compromised diet quality may not be a manifestation of food insecurity, action at this level may not be applicable to food insecure families and individuals.

Studies 4 and 5 highlighted the little relevance that community food programs had for families experiencing food insecurity. As already highlighted, the focus of interventions on the potential manifestations of food insecurity, namely abating acute experiences of hunger, improving fruit and vegetable intake (Figure 9.2), and encouraging social interaction, may underlie the disconnect between these programs and the problem of household food insecurity. For families experiencing marginal and moderate food insecurity, food banks were predominantly viewed as something they did not need. Studies among food bank operators have shown that they tend to emphasize quantitative deprivation, by seeing the assistance they offer as emergency relief from a crisis of hunger, making sure no one "starves", and "ensuring that at least everyone gets something" [125, 146, 221]. If individuals are not experiencing food deprivation, but are experiencing worry that their food supplies will not last and are making modifications to their food choices and intake patterns, the "last resort" offerings of food banks can do little to address these concerns [123]. Further, the findings from Study 4 suggested that self-management of the household food supply, even in the context of hardship, was important, evident in responses that highlighted the poor quality of foods available at food banks, rejection of charity, and statements emphasizing an ability to manage one's own food constraints. These findings suggest that a

response to household food insecurity should enable families to manage household food resources autonomously.

Further the tenuous nature of aid offered through food banks observed in families' reports of being unable to received assistance highlights that little security is offered by a system defined by reliance on donated food and labour (Figure 9.2). The lack of accessibility and poor quality of food offered at food banks meant that food banks were also not an accessible or utilized response by families in severe circumstances. Families who were severely food insecure were more likely to use food banks, but the recurrence of severe food insecurity among these families highlighted that even the most basic needs of not experiencing hunger were not met by this type of assistance. Though food banks may strive to offer protection from quantitative deprivation, even this goal is unrecognized. Additionally, as observed in Study 2, many families were experiencing hardships in other domains, especially those in the severe end of the food insecurity spectrum. Even if food bank assistance could offer some amelioration of food deprivation, they can do little to abate the experiences and consequences of bill arrears, poor housing, and going without services. Improving the well-being of families without sufficient finances for food must also be able to address other potential outcomes of inadequate household finances.

Study 5 highlighted that alternative food programs were not used by the overwhelming majority of families in the study population. The lack of resonance or appropriateness of these types of programs for food insecure families was evident in their responses, which highlighted the disconnect of what programs offered from the families' interests and needs. As observed for food bank use, obtaining any benefit from programs was highly contingent on knowledge of programs and ability to use. In light of what is known about the magnitude of the problem of food insecurity, these programs are not an efficient way to reach individuals with insufficient food access. Given the vulnerability of this population in multiple domains of well-being and seriousness of the problem of food insecurity, there is also an ethical question of whether one's ability to obtain sufficient quality and/or quantity of foods should be made contingent upon ability and willingness to use community food programs. This is especially true given the absence of evidence showing that participation and use of these programs can meaningfully impact dietary intakes, let alone other aspects of well-being in the face of ongoing realities of insufficient financial resources to meet household needs.

Next, are reflections on these findings in relation to two broad debates: is food insecurity different than poverty, and relatedly, what should intervention look like?

Is food insecurity different than poverty?

Returning to the concept of food insecurity

Since definitions of household food insecurity first emerged, confusion about what is meant by the concept has been evident. First, the importance of distinguishing the measure from income-based measures of poverty to provide impetus for its monitoring has possibly served to isolate the experience from the concept of poverty, rather than lead to its interpretation of a direct measure of poverty. The development of the concept of food insecurity within the nutritional sciences field, where it was first named as a core indicator of nutritional status, and interest in its ability to act as a marker of nutritional status, resulted in a research field that has primarily been located within nutrition. As such, interventions aimed at ameliorating food insecurity have focused on improving dietary quality and quantity, and food insecurity is often viewed as a problem of insufficient food availability or a result of inadequate food skills [106]. Lastly, communities have desired to respond to the problem but are limited by the type of responses that can be enacted at the community level, which has meant that responses have taken a form focused on potential consequences of the problem, quantitative deprivation or low diet quality. Authors have discussed a reciprocal nature to the way food insecurity came to be defined and the responses that developed. Poppendieck observed that hunger came to be recognized as a problem in the Unites States when the availability of a 'solution' in the form of surplus food became apparent, and thus, the problem of insufficient finances to meet basic needs, became typified as hunger which could be responded to through emergency food [259]. Findings from ethnographic studies of food bank operations have highlighted that volunteers [125] and food program organizers and funders [221] tend to focus on the quantitative deprivation as the problem necessary to intervene upon and see their role as ensuring that individuals at least have "something" to eat [221]. Similarly, the ability of organizations to garner support and funds for activities that reduce social isolation, promote food skills, improve healthfulness of diets, and that bring "good food" to places perceived to be desolate [260], have possibly contributed to food insecurity being conceptualized as a problem of low social support, food skill deficits, and poor diet quality.

The studies contained in this thesis serve to highlight that food insecurity is a manifestation of financial insufficiency and insecurity. The financial vulnerability underpinning experiences of food insecure families was highlighted by the association of food insecurity with financial hardships in other domains, such as compromised bill payments and poor housing. The observation that severity of food insecurity diminished when employment and incomes improved also reinforces that food insecurity is located within financial well-being of families.

Food insecurity is not equivalent to income-based poverty, but this does not mean it isn't a measure of poverty.

Low income in Canada is defined by comparing household annual incomes to income thresholds variously defined by two relative measures, the Low Income Measure (LIM) and the Low Income Cut-Off (LICO), and one absolute measure, Market-basket Measure (MBM) [172]. Food insecurity is not ubiquitous below any of these income-based low income thresholds, even at incomes only at 50% of the low-income lines, and a significant proportion of households that are food insecure have incomes above low income lines. Rather than suggest that food insecurity is a separate construct from poverty, however, this disconnect serves to highlight that annual income measures are insufficient to capture the material well-being of the Canadian population. The disconnect between income-based measures of poverty and food insecurity have been highlighted many times based on data from the United States [77, 79]. While low income puts individuals at much greater risk of experiencing food insecurity, there is only a weak linear relationship between income-based measures of poverty and food insecurity. Correlation coefficients are usually in the range of 0.2-0.4. The weak correlation can in part be attributed to the difficulty of obtaining accurate data on income, but also highlights how annual income measures fail to take into account lack of access to financial resources that can protect from financial shocks (i.e. savings and credit), between household variation in expenses, debt, and within year income variation [79, 94].

Definitions of poverty are highly contested, and it is widely acknowledged that no single measure provides a complete picture of economic well-being [77]. Food insecurity is a direct measure of lack of finances needed to acquire a resource required to maintain well-being, and thus it is a measure of absolute poverty. Other conceptualizations of poverty broaden the definition to capture the lack of ability to participate in activities that allow for meaningful

participation in society, have material resources that are the norm for others in the population, and incomes that are not highly disparate from the population median [78]. Measures used to capture inequality and social exclusion have highlighted that these are also important constructs for population well-being. Food insecurity is an absolute measure, and meeting a goal for food security alone in a population would not mean that individuals do not lack other material resources for health and well-being. However, ensuring the basic human right of access to food [211] should be a baseline target for population well-being. Developing policies that ensure food security for households is thus of great importance in Canada given the high magnitude of the problem.

What should intervention look like?

Interventions aimed at improving income and financial sufficiency and security.

The studies in this thesis suggest interventions that enhance households' financial ability to acquire the foods they need as well as meet other household needs and policies that provide security that they will be able to do so.

Moderate and severe food insecurity concentrates in the lowest end of the income distribution, and incomes falling well below market-based measures of low income are deemed objectively insufficient to meet household needs, thus, ensuring a basic level of income would likely address food insecurity for families who have incomes well-below low income lines. Most obviously, social assistance incomes across Canadian provinces fall well-below low income measures, and other income-transfer policies such as child tax benefits and working income tax benefits are not designed to meet basic income thresholds. Findings from Study 1 highlight that improvements in income associate with improved household circumstances, suggesting that improving incomes can make a difference for families' experiences of food insecurity. Providing a basic level of income security may also counter forces that compete for household finances such as debt and unexpected household expenses by promoting ability to save and anticipate availability of household financial resources (Figure 9.1). Steady, sufficient incomes promote ability to accumulate savings and access credit, which are important for smoothing household consumption [94].

Addressing household food insecurity above conventional low income lines means developing a more nuanced understanding of variation in costs of living and expenses that can diminish the sufficiency of incomes to cover household food needs. In the conceptual framework of determinants of food insecurity presented in Figure 9.1, variation in other household expenses and greater food costs are both positioned as potential reasons why the amount of income available for food is insufficient. Addressing the affordability of housing and food relative to household incomes could be one aspect of interventions.

Another aspect of the framework presented in Figure 9.1 is the role of financial insecurity in household food insecurity. As suggested by the findings in Study 1, reductions in income relate to exacerbations in food insecurity, suggesting that protection from income loss is important for preventing food insecurity. Policies that address insecurity of household finances would likely address acute experiences that arise from sudden income losses and the anxiety of not knowing if one will have secure income to meet needs from one month to the next.

Would scaled-up food programs address household food insecurity?

Inability to access food banks and other food programs emerged as a reason why families who were food insecure did not access these programs. This raises the question as to whether scaling up current programs to provide secure and accessible access to direct in-kind food assistance could be one way to enhance their effectiveness. However, even now, current levels of support able to be offered to the individuals that seek their support suggests little ability to ensure that even basic deprivation of food is addressed. In light of the magnitude of the problem of food insecurity in Canada an enormous amount of resources of both time and food would be necessary to make programs available to food insecure households to provide the type of support necessary for food insecure households, highlighting the inefficient nature of this type of assistance. In addition, the way in which families disassociated in-kind food assistance from their problem of insufficient finances for food in combination with knowledge of the other material hardships families were facing suggests that in-kind food assistance would remain to have little relevance for families who do not have sufficient finances to meet their household needs.

High-risk population interventions?

There may be some groups in the population that would benefit from targeted food-based interventions. These include individuals suffering from mental health disorders and/or drug addiction and those without housing, which may compromise ability to utilize financial resources to acquire food [33, 261]. Currently, charitable meal programs, food banks, and food offered through shelters, form the mainstay of support for these individuals. Given their vulnerability, it is essential that the support offered through such programs be accessible, reliable, and provide nutritional support needed to meet needs, features that have not been documented among studies of charitable meal programs or food banks [125, 128, 129, 185]. As a part of strategies to meet the needs of very vulnerable populations, in-kind food assistance must be dedicated part of funding and planning (Tyler Pettes, MSc Thesis, 2013)

Barriers to Intervention

As has been discussed by others, while the importance of economic resources for health and well-being is recognized in Canada, there has been a lack of political will and policy action to address this core determinant of health. Raphael and others [262] have argued that the dominance of neo-liberal ideology has been a key barrier, where health is ultimately viewed as a product of individual behaviours, in line with wider beliefs that social problems (e.g. unemployment, low income) are also the outcomes of individual deficits rather than outcomes of social, economic, and political structures. Poverty stigma has been documented in Canada, which reveals a societal tendency to blame individuals for financial insecurity, joblessness, and low income [263]. The societal acceptance of food charity and community food programs as interventions to improve food access for those with insufficient finances also suggest a tacit acceptance of the financial circumstances that underscore food insecurity. The tendency to individualize the problem of household food insecurity has been evident in programs focusing on self-help, which ultimately aim to help individuals cope better with limited finances, rather than challenge the structures that lead to financial insecurity [140].

9.2. Study Limitations

The body of work contained in this thesis uses quantitative methods to understand the experience of household food insecurity and effectiveness of interventions, and as such, relied on survey measures to gain an understanding of patterns of association. The use of the HFSSM enables the findings to be compared to other work that has used this measure, but has the potential to

misclassify families who did not identify with the experiences described or did not affirm responses for other reasons (e.g. shame, fear). Qualitative studies used to design the scale highlighted more elements of the experience than ended up as part of the measurement module, and it is possible that in-depth interviewing with study families would have revealed more insights into the experience than were able to be captured by the survey questions used. As already highlighted, in-depth interviews to allow for more fulsome understanding of non-use of food banks and community food programs would have enhanced understanding of the responses given. Further, future qualitative inquiry could explore the realm of interventions that families identify as important for ensuring their food security. To specifically inform debate about whether income-based or food-based programs would be most beneficial, deeper investigation into the co-occurrence of material hardships and how families use various financial resources to meet material needs when resources are scarce would provide insights for policy directions. Exploring how meeting needs in one area while others go unmet is also critical for understanding the impact of in-kind interventions on well-being and health.

The ability to examine temporal relationships between potential outcomes of food insecurity, impact of interventions, and predictors of within household change was limited by either cross-sectional data or the imprecision of a 12-month measurement period. In relation to the former, a recent study highlighted that chronic experiences of food insecurity manifest in greater likelihood of children having parent-rated poor health [81]. There is a lack of research documenting how persistence of food insecurity over time relates differently to adult health outcomes than more recent or transient experiences, and this was similarly a limitation of the analysis that examined food insecurity in relation to obesity, but chronicity may be important for understanding these relationships. Studies have also suggested that health conditions can predispose individuals to food insecurity, so examining temporality of relationships between food insecurity and health is important for informing interventions and needs more examination. The inability to examine food insecurity and other hardships over time also limited the analysis in Study 2. For some, food insecurity may represent an acute shortage of finances within a year and not be associated with longer term measures of hardship, while for others, chronic low incomes may mean measures have already been taken to reduce household costs (e.g. living in poor housing, going without services) and food insecurity arises after multiple compromises have been made [71].

The examination of the relationship between changes in severity of food insecurity measured over a 12-month period in relation to annual incomes and net employment gains or losses over the year meant the ability to ascertain the dynamics between these factors was limited. Month-to-month examination of household resources, use of strategies to prevent food depletion, and what types of resources offer households the financial security to know that they will not run out of food is necessary for developing a better understanding of vulnerability to food insecurity.

Similarly, summary measures of food bank use and food insecurity did not allow for the immediate benefits of food bank use to be examined. While the recurrent nature of food insecurity among food bank users highlighted that problems were not solved, they could have been ameliorated in the short-term. However, the relationships observed informed a larger question about what kinds of interventions lead to permanent transition out of food insecurity, and it did not appear that food bank use provided this security. Similarly, while we observed that income and employment gains were associated with household circumstances, long term effects on household food insecurity were not observed. There is a need for research to understand the conditions necessary at the individual and societal level that allow for long term household food security to be ensured, but this also speaks to the need to know more about the persistence and transience of the problem in the Canadian population.

The eligibility criteria and sampling strategy used to select the study population in Studies 1,2, 4, and 5 means that the study population was not reflective of the food insecure population in Canada, which restricts the ability to generalize study findings to the food insecure population in Canada. All households in the Toronto study were families with children under the age of 18. In the Canadian population, households with children under the age of 18 make up 38% of food insecure households (calculation from [19]).

The specific focus on subsidized housing families (recruited to be half of the study sample) could have skewed the study population toward a vulnerable subset of the food insecure population in Canada given the characteristics associated with entry into subsidized housing. Families with indications of greater vulnerability (i.e. living in subsidized housing, without any work) were also more likely to complete a follow-up interview (Appendix 2), which could have led to overestimation of the stasis of food insecurity. Unemployment and living in subsidized housing are characteristics that do not reflect much of the food insecure population in Canada. Over 65%

of the food insecure population has some income from employment (author analysis of CCHS 2011). There is not national data available on the intersection of subsidized housing and food insecurity in the population, but households living in rented accommodation make up 63% of food insecure households in Canada and in the general population, only 13.5% of renters live in subsidized housing units in Canada [264]. The market rent subset of the study population was more representative of the food insecure population in Canada.

Another characteristic of the study population was that all households lived in a large, metropolitan city. The experiences of food insecure individuals living within urban environments may be different than the experiences of individuals living in rural environments, but comparative analyses are necessary to test this hypothesis. Use of community resources could also vary by the characteristics of communities or the specific nature of the community food programs. However, cross-country characteristics of organizations running food banks have highlighted remarkable consistency in the defining features of operations, namely that they are highly variable, offer limited services highly dependent on volunteer labour and food donations, and that all struggle to meet the needs of people who use their services (V. Tarasuk, unpublished analysis). Other studies have documented differences in the features of community kitchen programs that may influence their ability to impact the food supplies of food insecure households, but features that would encourage or discourage participation were not compared [148], and comparative studies of other food programs operating across Canada have not been conducted.

9.3. Future Research Directions

As highlighted above, four of the five studies in this thesis came from a study population that is not representative of the food insecure population in Canada, and more specifically, two studies examined the intersection of food insecurity with place-specific factors, namely, alternative food program use and food bank use in high-poverty communities in Toronto. Future research that examines the research questions in this thesis in other locations and at the population level would be valuable for understanding the extent to which the findings in this thesis were place- and population-specific, or whether they reflect the experiences of the food insecure population more generally. Evaluating the relative importance of community resources across communities and household characteristics and comparative analyses of drivers of use and effectiveness in

different locations would allow for stronger conclusions on the utility of community food programs in relation to household food insecurity at the population level.

The proposed framework in Figure 9.1 highlights the need for more research on the determinants of food insecurity and the impact of policies in shaping these determinants. Specifically, there is a need to examine variation in household food need costs and other household expenses in relation to household food insecurity as there has been little research on these factors at the population level. Knowing these relationships is important for informing whether targeting intervention toward these determinants would reduce food insecurity at the population level. Other aspects of financial security beyond annual income measures such as availability of savings, access to credit, and job security have also not been examined in relation to food insecurity in Canada.

There has been little research aimed at informing policy development for household food insecurity. Examining how introduction of income-based policies (e.g. child tax benefits; minimum wage rates) and programs that provide in-kind support to reduce household expenses (e.g. subsidized childcare) relate to household food insecurity is a key research direction. This research has been impeded by a lack of household food insecurity measurement on surveys that include measures of receipt of government transfers and other in-kind supports like housing or childcare subsidies, and until recently, a lack of consistent monitoring to allow food insecurity trends over time in the population to be examined.

10 CONCLUSIONS

Household food insecurity, the lack of sufficient financial resources for food, can mean worry and anxiety, depleting household food supplies, altered eating patterns, and experiences of hunger and food deprivation. It can also increase risk of social isolation, inadequate nutritional intakes, and poor mental and physical health outcomes for both children and adults. Despite recognition of the seriousness of this problem, it has remained persistently high in Canada, affecting 12.3% of Canadian households in 2011. There is an urgent need for interventions that can effectively address this problem.

The studies included in this thesis aimed to contribute to the body of knowledge needed to advance intervention. They focused on understanding the experience along the spectrum of severity in relation to other material hardships, understanding co-occurring compromises in health and well-being, understanding the effectiveness of current responses, and understanding what dynamic household factors associate with change in the experience. Together, they highlighted the vulnerability of food insecure populations in multiple domains of well-being, reinforcing the notion that financial insecurity that underpins food insecurity can result in compromised well-being through multiple pathways. Examination of how current interventions aimed at preventing hunger and improving the nutritional well-being of food insecure families through community food programs are used by food insecure families highlighted that these programs had little relevance for food insecure families. Further, there was little evidence that their use could even prevent most extreme manifestations of food insecurity. In contrast to food program use, food insecurity was dynamically related to improvements in income and employment, suggesting that income and employment may be important levers for intervention.

Given the magnitude of the problem in Canada, far-reaching and effective interventions are needed to address the financial vulnerability that leads Canadians to be food insecure. The ability to make specific policy recommendations to address the problem has been limited by the lack of research focused on examining the interface of social policies with food insecurity in Canada. This is a critical direction for future research.

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APPENDIX 1: HOUSEHOLD FOOD SECURITY SURVEY MODULE

Available for use from the USDA Economic Research Service at:
http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#household

1. The first statement is "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that <u>often</u> true, <u>sometimes</u> true, or <u>never</u> true for (you/your household) in the last 12 months?

   [ ] Often true
   [ ] Sometimes true
   [ ] Never true

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

   [ ] Often true
   [ ] Sometimes true
   [ ] Never true

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

   [ ] Often true
   [ ] Sometimes true
   [ ] Never true

<u>Screener for Stage 2 Adult-Referenced Questions:</u> If affirmative response (i.e., "often true" or "sometimes true") to one or more of Questions 1-3, then continue to ***Adult Stage 2;*** otherwise, if children under age 18 are present in the household, skip to ***Child Stage 1,*** otherwise skip to ***End of Food Security Module.***

<u>Adult Stage 2: Questions 4-7</u> (asked of households passing the screener for Stage 2 adult-referenced questions).

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

   [ ] Yes
   [ ] No (Skip AD1a)

4a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months

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

[ ] Yes
[ ] No

6. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

[ ] Yes
[ ] No

7. In the last 12 months, did you lose weight because there wasn't enough money for food?

[ ] Yes
[ ] No

Screener for Stage 3 Adult-Referenced Questions: If affirmative response to one or more of questions 4 through 7, then continue to ***Adult Stage 3;*** otherwise, if children under age 18 are present in the household, skip to ***Child Stage 1,*** otherwise skip to ***End of Food Security Module.***

Adult Stage 3: Questions 8-8a (asked of households passing screener for Stage 3 adult-referenced questions).

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

[ ] Yes
[ ] No (Skip AD5a)

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

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months

Child Stage 1: Questions 9-11

Transition into Child-Referenced Questions:
Now I'm going to read you several statements that people have made about the food situation of their children. For these statements, please tell me whether the statement was OFTEN true, SOMETIMES true, or NEVER true in the last 12 months for (your child/children living in the household who are under 18 years old).

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

    [ ] Often true
    [ ] Sometimes true
    [ ] Never true

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

    [ ] Often true
    [ ] Sometimes true
    [ ] Never true

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

    [ ] Often true
    [ ] Sometimes true
    [ ] Never true

Screener for Stage 2 Child Referenced Questions: If affirmative response (i.e., "often true" or "sometimes true") to one or more of questions 9-11, then continue to ***Child Stage 2;*** otherwise skip to ***End of Food Security Module.***

Child Stage 2: Questions 12-15 (asked of households passing the screener for stage 2 child-referenced questions).

12. In the last 12 months, since (current month) of last year, did you ever cut the size of (your child's/any of the children's) meals because there wasn't enough money for food?

    [ ] Yes
    [ ] No

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

[ ] Yes
[ ] No (Skip CH5a)

13a. [IF YES ABOVE ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

[ ] Almost every month
[ ] Some months but not every month
[ ] Only 1 or 2 months

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

[ ] Yes
[ ] No

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

[ ] Yes
[ ] No

APPENDIX 2: SUPPLEMENTARY ANALYSES

Table A.1 Characteristics of households who completed a second study visit and those who did not (n=501) from study of low income families in Toronto.

	Did not complete second study visit (n=117)	Completed second study visit (n=384)	Unadjusted OR for completing second study visit
Number of adults			
1	30.8	45.8	Ref
2	60.7	44.0	**0.49 (0.31- 0.77)**
3+	8.6	10.2	NS
Number of children			NS
1	34.2	37.8	
2	38.5	33.1	
3+	27.4	29.2	
Respondent Education			
Less than high school	25.6	20.8	NS
Completed high school or GED	32.5	33.6	
Post-secondary	41.9	45.6	
Immigration status			
<10 years	40.2	50.5	0.57 (0.32-1.04)
10+ years	42.7	29.2	NS
Born in Canada	17.1	20.3	Ref
Highest work status			
None	33.3	43.0	**1.61 (1.02- 2.55)**
Part-time	16.2	16.7	NS
Full-time	50.4	40.4	Ref
Received welfare			NS
No	66.7	63.0	
Yes	33.3	37.0	
Received disability support			NS
No	93.2	92.5	
Yes	6.8	7.6	
Income as % of LICO (per 10% change) (median, IQR)	76.2 (61.7-87.9)	73.3 (57.1-94.5)	NS
Single Mother			
No	54.7	45.1	Ref
Yes	45.3	55.0	1.47 (0.97-2.23)
Household food security status			NS
Fully food secure	28.2	21.1	
Marginally food insecure	11.1	13.5	
Moderately food insecure	36.8	37.5	
Severely food insecure	23.9	27.9	
Food bank use in last 12 months			

	No	86.3	77.3	Ref
	Yes	13.7	22.7	**1.85 (1.04-3.30)**
Community kitchen use in last 12 months				N/A
	No	97.4	94.3	
	Yes	2.6	5.7	
Community garden use in last 12 months				N/A
	No	97.4	98.2	
	Yes	2.6	1.8	

Ref indicates reference group. NS non-significant Odds Ratio.

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