Food Insecurity in Urban and Rural Settings: A Mixed Methods Analysis of Risk Factors and Health

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Dedicated to everyone whose voice goes unheard.

Abstract

Food insecurity exists when access to safe, nutritionally adequate foods is limited or uncertain, or when acquisition of these foods occurs in socially unacceptable ways (Anderson, 1990). Considerable research has focused on identifying the risk factors for and potential consequences of household food insecurity; however, few studies have investigated whether and how place of residence might influence household food insecurity. To address this gap in the literature, a mixed methods approach was used to explore the connections between risk factors, household food insecurity, and health in urban and rural settings. This dissertation comprised three studies. In the first study, secondary data were used to identify the household factors that increased the risk for household food insecurity and to examine whether place of residence moderated these relationships. Significant associations were found between household sociodemographics and household food insecurity. In addition, rural households were more likely to report household food insecurity. Although most moderation models were non-significant, a moderation effect was found for educational attainment: secondary school graduation increased the risk for household food insecurity in urban households, yet it was protective in rural households. In the second study, secondary data were used to examine the relationship between household food insecurity and poor general, physical, and mental health, and to test for a moderation effect of place of residence. In the main effects models, household food insecurity was associated with an increased likelihood of poor health on all measures. There was no evidence of urban-rural differences in these relationships. In the third study, qualitative data were used to explore household food insecurity from the perspective of urban and rural residents in Eastern Ontario. Findings revealed that urban and rural residents described similar conditions, processes, and consequences of household food insecurity; however, the unique features of the urban and rural

settings influenced how people managed these experiences. In particular, certain aspects of the rural settings added to the complexity of managing household food insecurity. Overall, the results of this dissertation suggest that the urban-rural context, although important, is secondary to the primary contribution of low economic and social resources in household food insecurity.

Statement of Co-Authorship

The three manuscripts included in this dissertation were prepared in collaboration with my dissertation supervisor, Dr. Elizabeth Kristjansson, and one committee member, Dr. John Sylvestre. As the first author of all three manuscripts, I was responsible for the conceptualization of the research questions and research design, submission of research ethics applications, recruitment of study participants and data collection (Study 3), data analysis and interpretation of findings, and written preparation of the manuscripts. Dr. Kristjansson provided guidance and assistance in all aspects of the dissertation research, especially in the refinement of the research methods, quantitative data analysis, and editing of the three manuscripts. She appears as second author on the first and second manuscript, and as third author on the third manuscript. Dr. Sylvestre, as second author, contributed to the research design, qualitative data analysis, interpretation of findings, and editing of the third manuscript.

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List of Abbreviations

CAFB	Canadian Association of Food Banks
CCHS	Canadian Community Health Survey
CI	Confidence Interval
CIDI	Composite International Diagnostic Interview
CIHI	Canadian Institute for Health Information
CV	Coefficient of Variation
HFSSM	Household Food Security Survey Module
MDE	Major Depressive Episode
NLSCY	National Longitudinal Survey of Children and Youth
NSPFSP	Nova Scotia Participatory Food Security Projects
PHAC	Public Health Agency of Canada
USDA	United States Department of Agriculture
WHO	World Health Organization

Chapter 1: General Introduction

Food security has become recognized as an important public health issue (Dietitians of Canada, 2005; Health Canada, 2007) and a social determinant of health in Canada (McIntyre, 2004; Public Health Agency of Canada [PHAC], 2004; Raphael, 2004, 2010; Tarasuk, 2004, 2005). Much has been written about the importance of assuring food security for all, as food is considered a basic human right (Riches, 1999; Rideout, Riches, Ostry, Buckingham, & MacRae, 2007; United Nations, n.d.) and a necessary condition for a population to be healthy and well-nourished (Nord, Andrews, & Carlson, 2009; World Health Organization [WHO], 2004). However, this aim has not been fully realized for all members of our society. People experience food insecurity when regular access to nutritionally adequate and safe food, or when their ability to acquire food in a socially acceptable way, is limited or uncertain (Anderson, 1990; Campbell, 1991; Cohen, Andrews, & Kantor, 2002; Radimer, Olson, Greene, Campbell, & Habicht, 1992; WHO, 2004). Recent prevalence estimates show that approximately 8.1% of Canadian households reported experiencing moderate to severe food insecurity in 2011 (Tarasuk, Mitchell, & Dachner, 2013); this represents about 1.06 million households or 2.5 million people (T. Boston, personal communication, October 8, 2013). Although this statistic is likely an underestimate of the extent of food insecurity in Canada due to the exclusion of certain at-risk groups (Che & Chen, 2001; Tarasuk, 2005), such as on-reserve Aboriginal peoples and individuals who are homeless, it does provide an indication that food insecurity is a reality for some people in Canada.

My objectives for this introductory chapter are to: (a) introduce the definition and conceptual aspects of food insecurity; (b) outline the current state of knowledge on the associations between risk factors, household food insecurity and poor health; (c) discuss how

place of residence might be an important, yet largely unexplored factor in these associations; and (d) provide a summary of the gaps in the literature. In the last section of this chapter, I outline the conceptual model, research design and research questions that guided my dissertation research.

Conceptual Aspects of Food Insecurity

Our understanding of the experience of food insecurity stems from the seminal work of Radimer and colleagues (1990, 1992). These qualitative studies were conducted with women in low-income households and documented their lived experience of food insecurity, food insufficiency[1], and hunger (henceforth combined as 'food insecurity'). Participants' descriptions of their experiences led to the conceptualization of food insecurity into four dimensions at the individual and household-level: quantitative, qualitative, psychological, and social. At the individual-level, the women spoke about reductions in the sufficiency (quantity) and nutritional adequacy (quality) of their food intake, feelings of deprivation and perceived lack of choice (psychological), and disruptions in what was considered to be 'normal' eating patterns (i.e., three meals per day; social). At the household-level, food insecurity was experienced as a depletion in the household food supply (quantity), purchases of food that were low-cost, but often unsuitable or undesirable (quality), worry and preoccupation with the household food supply (i.e., "food anxiety"; psychological), and food acquisition practices that were outside of the 'normal' food system and perceived to be socially unacceptable or undesirable (social; Radimer, Olson, & Campbell, 1990; Radimer et al., 1992).

Across the studies, the women also described a sequence of events that documented the dynamic, managed process of food insecurity and the frequency, duration and severity of their challenges. For example, concerns about the adequacy of means (e.g., income) to obtain food for

the household preceded compromises in the quantity of food, which were then followed by reductions in the quality of food. Consequently, the women had some influence in the course of food insecurity at the individual- and household-level (Radimer et al., 1990, 1992).

This seminal work and that of others (Anderson, 1990) was instrumental for efforts to reach a consensus on the definition of food insecurity and to develop a valid measure of household food insecurity in the United States (Hamilton et al., 1997a). Subsequent quantitative and qualitative studies have shown that the common experiences of food insecurity tend to centre on the dimensions of compromises in the quantity and quality of food acquisition and intake, as well as the temporal sequencing of events in the household (i.e., severity of experiences; Alaimo, 2005; Bickel, Nord, Price, Hamilton, & Cook, 2000; Tarasuk, 2001b). These elements appear to be present in food insecure households, at least to some extent, irrespective of the place of investigation (Coates et al., 2006; Hamelin, Beaudry, & Habicht, 2002; Hamelin, Mercier, & Bédard, 2011; Tarasuk, 2001b). On the other hand, the psychological and social dimensions tend to be more variable and reflective of individual differences in how people perceive their experiences (e.g., what constitutes socially unacceptable practices; Tarasuk, 2001b). Qualitative studies have expanded the psychological and social dimensions to include concepts of alienation and social exclusion, disruptions to household dynamics and functioning, hunger and physical health effects, and psychological suffering (e.g., distress, sadness, frustration; De Marco, Thorburn, & Kue, 2009; Hamelin et al., 2002; Runnels, Kristjansson, & Calhoun, 2011). It has been suggested that these dimensions might be better conceptualized as consequences, rather than core components, of household food insecurity (Coates et al., 2006; Hamelin, Habicht, & Beaudry, 1999; Tarasuk, 2001b).

Food insecurity is a complex, multidimensional concept that has implications at both the individual- and household-level.[2] The current measurement tools for assessing food insecurity (e.g., United States Department of Agriculture [USDA] *Core Food Security Module*; Bickel at al., 2000; Health Canada, 2007) determine the food security status of the household rather than for each individual member of the household. Therefore, in the following literature review, I use the term 'household food insecurity.'

The Relationship Between Risk Factors and Household Food Insecurity

Considerable research has been directed at identifying the factors or conditions that place individuals and households at risk for food insecurity. Anderson (1990) and Campbell (1991) posited that household food insecurity was an outcome of exposure to factors that either limit the household resources (e.g., income, time) or the proportion of the household resources that are available for food acquisition (e.g., other bills). Analyses of population surveys in Canada have shown that the households most vulnerable to food insecurity include those with low incomes (Che & Chen, 2001; McIntyre, Connor, & Warren, 2000; McIntyre, Walsh, & Connor, 2001; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005); recipients of income supports (e.g., provincial income assistance or disability support; Che & Chen, 2001; McIntyre et al., 2000, 2001; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005); those with lower educational attainment (McIntyre et al., 2000, 2001); households with children, especially those headed by a lone female parent (Che & Chen, 2001; McIntyre et al., 2000, 2001; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005); single or unattached individuals (Che & Chen, 2001; Wu & Schimmele, 2005); tenants or household non-owners (Che & Chen, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003); and off-reserve Aboriginal peoples (Che & Chen, 2001;

Rainville & Brink, 2001; Willows, Veugelers, Raine, & Kuhle, 2008). Evidently, the groups most at-risk for food insecurity tend to be those that experience disadvantage in several areas, representing an imbalance of risks to assets to manage household food insecurity (Garasky, Morton, & Greder, 2004; Hamelin et al., 2011; Raphael, 2010).

Much of the research on risk factors and food insecurity has focused on poverty. A well-established link has been identified between food insecurity and the financial security of the household, suggesting that food insecurity is embedded within the context of poverty (Hamelin et al., 2002; McIntyre et al., 2002; PHAC, 2004; Rose, 1999; Tarasuk, 2001a, 2001b, 2005). However, researchers have argued that low income alone cannot explain food insecurity (Alaimo, 2005; Guo, 2011; Heflin, Corcoran, & Siefert, 2007; Mammen, Bauer, & Richards, 2009; Olson, 2005; Ribar & Hamrick, 2003; Rose, 1999; Siefert, Heflin, Corcoran, & Williams, 2001). Indeed, not all food insecure households are low-income and not all low-income households are food insecure. For example, despite the fact that the odds of being food insecure are highest for people in the lowest income categories, there are more households in the lower middle and middle income categories who report food insecurity (Che & Chen, 2001; Rose, 1999; Tarasuk et al., 2013; Tarasuk & Vogt, 2009). This discrepancy suggests that low income and food insecurity might denote different dimensions of economic hardship (Ribar & Hamrick, 2003). Interventions directed exclusively towards households with the lowest income might miss a large proportion of the households that are in need of financial, social and food supports (Rainville & Brink, 2001).

In addition, annual measures of household income do not take into account the unique needs of the household and the allocation of financial resources, nor do they capture the unforeseen circumstances that may jeopardize the household's financial security (DeVault, 1991;

Guo, 2011; Kirkpatrick & Tarasuk, 2008a; Ledrou & Gervais, 2005; Mammen et al., 2009, Rainville & Brink, 2001; Rose, 1999; Tarasuk, 2001c). Income measures also do not capture indicators of "household 'wealth'" (Tarasuk & Vogt, 2009, p. 186), such as household ownership and savings, which are protective against food insecurity (Che & Chen, 2001; Guo, 2011; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003). These liquid assets are particularly important because they can be used to counteract the effects of unexpected circumstances, such as a job loss, on the household food supply (Guo, 2011; Rainville & Brink, 2001; Rose, 1999). Thus, it is not only the amount of household income, but also the reliability and adequacy of that income that is important for meeting the food needs of household members (Alaimo, 2005; DeVault, 1991; WHO, 2004).

The lack of a one-to-one relationship between household income and household food insecurity might also be a reflection of the dynamic nature of household food insecurity. Household food insecurity is a managed process, such that members of the household use different strategies at different times and to different degrees to protect the household's food security by increasing and/or extending the household food supply (Hamelin et al., 2002; Radimer et al., 1990, 1992). Commonly cited strategies include adjusting resource allocation (e.g., delaying bill payments, giving up services), accessing tangible support from family and friends, augmenting household cash flow (e.g., selling possessions, borrowing money), compromising food quality and quantity, and using food assistance programs (De Marco et al., 2009; Hamelin et al., 2002; McIntyre et al., 2000, 2001; Olson, Rauschenbach, Frongillo, & Kendall, 1997, 2004; Rainville & Brink, 2001; Runnels et al., 2011; Swanson, Olson, Miller, & Lawrence, 2008; Tarasuk, 2001c). These strategies, often used in combination, might provide short-term improvements in the household's financial and social resource capital that can modify

the frequency, duration and intensity of their food insecurity (Rainville & Brink, 2001; Tarasuk, 2001a; Toronto Public Health, 2006). Nevertheless, research has shown that these strategies, though helpful, do not provide long-term solutions to the overarching inequalities faced by many food insecure households (Garasky et al., 2004; Hamelin et al., 2002; Olson, 2005; Olson et al., 1997, 2004; Tarasuk & Beaton, 1999a). This suggests that the degree of hardship encountered by those most at-risk for household food insecurity cannot be ameliorated by short-term increases in the household income or food supply because the needs of the household involve multiple domains (e.g., housing issues; unemployment, low education; Hamelin et al., 2011; Tarasuk, 2005). Certainly, food expenditures tend to be more flexible than fixed expenditures (e.g., housing and utility costs), and even when financial supports are temporarily increased, studies have consistently shown that adults in food insecure households often have to make difficult choices about resource allocation that typically does not favour the household food budget (De Marco et al. 2009; Dowler, 1998; Hamelin et al., 2011; Olson, 2005; PHAC, 2004; Runnels et al., 2011; Tarasuk & Maclean, 1990; Travers, 1996; Williams et al., 2012).

In summary, although household food insecurity often aligns with poverty, the absence of a direct one-to-one relationship suggests that the risks for food insecurity involve more than just low income (Gorton, Bullen, & Mhurchu, 2009). Structural and contextual risks, such as housing costs, poor access to higher education, and limited opportunities for employment, shape the resources that are available in the household and their members' ability to manage competing demands (Hamelin et al., 2011; Mammen et al., 2009). Lack of income is only one of the many personal, financial, social and environmental challenges that are encountered and accumulate to place an individual or household at-risk of food insecurity (Alaimo, 2005, Gorton et al., 2009;

Hamelin et al., 2002, 2011; Martin, Rogers, Cook, & Joseph, 2004; Rainville & Brink, 2001; Raphael, 2010; Tarasuk, 2001c, 2005; Travers, 1996).

Taken together, the literature on risk factors and household food insecurity illustrates that food insecure households are not homogenous (Health Canada, 2007; Rainville & Brink, 2001), underscoring the importance of assessing the unique and detailed circumstances of a household to understand the differential impact of risk factors on the experience of household food insecurity (Alaimo, 2005; Hamelin et al., 2011).

The Relationship Between Household Food Insecurity and Physical and Mental Health

The relationship between household food insecurity and poor physical and mental health has been consistently documented. Individuals who live in food insecure households are significantly more likely to report poor physical health, including fair/poor self-rated general and physical health (Che & Chen, 2001; McIntyre et al., 2000; Siefert et al., 2001, 2004; Stuff et al., 2004; Tarasuk, 2001c; Vozoris & Tarasuk, 2003), restricted physical activity (McIntyre et al., 2000; Rainville & Brink, 2001; Siefert et al., 2001, 2004; Tarasuk, 2001c; Vozoris & Tarasuk, 2003), poor functional health (Pheley, Holben, Graham, & Simpson, 2002; Stuff et al., 2004; Vozoris & Tarasuk, 2003), and presence of multiple chronic conditions (Che & Chen, 2001; Hanson & Olson, 2012; Olson, Anderson, Kiss, Lawrence, & Spelling, 2004; Rainville & Brink, 2001; Tarasuk, 2001c). An association has also been found between household food insecurity and an increased likelihood of diet-related chronic health conditions, such as diabetes (Galesloot, McIntyre, Fenton, & Tyminski, 2012; Gucciardi, DeMelo, Vogt, & Stewart, 2009; Holben & Pheley, 2006; Seligman, Bindman, Vittinghoff, Kanaya, & Kushel, 2007; Seligman, Laraia, & Kushel, 2010; Vozoris & Tarasuk, 2003), hypertension (Seligman et al., 2010; Vozoris & Tarasuk, 2003), heart disease and food allergies (Vozoris & Tarasuk, 2003). In addition,

individuals living in food insecure households are more likely to report poor mental health, such as fair/poor self-rated mental health (Che & Chen, 2001; Heflin et al., 2007; Mathews, Morris, Schneider, & Goto, 2010; Olson et al., 2004; Vozoris & Tarasuk, 2003), risk for depression (Casey et al., 2004; Che & Chen, 2001; Hanson & Olson, 2012; Heflin, Siefert & Williams, 2005; Huddleston-Casas, Charnigo, & Simmons, 2008; Melchoir et al., 2009; Siefert et al., 2001; Tarasuk, 2001c; Vozoris & Tarasuk, 2003; Whitaker, Phillips, & Orzol, 2006; Wu & Schimmele, 2005), high degree of distress (Carter, Kruse, Blakely, & Collings, 2011; Che & Chen, 2001; Vozoris & Tarasuk, 2003), and anxiety symptoms (Whitaker et al., 2006). All of these findings were significant after controlling for potentially confounding variables (e.g., household income, age, gender), which indicates that household food insecurity has an independent association with poor health. The wide range of health effects suggests that the impact of household food insecurity is not condition-specific (Vozoris & Tarasuk, 2003; Tarasuk, 2004).

Household food insecurity also affects the health of children and youth. Analyses of the National Longitudinal Survey of Children and Youth (NLSCY) have found that child hunger, as reported by caregivers, was associated with an increased likelihood of poorer child health (McIntyre et al., 2000, 2001) and asthma (McIntyre et al., 2001). A longitudinal analysis of the NLSCY showed that, among children, single and multiple episodes of hunger were associated with poorer health and, among youth, multiple episodes of hunger were associated with chronic conditions (e.g., heart condition, epilepsy) and asthma (Kirkpatrick, McIntyre, & Potestio, 2010). The impact of household food insecurity on children's health appears to be far reaching and involves several domains. For example, children and youth living in food insecure households are more likely to have poorer physical and psychosocial functioning (Alaimo, Olson, & Frongillo, 2001; Casey et al., 2005; Cook et al., 2004; Kleinman et al., 1998; Murphy et al.,

1998), increased rates of hospitalization (Cook et al., 2006), behavioural problems (Melchoir et al., 2009; Whitaker et al., 2006), poorer school performance (particularly in children 6-11 years old; Alaimo et al., 2001), lower quality of life (Casey et al., 2005), emotional problems (Belsky, Moffitt, Arsenault, Melchoir, & Caspi, 2010), and mood symptoms (e.g., suicidal ideation, dysthymia; Alaimo, Olson, & Frongillo, 2002; McIntyre, Williams, Lavorato, & Patten, 2013).

The impact of household food insecurity on the health of children and youth can occur even if they do not directly experience compromises in their food intakes. A study by Cook and colleagues (2006) found that households that reported both adult and child food insecurity (i.e., more severe level of food deprivation) had significantly higher odds of reporting the child's health as fair/poor than food secure households. The same significant relationship was also found for households in which only the adults experienced food insecurity. These results suggest that, even at low severity levels, household food insecurity can be associated with children's health through indirect pathways, such as parental stress and anxiety, modified child-parent interactions (e.g., parenting behaviour), and/or poor parental health associated with reduced food intake (Alaimo et al., 2001, 2002; Belsky et al., 2010; Cook et al., 2004, 2006; Cook & Frank, 2008; Raphael, 2010; Whitaker et al., 2006). Overall, the reviewed literature strongly supports the association between household food insecurity and poorer physical and mental health for adults, youth and children.

What might explain the relationship between household food insecurity and poorer health? The conceptual framework proposed by Campbell (1991) suggested two specific pathways. First, food insecurity might influence health indirectly through inadequate nutrition. This pathway has been extensively researched in the food insecurity literature with fairly consistent results. Adults who reside in food insecure households tend to report lower dietary

intakes (Bhattacharya, Currie, & Haider, 2004; Kirkpatrick & Tarasuk, 2008b; McIntyre, Glanville, et al., 2003; Rose, 1999; Tarasuk & Beaton, 1999b); limited consumption of fruits, vegetables, milk, and meat (Champagne et al., 2007; Gucciardi et al., 2009; Jacobs Starkey & Kuhnlein, 2000; Kendall, Olson, & Frongillo, 1996; Kirkpatrick & Tarasuk, 2008b; Mathews et al., 2010; Tarasuk, 2001c; Williams, McIntyre, & Glanville, 2010); and inadequate consumption of some essential vitamins and minerals (Bhattacharya et al., 2004; Champagne et al., 2007; Kendall et al., 1996; Kirkpatrick & Tarasuk, 2008b; McIntyre, Glanville, et al., 2003; Tarasuk & Beaton, 1999b). The research related to the nutritional status of children and youth living in food insecure households tends to be mixed, with some studies reporting nutritional inadequacies for certain age groups (McIntyre, Glanville, et al., 2003; Kirkpatrick & Tarasuk, 2008b), whereas others have found no nutritional differences between food insecure and food secure groups (Bhattacharya et al., 2004). The inconsistencies in the literature could be related to the use of different methodologies; however, it might also reflect the household food allocation patterns in food insecure households. In particular, parents tend to reduce or skip meals to ensure that their children have sufficient intakes of food and essential nutrients (Bhattacharya et al, 2004; Hamelin et al., 2002; McIntyre, Glanville, et al., 2003; McIntyre, Officer, & Robinson, 2003; Olson, 2005; Power, 2005; Radimer et al., 1992; Runnels et al., 2011; Stevens, 2010; Toronto Public Health, 2006; Williams et al., 2010, 2012). Overall, these studies suggest that, particularly for adults, household food insecurity might lead to dietary compromises that place them at an increased risk for nutritional inadequacies (Kirkpatrick & Tarasuk, 2008b). Although the immediate impact of poor nutrition might be minimal, the long-term effect of a low intake of certain nutrients can have serious implications for the health of individuals living in food insecure households. This includes, but is not limited to, their ability to maintain good health

and to manage existing chronic conditions (e.g., diabetes; Champagne et al., 2007; Cook et al., 2006; Kirkpatrick & Tarasuk, 2008a; Morton, Worthen, & Weatherspoon, 2004; Olson, 2005; PHAC, 2004; Raphael, 2010; Robertson, Brunner, & Sheiham; 2006; Tarasuk, 2004, 2005; Tarasuk & Beaton, 1999b).

Campbell (1991) also proposed that food insecurity might have direct impacts on health. A qualitative study by Hamelin and colleagues (2002) found that individuals in food insecure households experienced hunger and physical impairment (e.g., fatigue, illness), disruptions to household interpersonal dynamics and functioning, as well as distress, frustration and loss of dignity as perceived consequences of their variable access to healthy foods. For many people, alienation was a prominent aspect of their household food insecurity, and they described feelings of powerlessness, guilt, embarrassment, fear, and social exclusion. Other qualitative studies have found similar themes related to feelings of isolation, reluctance to seek support from others, helplessness, and despair (Ahluwalia, Dodds, & Baligh, 1998; Runnels et al., 2011; Williams et al., 2012). These experiences and statements reflected those from earlier qualitative studies, and highlight the worry that typically ensues when the food supply is depleted and the ability to obtain more food is variable or unknown (Radimer et al., 1990, 1992; Tarasuk & Maclean, 1990).

The connection between household food insecurity and poorer mental health has also been found in quantitative analyses. In a series of longitudinal studies of female income support recipients, researchers have found that a change in food insufficiency level was significantly associated with a change in major depression status (Heflin, Siefert, & Williams, 2005), and that those who became food insufficient between time points (T1 and T2) were more likely to meet criteria for depression at T2 (Siefert, Heflin, Corcoran, & Williams, 2004). These associations

were significant after controlling for common risk factors for depression in women, which suggests that household food insecurity has an independent association with depression. More recent studies have also found a similar relationship between household food insecurity and mental health difficulties (Lent, Petrovic, Swanson, & Olson, 2009; Melchoir et al., 2009).

There has been much debate about the directionality of household food insecurity and mental health. It is possible that household food insecurity increases the risk for depression because of the challenges and feelings that are associated with not being able to feed oneself and one's family. It is also possible that depression, in reducing psychosocial functioning, impacts one's ability to attain employment, sufficient income, and to support a family. A longitudinal study by Huddleston-Casas and colleagues (2008) found a bidirectional relationship between household food insecurity and depression among a sample of rural, low income families, which suggests that these conditions can influence each other to affect health and well-being. Furthermore, a longitudinal study by Hanson & Olson (2012) indicated that depression was an independent predictor of persistent food insecurity. The authors noted that depression and household food insecurity were long lasting, and that both often occurred at the same time. A qualitative investigation by Lent and colleagues (2009) suggested that depressive symptoms, such as anhedonia, can interfere with securing and maintaining employment, thereby contributing to persistent household food insecurity. More research is needed to understand the complex relationship between mental health and household food insecurity.

The relationship between poor mental health and household food insecurity can be conceptualized using the stress process model (Pearlin, 1999). This model posits that chronic stressors can affect mental health by reducing the availability of resources, interfering with the use of personal resources (e.g., coping, mastery, social support), and depleting resources as stress

persists over time. Pearlin (1999) also theorized that exposure to chronic stress might be regulated by the social and economic structures that influence access to the resources that can impact health and well-being. Researchers have suggested that the anticipatory anxiety of food shortages and preoccupation with food acquisition encountered by food insecure individuals might interfere with their ability to build the resources that are needed to manage stressful experiences (Heflin et al., 2007; Rainville & Brink, 2001; Raphael, 2010; Stevens, 2010; Wu & Schimmele, 2005). Further, the psychosocial stress that is associated with food insecurity, including changes in household dynamics and connectedness with others, might initiate and maintain feelings of self-blame, guilt, and reduced mastery or sense of personal control (Heflin et al., 2005). Exposure to chronic stress has also been associated with physiological changes in the hypothalamus-pituitary-adrenal (HPA) axis, a known correlate with decreased physical and mental health (Heim, Ehlert, & Hellhammer, 2000; Kudielka & Kirschbaum, 2005; McEwen, 1998; McEwen & Seeman, 1999). In combination, psychosocial stress and associated physiological changes might increase the likelihood of negative physical and mental health outcomes for those residing in food insecure households (Alaimo et al, 2002; Casey et al., 2004; Hammen, 2005; Heflin et al., 2005; Raphael, 2004; Stuff et al., 2004; Thoits, 2010; Wu & Schimmele, 2005). Although more research is needed, the results of the reviewed studies suggest that household food insecurity might impact health in ways that cannot be measured solely by reductions in food intake and nutritional status (Hamelin et al., 1999).

Place of Residence: An Unexplored Factor in Household Food Insecurity

The reviewed literature has demonstrated that most of the factors that are associated with greater risk for household food insecurity are those that are external to the individual. This finding aligns with the broader theoretical framework of the social determinants of health that

posits that the social and economic conditions of living, such as income distribution, education, and employment, significantly affect health and well-being (Raphael, 2004, 2010). These social determinants shape the quality and quantity of material and economic resources that are available to individuals and families (WHO, 2012b), which, in turn, influence the degree of stress that is experienced, and the strategies that are used to manage and interact with different environments (Pearlin, 1999; Raphael, 2010). The complex interaction between the social determinants of health and other important contextual determinants (e.g., physical environment) influences the expression and exacerbation of poor health (Canadian Institute for Health Information [CIHI], 2006; Raphael, 2010; Williams & Kulig, 2012).

One contextual determinant of health that has received less attention in the household food insecurity literature is the role of place of residence (urban/rural). This might be an important gap in the literature because it has been argued that place of residence is a useful explanatory variable in population health (CIHI, 2006; Romanow, 2002; Williams & Kulig, 2012). The ecological model (Bronfenbrenner, 1979) can be used to frame the connection between place of residence and an individual's experiences and outcomes. The ecological model characterizes the individual as embedded within a series of nested, interdependent social systems (e.g., microsystem, mesosystem, exosystem, macrosystem, chronosystem) that are connected through bidirectional transactions. To understand an individual, it is important to consider the social systems that surround him or her (Bronfenbrenner, 1979; Nelson & Prilleltensky, 2005). It is conceivable that the interactions between the individual and the various systems in which he or she is embedded would be different depending on the geographic locality because place of residence provides the broader context for exposure to risk and protective influences, access to

economic, social and community resources, and cultural norms (CIHI, 2006; Macintyre, MacIver, & Sooman, 1993; Williams & Kulig, 2012).

Prevalence of household food insecurity in urban and rural areas. A growing, yet limited, body of literature has identified differences in the prevalence of household food insecurity by place of residence.[3] These estimates are mainly from the United States, owing to the fact that household food insecurity has been monitored annually there since 1995 (Health Canada, 2012; USDA, 2012). For example, the prevalence of household food insecurity decreased in metropolitan areas between 1998 and 2000, while the prevalence of food insecurity was higher and unchanged in non-metropolitan areas (Nord, 2002). In 2011, estimates suggested that the prevalence of household food insecurity in non-metropolitan areas was slightly higher than in metropolitan areas (i.e., aggregate of principal cities and suburban areas; Coleman-Jensen, Nord, Andrews, & Carlson, 2012). Another estimate showed that households with children in non-metropolitan areas have a higher prevalence of household food insecurity than those in metropolitan areas (22.0% vs. 20.8%; Nord et al., 2009). These results have provided a mixed picture of the prevalence of household food insecurity in urban and rural areas in the United States.

Estimates of the prevalence of food insecurity in urban and rural households have only recently been provided for Canada. Unfortunately, differences in the definition of rural and urban areas, as well as in the definition of food insecurity make it difficult to compare estimates over time. Rainville & Brink (2001), using data from the National Population Health Survey (1998-1999), reported that the proportion of food insecure households in rural areas (8.4%) was lower than that in metropolitan (10.2%) and urban areas (10.9%; definitions for ‘urban’ and ‘rural’ were not provided). Recent estimates using the 2011 Canadian Community Health Survey

revealed that households in rural areas reported a lower prevalence of food insecurity than those in urban areas (6.3% vs. 8.6%, respectively; Tarasuk et al., 2013). In this case, households were classified as urban and rural using a definition based on population size and density. A study by the CIHI (2006) defined rural areas based on degree of integration with an urban area (i.e., commuting flow) and found that household food insecurity was significantly more prevalent in households located in areas that were weakly influenced by a large urban centre (i.e., less urban integration; 16.1%) compared to those located in large urban centres (14.5%).

A different picture of rural and urban environments emerges when food bank use statistics are used as an indirect marker of household food insecurity. Canadian food bank statistics have shown that about 45% of all food banks are situated in communities with populations of less than 10,000 people (Canadian Association of Food Banks [CAFB], 2005, 2007; Food Banks Canada, 2010, 2011). In Ontario, the percentage of households that use food banks in some small and rural communities is two to three times greater than the provincial average. For example, the rates of food bank use in Cochrane (5.1%), Cobalt (7.2%), and Wawa (7.2%) are much higher than the Ontario average (2.6%; Spence, 2006, 2007). Additionally, the profile of individuals and households that use rural food banks is different than the national statistics (i.e., all individuals and households). For example, a higher percentage of rural food bank clients are single, older adults, Aboriginal peoples, homeowners, recipients of income supports from social assistance or pension benefits, and couples without children; a lower percentage are lone parent and two-parent families, and immigrants (Food Banks Canada, 2012). It is important to note that food bank statistics are often an underestimate of the actual number of individuals who experience limited or uncertain access to food because many people who are food insecure do not use food banks as a resource augmentation strategy (Hamelin et al., 2011;

Hamilton et al., 1997a; Radimer et al., 1990; Tarasuk, 2001a, 2005; Toronto Public Health, 2006; Vozoris & Tarasuk, 2003). For example, estimates from national population surveys and community samples suggest that only 20-35% of individuals and families who experience food insecurity access community food banks (Che & Chen, 2001; Kirkpatrick & Tarasuk, 2009; Loopstra & Tarasuk, 2012; McIntyre et al., 2000; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003). Nevertheless, the food bank use statistics provide an indication that household food insecurity is an important concern among urban and rural populations.

How place of residence might affect household food insecurity. The potential relationship between household food insecurity and place of residence can be illuminated by reviewing the literature on the economic, social and environmental conditions of urban and rural environments. In Canada, the economic and social structure of urban and rural areas differ (Fairbairn & Gustafson, 2006; Rural Secretariat, 2005; Williams & Kulig, 2012). Although the factors that influence socioeconomic disadvantage might be the same in both settings, it has been argued that the depth of the challenges that are experienced by rural households might be greater than that experienced by urban households (Burns, Bruce, & Marlin, n.d.), especially in areas that are more remote and isolated (i.e., greater distances from large urban centres; Rural Secretariat, 2005). Rural residents tend to report lower median household incomes, persistent low-income status, higher unemployment rates, limited availability of full-time and high-paying employment opportunities, and lower educational attainment than urban residents (Alasia, 2003; Burns et al., n.d.; CIHI, 2006; Kirby & LeBreton, 2002; Rothwell, 2001; Rupnik, Thompson-James, & Bollman, 2001; Rural Secretariat, 2005; Singh, 2004; Vera-Toscano, Phimister, & Weersink, 2001). In addition, the rural ‘working poor’ are more likely to be part of a two-earner household with children, have lower education, and work more hours than urban low-wage

workers (Fortin, 2008), suggesting that the socioeconomic profile of at-risk groups may differ in urban and rural areas. Possible explanations for the poorer socioeconomic status of rural and remote areas include changes in rural economies and employment sectors (Alasia & Magnusson, 2005; Burns et al., n.d; Curto & Rothwell, 2002; du Plessis, 2004; Fairbairn & Gustafson, 2006), the out-migration of youth and working age adults (Alasia, 2003; Beckstead, Brown, & Newbold, 2008; Bryant & Joseph, 2001; Fairbairn & Gustafson, 2006; Statistics Canada, 2002c), and the effect of restructuring in social and educational services (DesMeules et al., 2012; Fairbairn & Gustafson, 2006; Halseth & Ryser, 2006). In contrast, studies have shown that availability of social support and community belongingness are rated higher by rural residents (CIHI, 2006; Nelson & Park, 2012; Romans, Cohen, & Forte, 2011). These findings on social capital underscore the importance of informal social networks in rural settings (Fairbairn & Gustafson, 2006). The economic and social resources in urban and rural areas have important implications as risk (Gorton et al., 2009) and protective factors (Martin et al., 2004; Morton, Bitto, Oakland, & Sand, 2005) for household food insecurity.

The environmental features of urban and rural areas might also impact household food insecurity based on the availability and accessibility to food options. In the United States, rural food environments are characterized by a limited number of all types of food stores, and a greater frequency of convenience stores compared to supermarket and discount stores (Kaufman, 1999; Morris, Neuhauser, & Campbell, 1992; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). Less is known about rural food environments in Canada. A few studies have suggested that the low availability of food stores in rural areas could result in insufficient access to healthy, varied, and low cost food items for rural residents (Atlantic Health Promotion Research Centre, 2004; Beaulac, Kristjansson, & Cummins, 2009; Drouin, Hamelin, & Ouellet, 2009; Ontario

Association of Food Banks, 2012; Nova Scotia Participatory Food Security Projects [NSPFSP], 2013; Pouliot & Hamelin, 2009; Travers et al., 1997). These characteristics of food environments have important implications for household food insecurity because food purchasing and food consumption have been linked to the availability of food stores that supply a variety of healthy and affordable food options (Bustillos, Sharkey, Anding, & McIntosh, 2009; Caraher, Dixon, Lang, & Carr-Hill, 1998; Cohen et al., 2002; Dowler, 1998; Gantner, Olson, Frongillo, & Wells, 2011; Garasky, Morton, & Greder, 2006; Huddleston-Casas et al., 2008; Jithitikulchai, Dean, & Sharkey, 2012; Liese, Weis, Pluto, Smith, & Lawson, 2007; Marshall & Bollman, 1999; Morris et al., 1992; Olson et al., 2004; Raine, 2005; Ramadurai, Scharf, & Sharkey, 2012; Robertson et al., 2006).

Physical accessibility might also have an important role in household food insecurity in urban and rural areas. As a defining feature, rural households are more dispersed than their urban counterparts, which typically results in longer travel distances to access goods, and community and social services (CAFB, 2003, 2005, 2007; Garasky et al., 2006; Halseth & Ryser, 2006). Consequently, private transportation has been identified as a necessity of rural living that, when available, would add to the financial constraints encountered by low-income households (CAFB, 2003, 2007; Lecompte, 2007; Marshall & Bollman, 1999; Mehak, 2007; Morton et al., 2004; Olson et al., 1997). A few studies have found that transportation challenges (e.g., unreliable transportation, expenses) exacerbate the food acquisition problems of rural, food insecure households (Garasky et al., 2006; Heflin et al., 2007; Holben, McClincy, Holcomb, Dean, & Walker, 2004). Furthermore, the trade-offs between transportation and food costs might be more prominent for rural residents because the available access to public transportation and closer proximity to food stores might result in more modest transportation expenditures for urban

residents (Kirkpatrick & Tarasuk, 2010; Marshall & Bollman, 1999). Differences in the distance to food stores might also play a role in the dietary patterns of urban and rural residents. A study conducted in Texas found that distance to the nearest large retail food environment was significantly negatively associated with fruit and vegetable intake for rural residents, but the relationship was non-significant for urban residents (Dean & Sharkey, 2011).

The studies investigating the relationship between food access and household food insecurity have produced mixed results. A study by Kirkpatrick and Tarasuk (2010) found no evidence that close proximity to a discount food store influenced the likelihood of household food insecurity in a sample of families residing in low-income, urban neighbourhoods in Toronto. However, residents' perceptions of high food prices and inadequacy in the number of food stores were positively related to household food insecurity in a sample of households in rural and small towns in Iowa. Households that were able to shop for food outside of their community were less likely to be food insecure (Garasky et al., 2006). Though methodological differences could elucidate the inconsistent results, the findings might also suggest that food accessibility and food availability have a different impact on household food insecurity in rural and urban settings.

Urban and rural differences: Risk factors and household food insecurity. Few studies have been conducted that explicitly examine urban and rural differences in household food insecurity. In the United States, some research has focused on the risks and conditions associated with household food insecurity in rural environments. As with urban samples, rural households that are at a greater risk for food insecurity tend to include those headed by lone-parents, younger adults, tenants, unemployed individuals, those with lower educational attainment, those with fewer food and financial skills, households with more members, and

households with economic constraints (e.g., low household income, unexpected expenditures; Hanson & Olson, 2012; Olson et al., 1997, 2004; Pheley et al., 2002; Stuff et al., 2004). The similar list of risk factors between urban and rural samples suggests that there might be common elements that influence the likelihood of food insecurity irrespective of place of residence. However, there might be differences in how household food insecurity is experienced in urban and rural areas. In a qualitative study of low-income and food insecure households in Oregon, urban and rural respondents described similar contributors and mechanisms that influenced their food security status, but only the rural sample identified themes related to social isolation, geographic location (e.g., higher food prices, lack of affordable transportation), and the use of alternative food sources, such as hunting and fishing (De Marco et al., 2009). This research raises questions about whether there are distinct risk and protective factors for household food insecurity in urban and rural areas.

Urban and rural differences: Household food insecurity and poor health. Research investigating the association between household food insecurity and health at the level of place is sparse (Morton et al., 2004). Furthermore, many of the studies investigating household food insecurity and health have used rural samples that reside in extremely impoverished regions in the United States. Given the specificity of these environments, the results of these studies may not be generalizable to the Canadian context. Nonetheless, these studies have found a significant relationship between household food insecurity and poor physical health (Pheley et al., 2002; Stuff et al., 2004), poor mental health (Lent et al., 2009; Stuff et al., 2004), risk for depression (Hanson & Olson, 2012; Huddleston-Casas et al., 2008; Lent et al., 2009; Olson et al., 2004), and presence of specific (i.e., diabetes; Holben & Pheley, 2006) and multiple chronic conditions (Hanson & Olson, 2012). These relationships were significant when other risk factors were

controlled, suggesting that food insecurity has an independent effect on the health of rural populations.

A small number of studies have investigated whether differences exist in the association between household food insecurity and health for urban and rural residents. A study by Sharkey and colleagues (2011) used stratified statistical analyses to test for the relationship between household food insecurity and health for a sample of urban and rural women in Texas. Results indicated that household food insecurity increased the likelihood of poor/fair self-rated health, mental distress and poor physical health for the rural women, whereas household food insecurity was only related to mental distress and poor physical health for the urban women (Sharkey, Johnson, & Dean, 2011). The difference between the logistic coefficients for the urban and rural models was not formally tested; therefore, it is unclear whether the observed relationships are comparable or suggestive of a health inequality for rural, food-insecure women. A Canadian study of older women found that household food insecurity was significantly associated with poor general health, arthritis, heart disease, and having at least one chronic condition for urban women, but not for rural women (Wanless, Mitchell, & Wister, 2010). Differences in methodology might explain the inconsistent results; however, these studies suggest that the connection between household food insecurity and place of residence may have important implications for health. Overall, more research is needed to understand the impact of place of residence on the health of individuals residing in food insecure households.

Gaps in the Literature

The literature review has provided evidence that household food insecurity can be conceptualized as both an outcome of exposure to risk factors and an important contributor to poor physical and mental health (Campbell, 1991; McIntyre, 2004; Raphael, 2010; Tarasuk,

2005). To date, much of the research in this area has been conducted using urban samples, or a mixture of urban and rural residents/households aggregated to represent one group. As a result, there is a dearth of research that explicitly investigates the role of place of residence in household food insecurity. This is particularly the case in Canada because few studies have looked at the nature of household food insecurity in rural areas (CAFB, 2007). In recent years, there has been an increased interest in "place" and how environments might influence the incidence of poor health (CIHI, 2006; Romanow, 2002; Williams & Kulig, 2012). Given the different demographic, social, and economic characteristics of urban and rural areas, it is possible that the relative influence of the risk factors for household food insecurity might differ depending on place of residence (CAFB, 2007; Morton et al., 2004; Pheley et al., 2002; Stuff et al., 2004). This is an important area to explore in order to enhance our understanding of how life circumstances, including where one lives, might shape exposure to the risk factors that are related to household food insecurity (Siefert et al., 2001). This would also include exploring the obstacles that households face in navigating their environment and the strategies used to manage these experiences (Alaimo, 2005; Garasky et al., 2004). A good base of qualitative literature has identified important aspects of household food insecurity and its potential consequences for urban households; however, these connections are less well understood for rural populations.

In addition, there is a paucity of research that has investigated the relationship between household food insecurity and health in rural populations. This is especially true in Canada. As a result, it is unknown whether and how the relationship between household food insecurity and health might differ in urban and rural settings (Morton et al., 2004; Sharkey et al., 2011). This is an important area to explore because studies have shown that the physical and mental health of rural populations tends to be poorer, on some health indicators, than their urban counterparts

(CIHI, 2006; DesMeules et al., 2012; Mitura & Bollman, 2003; Pampalon, Martinez, & Hamel, 2006; Pong, 2000; Romanow, 2002). It has been argued that the differences in certain health outcomes for urban and rural residents might be a function of the characteristics of rural places, such as structural and social risks (CIHI, 2006; Smith, Humphreys, & Wilson, 2008). Knowing the strong relationship between household food insecurity and poor health, place of residence might have an impact on the strength of these relationships. Thus, important health differences might exist for urban and rural households that would not be captured if the samples were collapsed.

From a public health perspective, it is extremely important to address these gaps in the literature. Evidence of a health inequality between rural and urban food-insecure households might influence resource allocation, such as funding for government and community-based strategies to reduce household food insecurity. Additionally, understanding whether risk factors have a differential impact in urban and rural settings may help in the development of targeted interventions for ameliorating the underlying contributors.

Conceptual Model

The conceptual model for the proposed study builds on the work of Campbell (1991). Specifically, I consider household food insecurity to be both an outcome of exposure to risk factors, and as a risk factor itself for poor health. With respect to risk factors, the proposed conceptual model includes economic (e.g., household income, home ownership) and household compositional (e.g., number of children) factors, all of which have been documented in the literature as contributors to an increased likelihood for household food insecurity. The health outcomes included in the model are general self-rated health, physical health (e.g., multiple chronic conditions, diabetes), and mental health (e.g., depression, distress). The unique

contribution of this model to the food insecurity literature is the inclusion of place of residence as an important contextual factor in understanding the affect of the risk factors on household food insecurity, as well, as on the relationship between food insecurity and health. Specifically, I hypothesize that place of residence might modify these connections by increasing or decreasing access to the economic, social, and environmental resources that are related to household food insecurity and health.

Research Design and Research Objectives

Building on this conceptual model, the main research objective of this dissertation was to examine and understand the relationship between risk factors, household food insecurity and health in rural and urban populations. A series of three parallel concurrent research studies were conducted using a mixed methods approach (i.e., integration of findings). Using two methodologies provided a comprehensive and perceptive analysis of risk factors and health related to household food insecurity in rural and urban populations by increasing the breath and range of inquiry (expansion) and the interpretability and meaningfulness of the results through elaboration and enhancement (complementarity; Creswell & Plano Clark, 2007; Greene, Caracelli, & Graham, 1989). In the mixed methods design, the quantitative method was used to condense the information and establish statistical associations, and the qualitative method was used to enhance our understanding of the prcesses that link the variables together from the perspective of those who experience household food insecurity. Additionally, potential areas of convergence and divergence in the obtained results of the two methodologies helped to augment the credibility of the study and to identify areas for future research (Hesse-Biber & Leavy, 2006; McGrath & Johnson, 2003).

Based on this rationale, the first phase of the dissertation was a quantitative analysis of the risk factors, household food insecurity and health. The three research objectives for the quantitative phase were to: (a) identify the risk factors associated with household food insecurity; (b) examine the relationship between household food insecurity and an individual's general, physical, and mental health; and (c) explore whether there were differences in these associations depending on place of residence. These objectives were separated into two research studies: a focused exploration of risk factors as contributors to household food insecurity (Study 1) and an examination of household food insecurity as a contributor to individual health (Study 2). In both studies, place of residence was conceptualized as an important moderator variable such that where one lives (i.e., urban or rural residence) might have a differential impact on the relationship between risk factors and household food insecurity, and between household food insecurity and poor health. Overall, the results from the quantitative phase helped to identify the statistical associations and potential pathways between risk factors, household food insecurity and health in urban and rural areas.

The second phase of the dissertation was a qualitative study conducted with a self-selected group of food insecure individuals in urban and rural households in Eastern Ontario (Study 3). The main objective of the qualitative study was to gain insight into household food insecurity by obtaining a rich, in-depth assessment of the contributors, course, and potential consequences of household food insecurity. This was completed by: (a) exploring how individuals who live in food insecure described their food situation in relation to risk/contributing factors, their health, and where they live; and (b) investigating whether different themes emerged from the experiences of rural and urban households.

Contribution to the Literature

The results presented in the three studies aim to contribute to the household food insecurity literature in several important ways. First, by using a large, representative survey of Canadian households, the findings will provide an estimate of the differences in the prevalence of household food insecurity in urban and rural areas. Second, the findings will extend the previous literature on the associations between risk factors and household food insecurity, and between household food insecurity and health by using a well-validated measure of household food insecurity. Third, this dissertation will represent one of the first studies to investigate the potential contribution of place of residence to household food insecurity, and whether, and to what extent, place of residence might alter the observed relationships between the risk factors, household food insecurity and health. Finally, the qualitative study will provide an in-depth exploration of people's perception of the conditions, processes and consequences related to household food insecurity. This will be complemented by evaluating whether and how aspects of urban and rural living contribute to these experiences.

Footnotes

[1] Food insufficiency refers to an exhausted household food supply or a restricted individual food intake. It is a narrower concept than food insecurity because it reflects primarily the quantitative dimension of food access. Food insufficiency is conceptually equivalent to food insecurity with episodes of hunger (Alaimo, 2005; Tarasuk, 2001b; Wu & Schimmele, 2005).

[2] Food insecurity also includes a community-level dimension. Community food security [CFS] exists when "all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system" (Hamm & Bellows, 2003, p.37). CFS tends to focus on the availability, affordability and physical accessibility of food within a community, and includes principles of social justice and community self-reliance (Campbell, 1991; Cohen et al., 2002; Dietitians of Canada, 2007; Hamm & Bellows, 2003). It is acknowledged that CFS has important implications for household-level and individual-level food security; however, the current dissertation focuses on the household and individual components of food insecurity (i.e., income related constraints rather than food system [e.g., production, distribution] constraints).

[3] The lack of consensus on what constitutes a rural area represents a particular challenge in research that seeks to explore differences in urban and rural environments (Pong, 2000; Williams & Kulig, 2012). In Canada, there are several methods available to classify urban and rural areas (e.g., population size and density, commuting flow, postal code). This results in different estimates of the number of people who reside in urban and rural areas. Efforts have been made to promote a single definition of urban and rural areas; however, it has been argued that the definition that is selected should be based on the research question(s) and the unit of classification that best informs the question (e.g., census division, enumeration area; du Plessis, Beshiri, Bollman, & Clemenson, 2001). Although the trends in the sociodemographic and

economic profile of urban and rural Canadians are similar irrespective of the definition that is used, it is acknowledged that the different classifications of what is considered to be an urban or rural area would result in some variation in the results presented between research studies.

Running Head: RISK FACTORS AND HOUSEHOLD FOOD INSECURITY

Chapter 2: Study 1

An Investigation of Risk Factors and Household Food Insecurity in Urban and Rural Households

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Abstract

Objectives: To estimate the frequency of household food insecurity in rural and urban areas, to identify the sociodemographic factors associated with household food insecurity, and to examine whether place of residence (urban/rural) moderates the relationship between sociodemographic factors and household food insecurity.

Method: Data were drawn from the Canadian Community Health Survey (cycle 3.1), a cross-sectional population survey of Canadians aged 12 years and older. Multivariate logistic regression was used to assess the relationship between sociodemographic factors, including place of residence, and household food insecurity. Using Baron and Kenny's (1986) criteria, multivariate logistic regression was used to test the moderation effect of place of residence in the relationships between the sociodemographic factors and household food insecurity.

Results: A significantly greater proportion of urban households reported household food insecurity than rural households. Nevertheless, after controlling for all sociodemographic factors, rural households were more likely to be food insecure than urban households. Moderation analyses revealed a non-significant interaction effect for most associations between the independent variables and household food insecurity; however, place of residence moderated the relationship between secondary school graduation and household food insecurity. In particular, secondary school graduation was associated with an increased likelihood of household food insecurity among urban households, yet it was protective for rural households.

Conclusion: These findings suggest that place of residence might be an important factor in household food insecurity in Canada. Further research is needed to identify the social, economic, and environmental mechanisms that affect household food insecurity in rural and urban areas.

An Investigation of Risk Factors and Household Food Insecurity in Urban and Rural Households

Food insecurity exists when regular access to nutritious and safe food is limited or uncertain, or when food acquisition occurs in socially unacceptable ways (Campbell, 1991; Radimer, Olson, Greene, Campbell, & Habicht, 1992; World Health Organization [WHO], 2004). Considered an important public health concern (Dietitians of Canada, 2005), household food insecurity[1] was estimated to affect approximately 1.06 million households in Canada in 2011 (Tarasuk, Mitchell, & Dachner, 2013).

Our understanding of the factors that contribute to household food insecurity in Canada has expanded thanks to ongoing community-based research and to recent monitoring efforts using population-level surveys (Health Canada, 2010; Kirkpatrick & Tarasuk, 2008a). For example, we know that households most likely to report food insecurity include those living on low income (Che & Chen, 2001; McIntyre, Connor, & Warren, 2000; McIntyre, Walsh, & Connor, 2001; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003), income assistance recipients (Che & Chen, 2001; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003), those with lower educational attainment (McIntyre et al., 2000; McIntyre et al., 2001), households headed by a lone-parent (especially female headed; Che & Chen, 2001; McIntyre et al., 2000; McIntyre, et al., 2001; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003), households with children (Che & Chen, 2001; Rainville & Brink, 2001), tenants (Che & Chen, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003), and off-reserve Aboriginal peoples (Che & Chen, 2001; Ledrou & Gervais, 2005; McIntyre et al., 2000; McIntyre, et al., 2001; Rainville & Brink, 2001; Willows, Veugelers, Raine, & Kuhle, 2008). Clearly, there are many challenges that can accumulate to place a household or individual at-risk

for food insecurity (Alaimo, 2005; Rainville & Brink, 2001; Raphael, 2010; Tarasuk, 2001b, 2005).

Much of the extant literature examining the relationship between risk factors and household food insecurity has been conducted with urban samples, or aggregate samples of urban and rural residents. Although studies of rural population have found a similar profile of vulnerability to household food insecurity as in urban and aggregate samples (Olson, Anderson, Kiss, Lawrence, & Spelling, 2004; Olson, Rauschenbach, Frongillo, & Kendall, 1997; Pheley, Holben, Graham, & Simpson, 2002; Stuff et al., 2004), rural residents have identified unique challenges related to the social and geographic isolation of rural areas (De Marco, Thorburn, & Kue, 2009). In the absence of direct comparisons, it remains unclear whether urban or rural residence plays a role in the observed associations between the known risk factors and household food insecurity.

Why might place of residence matter for household food insecurity? First, the economic conditions of urban and rural areas are different (Fairbairn & Gustafson, 2006; Rural Secretariat, 2005). In Canada, rural households tend to have lower median household incomes, higher rates of unemployment, and lower levels of educational attainment than their urban counterparts (Burns, Bruce, & Marlin, n.d.; Canadian Institute for Health Information [CIHI], 2006; DesMeules et al., 2012; Fairbairn & Gustafson, 2006; Rupnik, Thompson-James, & Bollman, 2001; Rural Secretariat, 2005; Williams & Kulig, 2012). This pattern tends to be more pronounced in areas that have less integration with urban centres (e.g., rural and remote areas; Rural Secretariat, 2005). These economic factors have an important role in access to the resources that can protect a household from challenges, including household food insecurity.

Second, rural environments are characterized by longer distances from larger centres that offer a wider variety of employment opportunities and community supports (Canadian Association of Food Banks [CAFB], 2003, 2005; Garasky, Morton, & Greder, 2006; Halseth & Ryser, 2006). As a consequence of greater isolation, rural residents are more dependent on private transportation (Burns et al., n.d.; De Marco et al., 2009), spending more of their household budget on transportation expenses than their urban counterparts (Marshall & Bollman, 1999). The costs of private transportation might represent an added financial burden on the limited budgets of low-income households, thereby exacerbating the challenges associated with household food insecurity (Heflin, Corcoran, & Siefert, 2007; Holben, McClincy, Holcomb, Dean, & Walker, 2004; Morton, Worthen, & Weatherspoon, 2004; Olson et al., 1997).

In addition, food accessibility and affordability are often significant challenges in rural environments. In the United States, rural areas are characterized by a higher proportion of convenience stores compared to supermarkets and discount food stores, low availability and variety of nutritious food items, and higher food prices (Bustillos, Sharkey, Anding & McIntosh, 2009; Dean & Sharkey, 2012; Gantner, Olson, Frongillo, & Wells, 2011; Jithitikulchai, Kaufman, 1999; Liese, Weis, Pluto, Smith, & Lawson, 2007; Morris, Neuhauser, & Campbell, 1992; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007; Ramadurai, Scharf, & Sharkey, 2012). These features of the food environment have important implications because high food prices and having fewer food stores in a community are both associated with an increased likelihood of food insecurity (Garasky et al., 2006). Although less is known about the food environment in rural areas in Canada, a few studies have found that rural residents might encounter challenges with accessing healthy and reasonably priced food (Atlantic Health Promotion Research Centre, 2004; Beaulac, Kristjansson, & Cummins, 2009; Drouin, Hamelin,

& Ouellet, 2009; Nova Scotia Participatory Food Security Projects [NSPFSP], 2013; Pouliot & Hamelin, 2009; Travers et al., 1997). For example, two studies found that rural areas in Quebec City had more high cost food stores (Drouin et al., 2009) and fewer stores with a wide variety of fruits and vegetables (Pouliot & Hamelin, 2009) than urban areas. The authors suggested that these characteristics might create an economic disadvantage for rural residents who must travel longer distances to access affordable fruits and vegetables. In addition, food costing data from Nova Scotia indicates that, on average, rural residents pay more for a National Nutritious Food Basket than urban residents (NSPFSP, 2013). Taken together, the reviewed research suggests that the socioeconomic characteristics of rural areas, coupled with the limited accessibility to affordable foods, represent unique challenges for rural residents that might influence their household food security status (CAFB, 2005; De Marco et al., 2009; Garasky et al., 2006; Morton et al., 2004; Ontario Association of Food Banks, 2012).

Finally, place of residence provides the context for the intersection of personal, economic, social and environmental factors that can influence poor outcomes (CIHI, 2006; Macintyre, MacIver, & Sooman, 1993; Williams & Kulig, 2012). Thus, it could be argued that where one lives might have a differential impact on a household's exposure to risk and protective factors that can affect the manifestation of household food insecurity. National estimates indicate that household food insecurity was more prevalent in urban households than in rural households in 2007-2008 (8.1% and 6.1%, respectively; Health Canada, 2011). This statistic provides an indication that differences might exist in rural and urban areas; however, it is unknown whether these differences would remain once important sociodemographic and economic indicators are taken into account. It also remains unclear whether urban and rural

residence has a comparable influence on the degree of association between the sociodemographic and economic risk factors and household food insecurity.

We sought to address this gap in the literature by conducting an investigation of household-level risk factors and household food insecurity in rural and urban households in Canada. Our objectives were to: (a) estimate the frequency of household food insecurity in urban and rural households; (b) describe the sociodemographic and economic profile of food insecure households in rural and urban areas; (c) identify the household-level characteristics associated with household food insecurity, including the independent contribution of place of residence; and (d) explore whether place of residence (urban/rural) moderates the association between the risk factors and household food insecurity.

Method

Data Source

We analyzed secondary data from the master file of the Canadian Community Health Survey (CCHS), cycle 3.1.[2] The CCHS was a cross-sectional, representative population health survey of individuals aged 12 years and older who live in private residences. The questionnaire was completed by one knowledgeable person per household who reported on individual-level and household-level sociodemographic and health information. For youth interviews, questions pertaining to household income and household food security status were answered by a parent or guardian. Participation in the survey was voluntary and verbal consent was obtained prior to conducting the interview. Excluded populations included people living on Indian Reserves or Crown lands, full-time members of the Canadian Armed Forces, residents of institutions, and residents of certain remote regions. Data for the CCHS cycle 3.1 were collected between

January 2005 and December 2005. The total sample size was *N* = 132, 947, which represents a response rate of 78.9% (Statistics Canada, 2006).

We limited our analytic sample to respondents who were asked to complete the Household Food Security Survey Module (HFSSM). The HFSSM was an optional module in the CCHS and was selected by health regions in British Columbia, Alberta, Ontario, Quebec, Nova Scotia, Prince Edward Island, Northwest Territories (NWT), and Nunavut. We excluded respondents from NWT and Nunavut (*n* = 1,790) from our analyses, as residents of these regions tend to have unique sociodemographic characteristics that may not be comparable with other areas of Canada. Thus, our sample comprised *N* = 105, 961 respondents in the six aforementioned provinces.[3]

Measures

Dependent variable. The HFSSM was designed to measure the severity of income-related household food security in the past 12 months (Health Canada, 2012). The HSSM consists of 18 items that assess the self-reported uncertainty, insufficiency or inadequacy of food access due to income constraints, and its associated impact on food consumption and eating patterns. Ten items focus on the experience of adults; an additional 8 items assess the independent experience of children less than 18 years of age in the same household. The HFSSM was adapted from a well-validated and reliable measure of food security developed by the United States Department of Agriculture (USDA; Bickel, Nord, Price, Hamilton, & Cook, 2000; Hamilton et al., 1997a, 1997b).[4]

We used the scoring protocol developed by Health Canada (2007)[5] to determine the food security status of the household (i.e., food secure, moderately food insecure, severely food insecure), which we dichotomized as ‘food secure’ and ‘food insecure.’

Independent variables. Given that food security was measured at the household-level, we limited our examination to sociodemographic and economic variables also measured at the household-level.[6] The independent variables included: adjusted household income, main source of household income, household ownership, highest level of education for any household member, household/family type, and number of children in the household (For a full description of derived variables, see Statistics Canada, n.d.).

The adjusted household income variable provides a relative measure of the purchasing power of the household compared to the income of other households. It was derived by forming an income ratio based on the self-reported total household income and the relationship of that income-level to the low-income cut-off (LICO).[7] The income ratios were standardized using National-level weighted data and distributed into similar sized deciles from lowest to highest income. For the present study, the deciles were initially grouped into five household income categories: lowest, lower-middle, middle, upper-middle and highest income; however, given the low frequency of household food insecurity in the upper-middle and highest income groups, these categories were collapsed to meet the data requirements for the statistical methods. The final variable included four income categories: lowest, lower-middle, middle, and upper-middle/highest.

The main source of household income variable was re-categorized from 14 categories into four groups: (a) salary/wage or self-employment; (b) social assistance/welfare (i.e., provincial or municipal social assistance or disability support), employment insurance or worker's compensation; (c) pension or senior's benefits (i.e., Canada or Quebec pension, retirement pension, or old age security/guaranteed income supplement); and (d) other source (i.e., dividends/interest, child tax benefit, child support, alimony, other or no income).

Household ownership was based on the respondent's self-report of whether there was a person residing in the household who owned the dwelling. The variable was grouped into two categories: owner and non-owner/tenant. The highest level of education variable was determined based on the self-reported highest level of education attained for any member of the household. The variable was grouped into four categories: less than secondary school graduation, secondary school graduation, some postsecondary education, and postsecondary graduation.

The household/family type variable represented the economic family status of the household, which was based on the sex of the respondent and his/her relationship to the other member(s) residing in the same household (i.e., parent, child, unrelated). Because the items for 'household with children' on the HFSSM were designed to measure the experience of children younger than 18 years of age (Bickel et al., 2000), the CCHS derived categories for households with children were re-categorized to reflect this criterion (Health Canada, 2007). A household was classified as having a dependent child(ren) if there was at least one member under 18 years of age residing in the household. Households identified as having a child(ren) between 18 and 25 years old were categorized as a 'couple household, living with others.' In addition, given the low frequency of female lone and male lone parent households, these categories were collapsed as 'lone parent with children' to increase the cell size for statistical analyses. Lone parents whose child(ren) were 18 years of age or older were categorized as an 'other' household/family type. The final household/family type variable included five household types: (a) single or unattached, living with or without others; (b) couple without a dependent child(ren), living with or without others; (c) couple with dependent child(ren) younger than 18 years old, living with or without others; (d) lone parent with a dependent child(ren) younger than 18 years old, living with or without others; and (e) other household.

The presence of children in the household variable was derived by summing the values of the following variables: number of persons 15 years of age or less in household, and number of dependents 16 or 17 years old in household. The derived variable was grouped into three categories: no children, 1 or 2 children, and 3 or more children.

Moderator variable. Place of residence was defined using an urban-rural dichotomy generated by Statistics Canada (n.d.). An urban area was defined as a continuously built-up area with a population concentration of 1,000 or more residents and a population density of 400 or more residents per square kilometer. A rural area was any area that was not classified as 'urban.' The population counts used to form the urban-rural dichotomy were based on data from the 2001 Canadian census (Statistics Canada, 2002a).

Data Preparation

In order to meet the statistical assumption of adequacy of expected frequencies, we collapsed the categories of some variables (e.g., household/family type) to increase the cell sizes and to produce more robust estimates. All other statistical assumptions for logistic regression analyses were met. Variables were either dichotomous or categorical. Dummy coding was used to re-categorize categorical variables into a set of dichotomous variables (i.e., 1 = group membership, 0 = reference group). For each independent variable, the category with the highest prevalence in the sample was set as the reference group. We formed a 'missing' response category for independent variables with a missing rate > 5% (i.e., "refusal", "don't know", "not stated").[8] These included adjusted household income (14.6%), highest level of education for any member of the household (8.6%) and main source of household income (6.7%). Cases with missing data on the remaining variables were dropped from the analyses.[9] The final sample size for the analyses was N = 100,665.

Statistical Analyses

Cross-tabulations were generated to determine the proportion of households reporting food insecurity and the distribution of households across the sociodemographic and economic variables by food security status and place of residence. The proportion of households in rural and urban areas reporting food insecurity was deemed to be significantly different if their 95% confidence intervals did not overlap.

Logistic regression was used to assess the associations between the independent variables, including place of residence, and household food insecurity status. Unadjusted odds ratios were generated using bivariate logistic regression and adjusted odds ratios were derived from a multivariate model that included all six independent variables and the place of residence variable. These analyses allowed us to test the unique contribution of each independent variable in the prediction of household food insecurity, while controlling for the effects of the other variables in the regression equation.

Following this, we used the criteria outlined by Baron and Kenny (1986) to assess whether place of residence modified the strength or direction of the relationship between the sociodemographic and economic variables and household food insecurity status. In these multivariate logistic regression models, we included the sociodemographic or economic variable of interest (predictor), place of residence (moderator), and the derived two-way interaction term (predictor *x* moderator). All models were adjusted using the other independent variables to control for potential confounding effects. A total of six moderation models were tested. A moderation effect was identified if an interaction term was significantly associated with household food insecurity, after controlling for the conditional effects of both the predictor and the moderator variable (Baron & Kenny, 1986; Frazier, Tix & Barron, 2004; Holmbeck, 1997;

Jaccard, 2001). We further assessed the meaningfulness of a statistically significant interaction term by evaluating whether its inclusion in the logistic regression model enhanced the prediction of household food insecurity. This was completed using the goodness-of-fit χ^2 analysis whereby we compared the change in the omnibus chi-square test between the interaction model and the main effect model.

In moderation analyses, the presence of a significant interaction term denotes that the association between the independent variable and the outcome variable is conditional on the level of the moderator; however, it does not specify the conditions that determine the significant association between the predictor and outcome (Holmbeck, 2002). We conducted post hoc analyses to probe the nature of the moderation effect for interaction models that enhanced the prediction of household food insecurity. This was completed by adjusting the dummy coding for the place of residence variable to form two conditional moderator variables. First, we assigned a value of zero to the 'urban residence' category, and, in the second, assigned a value of zero to the 'rural residence' category. We then ran separate multivariate models using each coding scheme to assess the conditioned effect of urban and rural residence on the associations between the independent variable (predictor) and household food insecurity (outcome). All models included the other sociodemographic and economic variables to control for potential confounding effects. For interpretation, the logistic coefficient of the independent variable represents its conditioned effect on the outcome when the moderator variable is coded as '0' (i.e., the effect for the reference group of the moderator variable; Jaccard, 2001). By using this statistical method, we were able to identify whether the observed association between the independent variable and household food security was significant for urban households, rural households, or for both, but in differing magnitudes (Holmbeck, 2002).

To account for the complex sampling design of the CCHS, data were weighted using household-level weights provided by Statistics Canada. The bootstrap variance estimation method was used to calculate standard errors, 95% confidence intervals (CIs) and coefficients of variation (CVs). We conducted analyses using SAS 9.3 software (SAS Institute Inc., Cary, NC, 2011).[10] Unless otherwise noted, statistical significance was set at $p < .05$.

Results

In the full sample, 7.5% of households reported experiencing food insecurity in 2005. This represented approximately 785, 500 households. A significantly greater proportion of urban households reported food insecurity compared to rural households (7.8% vs. 6.0%, 95% CIs [7.5, 8.0], [5.6, 6.4]). Table 1 presents the weighted distribution of household-level sociodemographic and economic characteristics for food insecure households by place of residence. Although urban and rural food insecure households had a similar pattern of vulnerability, there were significant differences between urban and rural households across several characteristics. Specifically, a higher proportion of urban food insecure households reported that their household income was in the lowest category, and that their main source of income was from social assistance/employment insurance/worker's compensation or 'other' sources of income (e.g., alimony, no income) than rural households. As the prevalence of household food insecurity increased the level of household educational attainment tended to decrease. This trend was more pronounced among urban households than rural households. Compared to rural households, a higher proportion of households composed of single individuals and other family types (e.g., unrelated members) in urban areas reported household food insecurity. Households with children in urban areas had a higher prevalence of food insecurity than their rural counterparts, especially those with three or more children.

Table 1

Sociodemographic and Economic Characteristics of Food Insecure Households by Place of Residence

Variable	Urban[a]		Rural[b]	
	n	Food Insecure % [95% CI]	*n*	Food Insecure % [95% CI]
Adjusted household income				
Lowest	1,872,900	22.8 [22.0, 23.6]	265,800	18.8 [17.1, 20.5]*
Lower-middle	1,562,100	7.7 [7.1, 8.2]	283,100	7.9 [6.8, 9.0]
Middle	1,498,200	3.7 [3.3, 4.1]	280,200	4.3 [3.5, 5.2]
Upper-middle/highest	2,808,400	1.2 [1.0, 1.3]	643,500	1.5 [1.2, 1.8]
Not stated	1,047,800	4.8 [4.2, 5.3]	206,700	3.1 [2.4, 3.8]*
Main source of income				
Salary/wage	5,987,800	6.4 [6.1, 6.7]	1,143,800	5.1 [4.7, 5.6]*
Social assistance/E.I./W.C	306,800	47.4 [45.1, 49.7]	47,700	39.7 [35.2, 44.2]*
Pension/senior's benefits	1,763,600	4.8 [4.4, 5.2]	365,800	4.5 [3.8, 5.2]
Other	383,900	14.6 [13.1, 16.1]	56,900	6.5 [4.5, 8.4]*
Not stated	347,400	4.2 [3.3, 5.1]	65,100	4.2 [2.8, 5.6]E
Home ownership				
Owner	5,932,800	3.6 [3.4, 3.8]	1,466,000	4.2 [3.8, 4.5]
Non-owner/tenant	2,856,700	16.5 [15.9, 17.1]	213,300	18.3 [16.5, 20.2]
Highest level of education				
Less than secondary	880,300	12.5 [11.7, 13.4]	237,600	9.1 [7.8, 10.3]*
Secondary graduation	926,600	10.9 [10.1, 11.7]	190,900	5.3 [4.2, 6.4]*
Some postsecondary	497,700	12.7 [11.5, 13.9]	87,500	11.0 [8.7, 13.4]
Postsecondary graduation	5,959,800	6.1 [5.8, 6.4]	1,056,200	4.9 [4.4, 5.3]*
Not stated	525,100	8.9 [7.9, 9.9]	107,000	7.2 [5.7, 8.8]
Household/family type				
Single/unattached	2,862,000	10.7 [10.2, 11.2]	387,800	8.2 [7.3, 9.2]*
Couple without children	2,918,100	3.2 [2.9, 3.4]	709,200	3.4 [3.0, 3.9]
Couple with children	2,157,700	6.4 [6.0, 6.9]	462,600	5.9 [5.1, 6.6]
Lone parent, children	490,300	22.5 [20.9, 24.0]	61,700	21.9 [18.4, 25.4]
Other	361,600	10.2 [9.0, 11.5]	58,000	6.1 [4.1, 8.1]E*
Presence of children				
No children	6,100,000	7.0 [6.8, 7.3]	1,143,000	5.2 [4.7, 5.6]*
1 to 2 children	2,288,700	8.8 [8.3, 9.4]	436,000	7.2 [6.4, 8.1]*
3 or more children	400,900	13.2 [11.8, 14.7]	100,200	9.6 [7.8, 11.5]*

Note. n = weighted sample size using household survey weights, rounded to the nearest 100. % = proportion of the weighted sample that reported living in a food insecure household. CI = confidence interval. W.C. = worker's compensation. E = estimate is considered of marginal quality due to high sampling variability. The reader is advised to 'use with caution.'

[a] Weighted urban sample size (rounded to the nearest 100): N = 8,789,500. [b] Weighted rural sample size (rounded to the nearest 100): N = 1,679,300.

*Statistically significant difference between urban and rural food insecure households based on non-overlapping 95% CIs.

In the multivariate analysis of main effects, households reliant on social assistance, employment insurance, or worker's compensation, non-owners/tenants, single or unattached individuals, lone-parent families, households with three or more children, and those with some postsecondary education had greater odds of reporting household food insecurity (Table 2).[11] The likelihood of household food insecurity increased significantly as household income decreased. Households in the lowest income category were nearly 14 times more likely to report household food insecurity than those in the upper-middle/highest level of household income. After controlling for all other variables, urban residency was associated with a lower likelihood of reporting household food insecurity.

Table 2

Odds of Household Food Insecurity in Relation to the Sociodemographic and Economic Household Characteristics

Variable	Unadjusted		Adjusted[a]	
	OR	[95% CI]	OR	[95% CI]
Adjusted household income				
Lowest	23.33	[20.5, 26.5]*	13.89	[12.1, 16.0]*
Lower-middle	6.77	[5.9, 7.8]*	5.48	[4.8, 6.3]*
Middle	3.20	[2.8, 3.7]*	2.79	[2.4, 3.2]*
Upper-middle/highest[b]	1.00		1.00	
Not stated	3.82	[3.3, 4.5]*	3.57	[3.0, 4.2]*
Main source of income				
Salary/wage[b]	1.00		1.00	
Social assistance/E.I./W.C.	13.10	[11.9, 14.4]*	3.03	[2.7, 3.4]*
Pension/senior's benefits	0.76	[0.7, 0.8]*	0.41	[0.7, 0.5]*
Other	2.38	[2.1, 2.7]*	1.02	[0.9, 1.6]
Not stated	0.66	[0.5, 0.8]*	0.60	[0.5, 0.8]*
Home ownership				
Owner[b]	1.00		1.00	
Non-owner/tenant	5.17	[4.8, 5.5]*	2.22	[2.1, 2.4]*
Highest level of education				
Less than secondary	2.13	[2.0, 2.3]*	1.05	[1.0, 1.2]
Secondary graduation	1.76	[1.6, 1.9]*	1.14	[1.0, 1.3]*
Some postsecondary	2.26	[2.0, 2.5]*	1.23	[1.1-1.4]*
Postsecondary graduation[b]	1.00		1.00	
Not stated	1.50	[1.3, 1.7]*	1.33	[1.2, 1.5]*
Household/family type				
Single/unattached	3.47	[3.2, 3.8]*	1.48	[1.4, 1.6]*
Couple without children[b]	1.00		1.00	
Couple with children	2.03	[1.8, 2.2]*	1.03	[0.7, 1.5]
Lone parent, children	8.65	[7.8, 9.7]*	1.73	[1.1, 2.6]*
Other	3.20	[2.8, 3.7]*	1.91	[1.6, 2.3]*
Presence of children				
No children[b]	1.00		1.00	
1 to 2 children	1.30	[1.2, 1.3]*	1.29	[0.9, 1.9]
3 or more children	1.97	[1.8, 2.2]*	1.68	[1.1, 2.5]*
Place of Residence				
Urban	1.33	[1.2, 1.4]*	0.83	[0.8, 0.9]*
Rural[b]	1.00		1.00	

Note. N = 100,665. OR = odds ratio. CI = confidence interval. E.I. = employment insurance. W.C. = worker's compensation.

[a] Adjusted for the other variables listed in the table. [b] Reference category.

* Statistically significant difference from estimate for reference category ($p < .01$).

In the second set of analyses, evidence of a moderation effect of place of residence was found for only two variables: highest level of educational attainment and adjusted household income. A test of the moderation model with the interaction terms for educational attainment against the main effect model showed a statistically reliable difference in the prediction of household food insecurity, χ^2 (4, N = 100,665) = 20.19, $p < .001$. The interaction term for secondary school graduation by place of residence was significantly associated with household food insecurity (Wald = 11.12, $p < .001$). Post hoc probing revealed that, compared to postsecondary school graduates, urban households with secondary school graduation were more likely to report household food insecurity (OR = 1.20, 95% CI [1.06, 1.37], $p < 0.01$), whereas rural households with secondary school graduation were less likely to report household food insecurity (OR = 0.74, 95% CI [0.57, 0.96], $p = .02$).

With respect to adjusted household income, the moderation model was significantly different from the main effect model, χ^2 (4, N = 100,665) = 16.80, $p < .01$. The interaction term for 'missing' household income by place of residence was significantly associated with household food insecurity (Wald = 9.78, $p < .05$), indicating that the effect of 'missing' income was different between urban and rural households. Post hoc analysis found that, compared to households in the upper-middle/highest income category, both urban and rural households that did not state their household income were significantly more likely to report household food insecurity; however, the magnitude of the relationship was greater for urban households (OR = 3.92, 95% CI [3.22, 4.76], $p < 0.001$) than for rural households (OR = 2.20, 95% CI [1.63, 2.98] $p < 0.001$).

Discussion

The objective of the present study was to understand whether and how urban-rural residence was related to household food insecurity. To our knowledge, this study is one of the first to examine place of residence as a factor in the likelihood of household food insecurity in Canada. We found a significantly higher prevalence of household food insecurity among urban households than rural households. This result is comparable to other studies using data from other cycles of the CCHS (Health Canada, 2007, 2011; Tarasuk et al., 2013). Although urban and rural food insecure households had a similar sociodemographic and economic profile, a higher proportion of urban households were classified in the 'at-risk' categories on several household-level indicators (e.g., lowest household income, educational attainment, household/family type). This result might suggest that urban food insecure households experience more pronounced disadvantage than rural food insecure households. On the other hand, it might also be a reflection of the trend in Canada towards migration to urban areas, particularly among youth and working-age adults (Bryant & Joseph, 2001; Rothwell, Bollman, Tremblay, & Marshall, 2002; Statistics Canada, 2002c). Households that have difficulty supporting the needs of their members might choose to reside in an urban area because these areas tend to offer better access to goods, social services, and employment opportunities (Fairbairn & Gustafson, 2006; Halseth & Ryser, 2006). Thus, the concentration of food insecure households may be greater within urban areas than rural areas.

In the multivariate analyses, the likelihood of reporting household food insecurity was highest among households in the lowest income category, recipients of social assistance, employment insurance or worker's compensation, those with lower educational attainment, non-owners/tenants, lone parents with children, single or unattached individuals, and households with

three or more children. Among these household-level factors, household income, main source of income, and home ownership were the strongest predictors of household food insecurity, which provides further evidence of the substantial economic constraints experienced by households reporting food insecurity (Tarausk, 2005; Tarasuk & Vogt, 2009). These findings are consistent with other published analyses from Canada (Che & Chen, 2001; McIntyre et al., 2000, 2001; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003) and offer a profile of the household-level indicators that are indicative of increased odds of household food insecurity.

Place of residence was independently associated with household food insecurity in the main effects model. Our finding that rural residency was associated with an increased vulnerability to household food insecurity might appear inconsistent with the univariate finding that a higher proportion of urban households were food insecure. However, the fact that the odds ratio for household food insecurity was higher for urban households before controlling for the other independent variables suggests that the higher prevalence of food insecurity in urban households is a reflection of their poorer household circumstances. Overall, the significant relationship between place of residence and household food insecurity suggests that where one lives has a unique contribution to household food insecurity beyond what is explained by the sociodemographic and economic differences of urban and rural households. The unmeasured aspects of rural environments, such as greater distances to goods and services, reliance on private transportation, limited affordable food choices, and reduced access to social services, might contribute to the greater odds of household food insecurity in rural households (CAFB, 2003, 2005; Garasky et al., 2006; Morton et al., 2004; Ontario Association of Food Banks, 2012).

Moderation analyses exploring whether place of residence altered the associations between the household-level variables and household food insecurity produced mixed results.

Most of the interaction terms were non-significant, indicating that the strength and/or direction of the relationship between the household-level indicator and household food insecurity was not dependent on whether the household was located in an urban or rural area. Thus, the independent effect of main source of income, home ownership, presence of children, and household/family type on the likelihood of household food insecurity was similar for urban and rural households.

The moderation models for highest level of educational attainment and adjusted household income showed a significant moderation effect of place of residence in the association with household food insecurity. Although the majority of the interaction terms in these moderation models were non-significant (i.e., place of residence did not moderate the associations), post hoc analyses showed that, compared to postsecondary school graduation, secondary education graduation was associated with an increased likelihood of household food insecurity among urban households, and a decreased likelihood for rural households. This result might seem anomalous because higher educational attainment has been associated with a decreased prevalence of household food insecurity (Health Canada, 2007, 2011; McIntyre et al., 2000; McIntyre, et al., 2001). The fact that secondary school graduation was a risk factor among urban households and a protective factor for rural households suggests that there is a qualitative difference in the role of education in household food insecurity in urban and rural areas. One explanation might be related to educational attainment and the employment opportunities in urban and rural areas. In Canada, research suggests that rural areas have a greater proportion of lower skilled occupations (Alasia & Magnusson, 2005), part-time employment (e.g., seasonal, contract; Curto & Rothwell, 2002), and self-employment (du Plessis, 2004) than urban areas. Rural households that obtain these forms of employment might be able to secure sufficient

financial resources to support the needs of their members. This might also be a reflection of out-migration of youth and working age adults from rural to urban areas (Bryant & Joseph, 2001; Rothwell, Bollman, Tremblay, & Marshall, 2002; Statistics Canada, 2002c), resulting in a greater proportion of the rural workforce being represented by secondary school graduates who are better able to secure employment within the main industry sectors in these communities (i.e., greater skill to position fit). The same relationship may not be present in urban areas. For example, there is a predominance of professional and highly skilled occupations in urban areas (Alasia & Magnusson, 2005; Beckstead, Brown, & Newbold, 2008), which typically require higher levels of educational attainment. Consequently, those who have lower levels of education might be particularly vulnerable to negative outcomes.

Another explanation might be related to the way in which educational attainment was measured in this study. Specifically, we restricted our analyses to variables that were measured at the household-level, which meant that the highest level of educational attainment was for any member of the household. It is possible that the household member with the highest level of education was not the head of household with respect to other important characteristics (e.g., income earner). This measurement issue may be particularly relevant for rural households because postsecondary education was associated with an increased likelihood of household food insecurity. It is likely that a combination of factors, such as educational attainment, household income, and employment status, are responsible for the observed moderation effect of place of residence and secondary school education. More extensive monitoring of household food insecurity and research that pairs robust measures of household food insecurity, employment status, types of employment opportunities (e.g., occupation, industry sector), and educational attainment for rural and urban households would aid in further elucidating this moderation effect.

The significant moderation effect between households that did not state their income and place of residence was an interesting finding. The direction of the association was similar for rural and urban households (i.e., greater likelihood of household food insecurity), and the magnitude of the odds ratios suggests that this missing group includes households from all income categories. It is difficult to interpret this result in the absence of specific information about the respondent's reason(s) for not disclosing their household income. Nevertheless, it does highlight the importance of retaining households with missing data in the analyses because they have different characteristics than those who provide complete responses to survey items.

Strengths and Limitations

In this study, we were able to provide estimates of household-level factors and household food insecurity for rural and urban households using a large, reasonably representative sample of the Canadian population. Our analytic approach investigating moderation effects allowed us to formally test whether the observed relationships between the household-level factors and household food insecurity were significantly different for urban and rural households.

Nevertheless, there are some limitations. The use of cross-sectional data precludes the discussion of causal inferences between household-level factors and household food insecurity. All data were self-reported and thus subject to recall bias and errors. The frequency of household food insecurity and the magnitude of the associations for certain indicators are likely an underestimate given the exclusion of certain disadvantaged populations (e.g., on-reserve Aboriginal peoples, homeless individuals). The HFSSM was designed to measure income-related food security, and does not take into account other reasons for inadequate food acquisition and consumption (e.g., poor access and availability in the food environment) or the strategies that are used to ameliorate the household food supply (e.g., individuals skills, social

support). Qualitative differences may exist between rural and urban households in the experience of household food insecurity that would not be captured by this measurement tool.

Our decision to restrict our analyses to household-level indicators was both a strength and limitation. On the one hand, the HFSSM and the selected indicators were designed to represent the status of the household (i.e., same unit of measurement); therefore, the responses to these measures would not be dependent of which member of the household was selected to participate in the CCHS. However, using only household-level indicators excluded other explanatory variables, such as community-level (e.g., sense of belonging, access to services) and individual-level factors (e.g., age, sex, social support) that might play an important role in the manifestation of household food insecurity in rural and urban areas.

Lastly, we acknowledge that places of residence, particularly rural areas, are not homogenous and unique differences exist based on the level of urban integration (e.g., near urban centre vs. remote area; du Plessis, Beshiri, Bollman, & Clemenson, 2001; Williams & Kulig, 2012). A limitation of our study was the use of a dichotomous place of residence variable that was based on a simplistic operational definition of urban and rural areas. However, the fact that household food security status was an optional module on the CCHS and not selected by provinces with larger rural populations (e.g., Saskatchewan, New Brunswick; Statistics Canada, 2002b), combined with the low frequency of household food insecurity in the general population and the unequal distribution of urban and rural households in Canada, our ability to examine household food insecurity within specific classes of rural areas (e.g., low to high integration with an urban centre) was significantly limited. Therefore, our analyses provide crude estimates of the effect of urban and rural residence on the association between household-level indicators and

household food insecurity. Future research should strive to evaluate differences in household food insecurity both between and within different classes of urban and rural areas.

Conclusions

Our research has begun to uncover the complex connections between place of residence and household food insecurity. The results suggest that rural residency has a unique contribution to household food insecurity beyond what can be explained by other household-level factors. Although the effect of many household-level factors in the likelihood of household food insecurity was comparable for urban and rural households, the different effect of secondary school education has raised questions about the role of education in rural and urban food insecure households. Research that investigates the features of urban and rural food and social environments, and explores the experience of food insecurity in urban and rural households would help to identify the social, economic and environmental mechanisms that effect household food insecurity in urban and rural areas. Overall, our research highlights the importance of including place of residence in discussions about household food insecurity in Canada.

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Footnotes

[1] The authors include a third category, marginal household food insecurity, in their estimates of household food insecurity in Canada in 2011 (Tarasuk et al., 2013). This less conservative category is indicative of one affirmative response on the HFSSM. To be comparable with the Health Canada (2007) scoring method (see Footnote 5), we report the prevalence estimate for households reporting moderate to severe food insecurity.

[2] Permission to access the master file of the CCHS was granted through application to the Statistics Canada Research Data Centres Program. All research activities were conducted at the Carleton Ottawa Outaouais Local Research Data Centre (COOL RDC). The use of secondary data for research was approved by the University of Ottawa Social Sciences Research Ethics Board.

[3] Although the present study does not include respondents from all Canadian provinces and territories, approximately 88.6% of the Canadian population, or 91% of the urban and 78.9% of the rural population, are located in the six provinces included in the analytic sample (Statistics Canada, 2002b).

[4] As a module in the CCHS, specific psychometric properties for the HFSSM are not available. Validity was measured by the developers of the HFSSM (Hamilton et al., 1997a, 1997b) and showed appropriate face validity, construct validity and convergent validity. Reliability estimates ranged from .89 (all households) to .90 (households with children). Internal consistency estimates (Cronbach's alpha) ranged from .86 (all households) to .88 (households with children).

[5] The scoring system used for this study is a departure from the USDA standard method (Bickel et al., 2000), whereby households are considered to be food insecure if there are three or

more affirmative responses to the 10-item (adult) or 18-item food security scale (adult and child). The less conservative threshold for household food insecurity (two or more affirmative responses) developed by Health Canada (2007) has been adopted by Statistics Canada in recent iterations of the CCHS, and has been used by Canadian researchers in the area of household food insecurity (see Tarasuk & Vogt, 2009). Thus, the Health Canada method was used in the present study to allow for comparability within the Canadian context.

[6] It is presumed that the sociodemographic and economic variables would be answered similarly irrespective of which member of the household was selected to participate in data collection for the CCHS.

[7] LICO was derived using the number of persons in the household and the size of the community, and represents a threshold at which a household would spend a larger portion (typically > 30%) of its income on basic necessities (i.e., food, shelter and clothing). The LICO considers the total household income, the number of people that the household supports on that income and the cost of living (or purchasing power) within the community (Statistics Canada, n.d.).

[8] We selected this method of dealing with missing data for a number of reasons. First, due to the high rate of missing data, full case deletion would have resulted in a substantial loss of cases (20.4% of the sample). Second, results from the missing values analysis revealed that the pattern of missing data was not random. Therefore, deletion of cases with missing data may distort the representativeness of the sample and introduce bias in the analyses. Third, multiple imputation would be an inappropriate method for this sample given the high rate of missing data among several independent variables. We conducted a sensitivity analysis using multivariate logistic regression to test the similarity of results for a sample that included a ‘missing’ response

category for variables that had a high rate of missing data compared to a sample that included only complete cases (i.e., full case deletion of missing data). The results from the two samples were quite similar and the statistical inferences generated from the two sets of data were the same. Thus, we decided that the retention of cases using the 'missing' response category method far outweighed the loss of data associated with full case deletion.

[9] Approximately 5% of the respondents were excluded from the analyses, most of them had missing data on the HFSSM (dependent variable).

[10] We used SPSS 21.0 software (IBM Corporation, Armonk, NY, 2012) to produce weighted estimates for the goodness-of-fit χ^2 analyses.

[11] The percentage of cases that were correctly classified in the main effects model was 92.8%.

Running Head: HOUSEHOLD FOOD INSECURITY AND HEALTH

Chapter 3: Study 2

Relationship Between Household Food Insecurity and Poor Health for Urban and Rural Residents

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Abstract

Objectives: To provide an estimate of the prevalence of poor general, physical, and mental health for individuals residing in food insecure households in rural and urban areas; to examine the association between household food insecurity and poor health, controlling for place of residence and sociodemographic factors; and to investigate whether place of residence moderates the relationship between household food insecurity and poor health.

Method: We analyzed cross-sectional data from the Canadian Community Health Survey (Cycle 3.1). Our sample included respondents 12 years and older who completed all survey modules of interest (N = 52,637). Multivariate logistic regression was used to assess the relationship between household food insecurity and poor health, and to test for a moderation effect of place of residence.

Results: Poor health was more prevalent for individuals in food insecure households and there were no differences based on place of residence. Regression analyses showed that living in a food insecure household was independently associated with an increased likelihood of poor self-rated general and mental health, multiple chronic conditions, diabetes, high blood pressure, heart disease, food allergies, elevated distress, major depressive episode, mood disorder and anxiety disorder. The interaction between household food insecurity and place of residence was non-significant for all health models.

Conclusions: Household food insecurity was independently associated with poorer general, physical and mental health. We found no evidence of urban-rural differences in these relationships, which suggests that the health disadvantage of living in a food insecure household is similar for urban and rural residents.

Relationship Between Household Food Insecurity and Poor Health for Urban and Rural Residents

Food security, defined as the assured access to nutritious and safe foods, emphasizes the global position that food is a fundamental right (Riches, 1999; Rideout, Riches, Ostry, Buckingham, & MacRae, 2007; United Nations, n.d.) and a basic necessity for an individual to be healthy, active, and well-nourished (Dietitians of Canada, 2005; Nord, Andrews, & Carlson, 2009). Yet, recent estimates suggest that 1.06 million households, or approximately 2.5 million Canadians, had limited or uncertain access to adequate food in 2011[1] (Tarasuk, Mitchell, & Dachner, 2013; T. Boston, personal communication, October 8, 2013). This statistic is concerning because food security is recognized as an important social determinant of health (McIntyre, 2004; Raphael, 2004, 2010; Tarasuk, 2004, 2005).

Researchers have consistently demonstrated a strong, independent association between household food insecurity and poor health. In Canada, individuals living in food insecure households are more likely to rate their health as fair or poor, experience restricted activity, have poor functional health, report being diagnosed with multiple chronic conditions, be at risk for major depression, and have high distress (Che & Chen, 2000; McIntyre, Connor, & Warren, 2000; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005). An association has also been found between household food insecurity and certain chronic health conditions (e.g., diabetes, hypertension; Galesloot, McIntyre, Fenton, & Tyminski, 2012; Gucciardi, DeMelo, Vogt & Stewart, 2009; Vozoris & Tarasuk, 2003). The effect of household food insecurity on health is not limited to adults. Studies from North America suggest that children and youth living in food insecure household can experience a range of adverse outcomes, including poor general health (Cook et al., 2006; Kirkpatrick, McIntyre & Potestio,

2010; McIntyre et al., 2000; McIntyre, Walsh, & Connor, 2001), increased rates of hospitalization (Cook et al., 2006), chronic conditions (Kirkpatrick et al., 2010; McIntyre et al., 2000), behavioural problems (Alaimo, Olson, & Frongillo, 2001; Kleinman et al., 1998; Murphy et al., 1998), emotional problems (Belsky, Moffitt, Arsenault, Melchoir, & Caspi, 2010), and mood symptoms (Alaimo, Olson, & Frongillo, 2002). In all of this research, the effects of household food insecurity on health remained significant after controlling for other sociodemographic factors, which indicates that the impact of household food insecurity is distinct from the known relationship between low socioeconomic status and poor health.

The relationship between household food insecurity and poor health is complex and likely involve multiple pathways. For example, household food insecurity might indirectly affect physical health through inadequate nutrition resulting from diets that are comprised of poor quality, high caloric density foods and lower intakes of fruits, vegetables, milk and meat (Champagne et al., 2007; Jacobs Starkey & Kuhnlein, 2000; Kendall, Olson, & Frongillo, 1996; Kirkpatrick & Tarasuk, 2008b; Mathews, Morris, Schneider, & Goto, 2010; McIntyre, Glanville, et al., 2003; Tarasuk, 2001c; Williams, McIntyre, & Glanville, 2010), and diets that are deficient in some essential vitamins and minerals (Bhattacharya, Currie & Haider, 2004; Champagne et al., 2007; Kirkpatrick & Tarasuk, 2008b; McIntyre, Glanville, et al., 2003; Tarasuk & Beaton, 1999b). In addition, the circumstances surrounding household food insecurity itself, such as the uncertainty of resources (Hamelin, Beaudry, & Habicht, 2002; Radimer, Olson, Greene, Campbell, & Habicht, 1992; Tarasuk & Maclean, 1990), disruptions to social interactions (Ahluwalia, Dodds & Baligh, 1998; Hamelin, Habicht, & Beaudry, 1999; Runnels, Kristjansson, & Calhoun, 2011), and lowered sense of mastery (Siefert, Heflin, Corcoran, & Williams, 2004), might increase perceived stress (Heflin, Siefert, & Williams, 2005; Wu & Schimmele, 2005) and

feelings of sadness, worry, and/or despair (Hamelin et al., 2002, Runnels et al., 2011). Building our awareness of the factors that are related to household food insecurity and health are important areas for future research.

One area that has received little attention in the literature is the role of environmental factors, such as place of residence, in the relationship between household food insecurity and poor health (Morton, Worthen, & Weatherspoon, 2004). There is a growing interest in the role of place in health research (Canadian Institute for Health Information [CIHI], 2006; Williams & Kulig, 2012) and many experts advocate that "geography is a determinant of health" (Romanow, 2002, p. 159). The contextual features of rural and urban residence might exert a differential influence on exposure to the social and economic resources that can affect health and well-being (Williams & Kulig, 2012). This would have important implications for the likelihood of household food insecurity, and ultimately, for its association with health.

In Canada, studies examining urban-rural differences in health have shown that rural residents tend to have poorer health on some indicators than their urban counterparts. For example, rural residents have higher rates of mortality, certain chronic conditions (e.g., high blood pressure, arthritis), and poor self-assessed general health (CIHI, 2006; Mitura & Bollman, 2003; Pampalon, Martinez, & Hamel, 2006). It has been hypothesized that the higher vulnerability to poor health for rural residents is linked to the underlying socioeconomic challenges in rural areas (e.g., lower household income, unemployment, lower educational attainment; CIHI, 2006; Smith, Humphreys & Wilson, 2008). These factors also have a known association with an increased risk for household food insecurity (Gorton, Bullen, & Mhurchu, 2009). Rural residents also report lower consumption of fruits and vegetables compared with urban residents (DesMeules et al., 2012). Although there might be individual differences in food

selection, the constraints to attaining a healthy diet could be related to the food environments of rural areas that are characterized by limited availability and variety of nutritious, affordable foods (Atlantic Health Promotion Research Centre, 2004; Beaulac, Kristjansson & Cummins, 2009; Drouin, Hamelin & Ouellet, 2009; Nova Scotia Participatory Food Security Projects, 2013; Pouliot & Hamelin, 2009; Travers et al., 1997).

In contrast, rural residence might confer certain benefits for other aspects of health. Rural residents tend to report better mental health, including lower rates of major depressive episodes and personal stress (CIHI, 2006; Nelson & Park, 2012; Romans, Cohen, & Forte, 2011; Wang, 2004), which might be a function of the buffering effect of stronger social supports and community connectedness in rural areas (Nelson & Park, 2012; Romans et al., 2011; Turcotte, 2005). Studies have shown that households with access to social supports and perceived sense of community have a lower likelihood of reporting hunger (Martin, Rogers, Cook, & Joseph, 2004; Morton, Bitto, Oakland, & Sand, 2005). Taken together, this research suggests that place of residence could influence the exposure to the risk and protective factors for household food insecurity, which, in turn, could impact the likelihood of poor health in urban and rural populations.

Relatively little is known about the health of people residing in rural food insecure households, especially in Canada. Although research from the United States has shown similar trends in the association between household food insecurity and poor health for rural populations (Hanson & Olson, 2012; Huddleston-Casas, Charnigo, & Simmons, 2008; Lent, Petrovic, Swanson, & Olson, 2009; Pheley, Holben, Graham, & Simpson, 2002), few studies have investigated whether differences exist in the magnitude of the association between household food insecurity and poor health for rural and urban residents. A study by Sharkey and colleagues

(2011) examined the association between household food insecurity and health among a sample of women from urban and rural counties in Texas. Results indicated that household food insecurity was associated with poor general health, poor physical health and mental distress for rural women, yet it was associated with only poor physical health and mental distress for urban women (Sharkey, Johnson, & Dean, 2011). Conversely, a Canadian study found that household food insecurity was significantly associated with poor general health, heart disease, arthritis, and having at least one chronic condition for urban, but not for rural older women (Wanless, Mitchell, & Wister, 2010). Although the methodological differences might explain the inconsistent results, these studies suggest that the interaction between household food insecurity and place of residence could have important implications for health. However, given the lack of research in this area, it remains unclear whether, and to what extent, household food insecurity might differentially affect the health of urban and rural residents.

The current study was designed to address this gap in the literature by examining the relationship between household food insecurity and poor health among urban and rural residents in Canada. Our objectives were to: (a) provide an estimate of the rate of poor general, physical, and mental health among food insecure households in rural and urban areas; (b) extend previous research by examining the effect of household food insecurity on an individual's likelihood of reporting poor health, controlling for place of residence and sociodemographic factors; and (c) investigate whether place of residence influences the association between household food insecurity and poor general, physical and mental health.

Method

Data

We used secondary data from the master file of the Canadian Community Health Survey (CCHS) Cycle 3.1.[2] The CCHS is a cross-sectional population health survey of the Canadian population aged 12 years and older residing in private dwellings. One respondent per household was selected to provide information on his or her own health and demographic characteristics, as well as information about the household and its members (e.g., composition, income). For youth interviews, a parent or guardian responded to questions pertaining to household income and household food security status. Populations excluded from participation in the CCHS were individuals living on Indian Reserves and Crown Lands, residents of institutions, full-time members of the Canadian Forces, and people living in certain remote regions. The data collection period for the CCHS Cycle 3.1 was from January 2005 to December 2005. The total sample size for the CCHS Cycle 3.1 was N = 132,947, with a response rate of 78.9% (Statistics Canada, 2006).

The CCHS Cycle 3.1 contained common content posed to all respondents and optional content administered to respondents from the health regions that selected these modules for the questionnaire. For the present study, we limited our sample to respondents who were administered all of the modules of interest for our analyses. Because the Household Food Security Survey Module (HFSSM), Depression Module, and Distress Module were optional content, our analyses are representative of respondents from the health regions in British Columbia, Alberta, Quebec and Prince Edward Island (N = 59,139).

Additional steps were taken to prepare the data for the statistical analyses. First, we included a “missing” response category (i.e., “refusal,” “don’t know,” “not stated”) for the

sociodemographic variables that had a missing rate of > 5%.[3] These variables included adjusted household income (15.3%), main source of household income (8.9%), and highest level of educational attainment (household-level; 7.2%). Respondents with missing data on the HFSSM, health measures (dependent variables) and other sociodemographic variables were dropped from the analyses.[4] The final sample size for the statistical analyses was N = 52,637.

Measures

Household food security status was determined using the HFSSM,[5] an 18 item standardized measure of self-reported uncertainty, insufficiency or inadequacy of food access, food availability and food utilization over the previous 12 months due to income constraints (Bickel, Nord, Price, Hamilton, & Cook, 2000; Health Canada, 2007). Questions assess the severity of household food security, ranging from compromises in the quality and/or quantity of food consumed to direct reductions in food intake and disrupted eating patterns. Ten items focus on the experience of adults in the household and an additional 8 items assess the independent experience of any children under the age of 18 years residing in the same household. Households were classified as 'food secure' or 'food insecure' according to the scoring criteria developed by Health Canada (2007).[6] Analyses of response patterns revealed that the HFSSM performs well as a measure of household food-insecurity within sub-populations in Canada and that response patterns are comparable to those of participants in the United States (Health Canada, 2007).

The dependent variables for the study characterized the general, physical and mental health of the respondent. The selected modules were: general self-rated health, general self-rated mental health, multiple chronic conditions, depression scale, distress scale, diagnosed mood disorder, and diagnosed anxiety disorder. To further assess physical health, we conducted an

independent analysis of four diagnosed chronic health conditions, heart disease, high blood pressure, diabetes and food allergies, because the etiology and/or management of these conditions has been linked to personal dietary patterns (Robertson, Brunner & Sheiham, 2006, Seligman, Laraia, & Kushel, 2010; Vozoris & Tarasuk, 2003; World Health Organization [WHO], 2004). Each health measure was transformed into a dichotomous variable that classified the respondent's health as either 'good' or 'poor.' A complete description of the health measures, as well as the criterion used to dichotomize the variables is presented in Appendix.

The moderator variable, place of residence, was defined using the urban-rural classification developed by Statistics Canada (n.d.). An urban area was characterized by a population concentration of 1,000 or more residents and a population density of 400 or more residents per square kilometer. A rural area was any area that fell outside of this geographic definition. Population counts from the 2001 Canadian census were used to determine population concentration and density (Statistics Canada, 2002a).

Several sociodemographic variables were chosen to represent the characteristics of the respondent and his or her household. These variables each have a known association with household food insecurity (Che & Chen, 2001; Health Canada, 2007; Vozoris & Tarasuk, 2003) and, in this sample, were significantly related to most measures of health at the bivariate-level ($p = .10$). Where possible, we used variables measured at the household-level in order to be congruent with the unit of measurement of the HFSSM. The sociodemographic variables included: age, sex, aboriginal status, immigrant status, adjusted household income, main source of household income, home ownership, highest level of educational attainment for any member of the household, household/family type, and presence of children in the household. Some variables were re-categorized to increase the cell sizes for the statistical methods. All categorical

variables were dichotomized using dummy coding. A full description of the sociodemographic variables can be found in Appendix.

Statistical Analyses

Data were weighted using person-level weights supplied by Statistics Canada. The bootstrap variation estimation method was used to calculate coefficients of variation and 95% confidence intervals. Descriptive cross-tabulations were used to: (a) determine the proportion of individuals residing in food insecure households; (b) estimate the distribution of household and individual-level sociodemographic variables by food security status and place of residence; and (c) estimate the proportion of individuals reporting good and poor health by food security status and place of residence. Following Statistics Canada (2006) release guidelines, we suppressed data in the descriptive tables that were calculated using fewer than 30 respondents. Proportions were significantly different if the bootstrapped 95% confidence intervals did not overlap.

A multivariate logistic regression model estimating the likelihood of poor health was tested for each health variable as the dependent variable. The reference category for the household food security status variable was 'food secure.' All multivariate models were bootstrapped and adjusted using the place of residence variable and the sociodemographic variables. To test for moderation, the multivariate logistic regression models were repeated with the inclusion of the derived two-way interaction term between household food security status and place of residence (predictor *x* moderator). The interaction models were bootstrapped and adjusted using the abovementioned sociodemographic variables to control for potential confounding effects. A moderation effect was identified if the two-way interaction term was significantly associated with poor health after controlling for the conditioned effect of household food security status and place of residence (Baron & Kenny, 1986; Jaccard, 2001). This would

indicate that place of residence acted as a moderator variable by modifying the strength or direction of the association between household food insecurity and poor health.

All statistical analyses were conducted using SAS 9.3 software (SAS Institute Inc., Cary, NC, 2011). Unless otherwise noted, statistical significance was set at $p < .05$.

Results

In the full sample, the majority of individuals reported residing in a food secure household (93.8%). A statistically significant difference was found in the proportion of urban residents who reported household food insecurity compared to rural residents (6.4% vs. 5.1%, 95% CIs [6.1, 6.7], [4.5, 5.8]). A similar profile of those who were food insecure was found in urban and rural areas (Table 1). Regardless of place of residence, a greater proportion of females, youth, young adults, those of aboriginal identity, and recent immigrants reported residing in food insecure households. At the household-level, a higher proportion of households with the lowest household income, those whose main source of income was social assistance, employment insurance or worker's compensation, tenants/non-owners, those with lower levels of educational attainment (e.g., less than high school, some postsecondary education), single/unattached individuals, those headed by a lone parent, and households with three or more children reported household food insecurity. A few significant differences were found between the urban and rural food insecure samples. A higher proportion of urban food insecure residents were young adults, non-aboriginal, lived in households without children, and had lower levels of household educational attainment (Table 1).

Table 1
Sociodemographic Characteristics of Food Insecure Respondents and their Households by Place of Residence

Variable	Urban[a]			Rural[b]		
	n	Food Insecure %	[95% CI]	*n*	Food Insecure %	[95% CI]
Sex						
Male	4,598,800	5.4	[5.0, 5.9]	986,200	4.2	[3.5, 5.0]
Female	4,796,900	7.3	[6.8, 7.8]	949,500	6.0	[5.0, 7.0]
Age Group						
12-17 years	830,700	8.3	[7.1, 9.4]	190,100	8.6	[6.2, 11.0]
18-44 years	4,411,200	8.2	[7.6, 8.8]	800,300	5.6	[4.5, 6.6]*
45-64 years	2,909,600	4.7	[4.2, 5.2]	704,700	4.8	[3.7, 5.9]
65+ years	1,244,300	2.8	[2.3, 3.3]	240,700	1.7	[1.0, 2.5][E]
Aboriginal Identity						
Non-Aboriginal	9,230,600	6.2	[5.8, 6.5]	1,890,100	4.8	[4.2, 5.4]*
North American Indian/Métis/Inuit	165,100	19.1	[15.4, 22.7]	45,700	17.8	[8.8, 26.8][E]
Immigrant Status						
Canadian-born	7,660,600	6.2	[5.8, 6.5]	1,811,900	5.3	[4.6, 5.9]
Immigrant (5 years or more)	1,483,100	6.7	[5.7, 7.7]	1,600,700	—	—
Recent immigrant (less than 5 years)	252,000	11.0	[8.5, 13.6]	6,200	—	—
Adjusted household income						
Lowest	1,741,100	21.1	[19.8, 22.4]	268,800	18.3	[15.1, 21.4]
Lower-middle	1,712,300	6.5	[5.7, 7.2]	351,900	7.1	[5.3, 8.8]
Middle	1,706,200	3.1	[2.5, 3.8]	350,300	3.3	[2.1, 4.5][E]
Upper-middle/highest	3,075,100	0.07	[0.06, 0.08]	728,500	1.0	[0.06, 1.5][E]
Not stated	1,161,000	4.1	[3.3, 4.8]	236,300	2.5	[1.6, 3.5][E]
Main source of household income						
Salary/wages	7,108,200	5.3	[5.0, 5.7]	1,475,600	4.3	[3.5, 5.0]
Social assistance/Employment Insurance/Worker's Compensation	268,200	41.7	[38.0, 45.4]	50,000	37.8	[30.4, 45.2]
Pension/senior's benefits	1,304,400	4.0	[3.5, 4.6]	289,600	5.6	[2.5, 5.3][E]
Other	332,900	12.8	[0.5, 15.1]	51,500	—	—
Not stated	382,000	3.8	[2.5, 5.2][E]	69,100	—	—

Table 1
Sociodemographic Characteristics of Food Insecure Respondents and their Households by Place of Residence (continued)

Variable	Urban[a]			Rural[b]		
	n	Food Insecure %	[95% CI]	*n*	Food Insecure %	[95% CI]
Home ownership						
Owner	6,641,900	2.8	[2.5, 3.2]	1,718,700	3.6	[2.9, 4.2]
Non-owner/tenant	2,753,800	15.0	[14.1, 15.8]	217,000	17.5	[14.7, 20.3]
Highest level of education						
Less than secondary school graduation	643,600	12.5	[11.1, 14.0]	216,100	8.2	[5.8, 10.5]*
Secondary school graduation	807,700	9.7	[8.4, 11.0]	203,300	3.8	[2.3, 5.2][E]*
Some postsecondary education	557,400	10.5	[9.0, 11.9]	118,200	9.6	[6.8, 12.3]
Postsecondary graduation	6,739,300	5.0	[4.6, 5.3]	1,262,200	4.2	[3.5, 5.0]
Not stated	647,700	7.6	[6.1, 9.0]	135,900	6.5	[3.9, 9.2][E]
Household/family type						
Single/unattached	1,799,600	10.7	[10.0, 11.5]	228,800	8.8	[7.3, 10.3]
Couple without children	3,559,400	3.0	[2.6, 3.3]	853,000	3.3	[2.5, 4.1]
Couple with children	3,077,000	5.5	[4.9, 6.1]	705,200	4.9	[3.7, 6.1]
Lone parent, children	519,000	18.5	[16.2, 20.8]	71,300	18.7	[13.0, 24.4]
Other	440,800	8.5	[6.9, 10.2]	77,400	—	—
Presence of children						
No children	5,749,100	5.7	[5.4, 6.1]	1,142,700	4.4	[3.7, 5.1]*
1 to 2 children	3,047,000	7.0	[6.3, 7.7]	632,800	5.2	[4.0, 6.4]
3 or more children	599,600	9.8	[8.0, 11.5]	160,200	9.8	[5.9, 13.6][E]

Note. *n* = weighted sample size using person survey weights, rounded to the nearest 100 (column sample sizes might not be equal due to rounding). % = proportion of respondents from the weighted sample who reported living in a food insecure household.
CI = confidence interval. Dash indicates that datum was suppressed because the cell size did not meet the criteria for disclosure.
E = estimate is considered of marginal quality due to high sampling variability. The reader is advised to 'use with caution.'
[a] Weighted urban sample size (rounded to the nearest 100): *N* = 9,395,700. [b] Weighted rural sample size (rounded to the nearest 100): *N* = 1,935,700.
* Statistically significant difference between urban and rural food insecure households based on non-overlapping 95% CIs.

Table 2 presents the weighted proportion of self-reported poor general, physical and mental health by household food security status and place of residence. Both urban and rural residents living in food insecure households reported a significantly higher prevalence of fair/poor self-rated general and mental health, and of having multiple chronic conditions, depression, high distress, diagnosed mood disorder, and diagnosed anxiety disorder compared to their counterparts in food secure households. Although the prevalence of heart disease and diabetes was higher for individuals residing in food insecure than food secure households, the proportions were not significantly different. In urban areas, people residing in food insecure households had a significantly higher rate of food allergies and lower rate of high blood pressure than those in food secure households. No significant differences were observed in the prevalence of poor health between the urban and rural residents living in food insecure households (Table 2).

Table 2

Self-Reported Poor General, Physical, and Mental Health by Household Food Security Status and Place of Residence

Variable	Urban[a]				Rural[b]			
	Food Secure		Food Insecure		Food Secure		Food Insecure	
	%	[95% CI]	%	[95% CI]	%	[95% CI]	%	[95% CI]
General Health								
Fair/poor self-rated health	8.7	[8.3, 9.1]	22.0	[19.9, 24.1] *	8.6	[7.9, 9.3]	26.3	[21.3, 31.2]**
Physical Health								
Multiple chronic conditions	22.1	[21.5, 22.6]	37.1	[34.6, 39.7] *	22.7	[21.5, 23.8]	40.3	[34.3, 46.3]**
Diabetes	4.4	[4.1, 4.7]	5.9	[4.7, 7.1]	4.3	[3.8, 4.8]	7.2	[4.0, 10.4][E]
Food allergies	7.1	[6.7, 7.5]	9.5	[7.8, 11.3] *	6.1	[5.5, 6.8]	9.6	[5.9, 13.3][E]
Heart disease	4.2	[3.9, 4.4]	4.6	[3.7, 5.5]	4.3	[3.8, 4.8]	6.6	[3.9, 9.2][E]
High blood pressure	13.8	[13.3, 14.2]	10.8	[9.4, 12.2] *	13.9	[13.0, 14.8]	14.1	[10.6, 17.6]
Mental Health								
Fair/poor self-rated mental health	3.6	[3.3, 3.9]	15.1	[13.1, 17.1] *	3.1	[2.7, 3.6]	16.6	[12.6, 20.6]**
Major depressive episode	4.3	[4.0, 4.6]	17.9	[15.9, 19.9] *	3.8	[3.3, 4.3]	15.6	[11.5, 19.7]**
High/very high distress	8.9	[8.4, 9.3]	31.6	[29.2, 34.1] *	8.0	[7.2, 8.8]	31.0	[25.4, 36.5]**
Mood disorder	4.2	[3.9, 4.5]	15.1	[13.2, 17.0] *	3.5	[3.0, 4.0]	15.9	[11.9, 19.8]**
Anxiety disorder	3.7	[3.4, 4.0]	12.1	[10.5, 13.8] *	3.1	[2.6, 3.5]	12.2	[8.4, 15.9][E]**

Note. % = proportion of respondents from the weighted sample that reported having poor health. CI = confidence interval.
E = estimate is considered of marginal quality due to high sampling variability. The reader is advised to 'use with caution.'
[a] Weighted urban sample size (rounded to the nearest 100): food secure, n = 8,795,100; food insecure, n = 600,600. [b] Weighted rural sample size (rounded to the nearest 100): food secure, n = 1,836,800; food insecure, n = 99,000.
* Significantly different from estimate for individuals in urban food secure households based on non-overlapping 95% CIs.
** Significantly different from estimate for individuals in rural food secure households based on non-overlapping 95% CIs.

After controlling for place of residence and sociodemographic factors, the regression analyses showed that people residing in food insecure households were significantly more likely to report fair/poor self-rated general health, fair/poor self-rated mental health, multiple chronic conditions, heart disease, high blood pressure, diabetes, food allergies, major depressive episode, high/very high distress, mood disorder and anxiety disorder than those in food secure households (Table 3). For all multivariate models, the two-way interaction between household food security status and place of residence was not significantly associated with poor health (data not shown).

Table 3

Odds of Poor General, Physical, and Mental Health in Relation to Household Food Insecurity

Variable	Adjusted OR[a]	95% CI
General health		
Fair/poor self-rated health	2.64*	[2.3, 3.0]
Physical health		
Multiple chronic conditions	2.40*	[2.1, 2.7]
Diabetes	1.75*	[1.4, 2.3]
Food allergies	1.39*	[1.1, 1.7]
Heart disease	1.69*	[1.3, 2.1]
High blood pressure	1.30*	[1.1, 1.5]
Mental Health		
Fair/poor self-rated mental health	3.45*	[2.9, 4.1]
Major depressive episode	3.99*	[3.3, 4.8]
High/very high distress	3.06*	[2.7, 3.5]
Mood disorder	3.12*	[2.6, 3.7]
Anxiety disorder	2.58*	[2.1, 3.1]

Note. N = 52,637. OR = odds ratio. CI = confidence interval.

[a] Adjusted for age, sex, aboriginal status, immigrant status, adjusted household income, main source of household income, home ownership, highest level of educational attainment, household/family type, and presence of children.

* Significantly different from estimate for individuals in food secure households ($p < .01$).

Discussion

The present study was an investigation of household food insecurity and its relationship to poor health among rural and urban residents. In our sample, a significantly greater proportion

of urban residents reported living in a food insecure household than rural residents. The sociodemographic profile of individuals residing in food insecure households was similar between urban and rural areas, and was consistent with the common sociodemographic correlates of household food insecurity in Canada (Che & Chen, 2001; Health Canada, 2007; Ledrou & Gervais, 2005; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003). Significant differences were found in the prevalence of self-reported poor general, physical and mental health among individuals residing in food insecure households compared to those in food secure households; however, no significant differences in health were found between individuals in rural and urban food insecure households. This non-significant difference might, in part, be attributable to high sampling variability for certain health conditions, particularly in the rural sample, or to the joint confounding effect of sociodemographic factors (e.g., household income) or lifestyle factors (e.g., poor diet).

Household food insecurity was independently associated with poor general, physical and mental health. Individuals living in food insecure households were significantly more likely to report poor self-rated general and mental health, multiple chronic conditions, diabetes, high blood pressure, heart disease, food allergies, elevated distress, major depressive episode, mood disorder and anxiety disorder, even after accounting for place of residence and other covariates in the multivariate model. The observed associations are consistent with previous research from Canada (Che & Chen, 2001; Gucciardi et al., 2009; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005) and elsewhere (Carter, Kruse, Blakely & Collings, 2011; Casey et al., 2004; Hanson & Olson, 2012; Huddleston-Casas et al., 2008; Pheley et al., 2002; Seligman et al., 2010; Siefert, Heflin, Corcoran, & Williams, 2001, 2004; Stuff et al., 2004; Whitaker,

Phillips, & Orzol, 2006), and provide additional evidence that household food insecurity has an important contribution to poor health (Tarasuk, 2004; Vozoris & Tarasuk, 2003).

The fact that we found significant, positive associations between household food insecurity and multiple measures of poor health suggests that individuals living in food insecure households struggle with emotional and physical symptoms that can significantly disrupt their quality of life and interfere with their participation in personal, familial, and social endeavours (Hamelin, et al., 2002; Runnels et al., 2011; Vozoris & Tarasuk, 2003). The strong association between household food insecurity and poor mental health is especially concerning. Mental illness, particularly major depression, is as a leading cause of disability, disease burden, and reduced quality of life in Canada and worldwide (Mathers, Boerma, & Ma Fat, 2008; Mathers, Lopez, & Murray, 2006; Ratnasingham, Cairney, Rehm, Manson, & Kurdyak, 2012; WHO, 2012a). Given the strong connection between poor mental health and certain physical health conditions (e.g., heart disease; Patten, 2001; Prince et al., 2007), promoting and maintaining mental health is an essential component of overall health and well-being (WHO, 2010). Unfortunately, the capacity to achieve a state of well-being might be constrained for those who are food insecure because their every-day experiences often include exposure to multiple economic, social, and physical barriers.

In our sample, the significant associations between household food insecurity and poor physical health were lower than those for poor mental health. It might be the case that the effect of household food insecurity on the progression of a chronic health condition is indirect, requiring long-term or repeated exposure to lower food intakes or nutritional compromises to have an influence on poor physical health (Olson, 2005; Tarasuk & Beaton, 1999a, 1999b). The lower likelihood of poor physical health might also be a consequence of the way that chronic

health conditions were measured in the CCHS. Specifically, presence of a chronic health condition was self-reported and conditional on a diagnosis from a health care professional. Studies have shown that adults with lower socioeconomic status are less likely to make an initial contact with a physician (Curtis & MacMinn, 2008), and that individuals living in food insecure households have higher rates of suspected undiagnosed diabetes (Seligman et al., 2010) and are more likely to postpone needed medical care (Kushel, Gupta, Gee, & Haas, 2006). Therefore, it is possible that our results underestimated the association between household food insecurity and chronic disease. Research that monitors the severity and chronicity of household food insecurity and uses objective measures of health would aid in expanding our knowledge of these relationship (Kirkpatrick & Tarasuk, 2008b; Seligman et al., 2010).

We found no evidence of rural-urban differences in the association between household food insecurity and poor health. Although the two-way interaction term approached significance for both fair/poor self-rated general and mental health, the interaction between household food insecurity and place of residence was not associated with poor health in any of the multivariate models. These results suggest that the likelihood of reporting poor health is comparable for rural and urban residents in food insecure households. Our findings are inconsistent with the two previous research studies investigating rural-urban differences in the health of individuals in food insecure households (Sharkey et al., 2011; Wanless et al., 2010). The methodological differences in the measurement of household food insecurity and sample characteristics might partially explain the lack of congruency with our results.

The non-significant moderation effect could also be due to the definition we used to classify place of residence. The census population definition, which uses population density and population size to define urban and rural residence, might have been too broad to capture the

unique effect of place of residence in the association between household food insecurity and poor health. A study by the CIHI (2006), that used a more detailed delineation of rural areas, found that health status often varies depending on level of urban integration (e.g., near urban centres vs. remote areas). It is possible that using a crude measure of urban and rural areas weakened the independent effect of place of residence, and its interaction with household food insecurity, on the observed associations with poor health. However, because the HFSSM and two health modules were optional content in the CCHS and selected by a small sub-group of provinces, and household food insecurity and poor health are relatively infrequent in the general population, our sample size was restricted and we were unable to produce estimates using a more detailed classification of urban and rural areas. Finally, although we controlled for the effects of several important demographic and economic factors, there might be other relevant factors (e.g., lifestyle, food environment) that could elucidate a relationship between household food insecurity and health at the level of place.

Additional research is needed to further investigate whether place of residence has an effect on the relationship between household food insecurity and poor health. This work would be supported by examining differences between and within urban and rural areas, by including the HFSSM and other health modules (e.g., depression) as common content in consecutive cycles of the CCHS, and by exploring whether other factors (e.g., community support) might contribute to household food insecurity and poor health in urban or rural areas. Qualitative research that explores the perceptions and experiences of people who are food insecure would help to explain how household food insecurity affects poor physical and mental health, and whether differences exist between urban and rural residents.

Strengths and Limitations

The results of this study contribute to the literature in several important ways. First, we provided estimates of household food insecurity in rural and urban areas using a large sample of Canadians. Secondly, our work extends previous research by using a well-validated measure of household food insecurity to investigate the relationship between household food insecurity and poor health in Canada. Lastly, to our knowledge, few studies have examined the potential differential relationship between household food insecurity and health separately for rural and urban residents.

Our study is not without limitations. All data were self-reported and subject to recall biases and errors. The results might not be generalizable to other provinces in Canada. The geographic variable used to define urban and rural areas was simplistic and did not take into account the heterogeneity that exists in rural areas. The prevalence of household food insecurity and the estimates for its association with poor health might be an underestimate given the exclusion of certain disadvantaged populations (i.e., on-reserve Aboriginal peoples, homeless individuals). Underestimation of effects might be especially pertinent to the rural sample because individuals living in certain remote regions and respondents from provinces with larger rural populations were excluded from the sample (Statistics Canada, 2002b).

The HFSSM focuses exclusively on food insecurity resulting from income constraints, and does not assess other reasons for compromised food consumption (e.g., access constraints) or the strategies that are used to augment the quantity and/or quality of the household food supply (e.g., social support, individual resources). In addition, we were unable to determine the food security status of individual members of the household because the HFSSM is a measure of household food insecurity. Research has shown that adults residing in the same household are

likely to experience some level of food insecurity if the household is food insecure (Bickel et al., 2000; Health Canada, 2007), and youth and children's health can be affected even if they do not directly experience food insecurity (i.e., indirect pathway; Cook et al., 2006). Thus, although we cannot know for certain that the selected respondent directly experienced food insecurity, the effect of misclassification on the observed associations would likely be minimal.

The use of data from a cross-sectional survey precludes discussion of causality between household food insecurity and poor health. It is equally possible that some health conditions might precede household food insecurity, particularly those that contribute to disability, as it is that other conditions might develop following exposure to household food insecurity and its associated challenges (Heflin et al., 2005; Olson, 2005; Tarasuk, 2001c). Researchers have begun to explore potential causal relationships (Huddleston-Casas, et al., 2008); however, much more longitudinal research is needed to understand the interrelated pathways between household food insecurity and health. Currently in Canada, household food insecurity is not measured longitudinally and thus, at the national-level, its relationship with health cannot be measured over time. Research that monitors at-risk individuals over time could provide an estimate of the longitudinal effects of household food insecurity on poor health (Runnels et al., 2011).

Conclusions

In our study, living in a food insecure household was independently associated with poor general, physical and mental health. Consistent with previous research, the results demonstrate that household food insecurity might disproportionately hamper an individual's ability to attain an overall state of well-being. We found no evidence of urban-rural differences in the relationship between household food insecurity and poor health, which suggests that the health disadvantage of living in a food insecure household is comparable regardless of place of

residence. Further research is needed, especially studies that use more specified classifications of urban and rural areas, to substantiate our results.

The results of this study highlight the importance of addressing household food insecurity from a population health perspective (Dietitians of Canada, 2005). Interventions aimed at reducing household food insecurity, including ensuring stable access to nutritious food and modifying the underlying social and economic inequalities, as well as those focused on supporting physical and mental health would undoubtedly help to enhance the outcomes of individuals in food insecure households. Adopting a macrolevel approach that addresses the underlying contributors to household food insecurity (e.g., income inadequacy) would likely exert a greater impact in alleviating the burden of poor health for those vulnerable to household food insecurity (Dietitians of Canada, 2005; Health Canada, 2007; Tarasuk, 2005).

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Footnotes

[1] The authors include a third category, marginal household food insecurity, in their estimates of household food insecurity in Canada in 2011 (Tarasuk et al., 2013). This less conservative category is indicative of one affirmative response on the HFSSM. To be comparable with the Health Canada (2007) scoring method (see Footnote 5), we report the prevalence estimate for households reporting moderate to severe food insecurity.

[2] The use of secondary data was approved by the University of Ottawa Social Sciences Research Ethics Board. Access to the CCHS 3.1 master file was granted through application to the Statistics Canada Research Data Centres Program. All research activities were conducted at the Carleton Ottawa Outaouais Local Research Data Centre (COOL RDC).

[3] We used this method to deal with missing data for several reasons. First, there was a high rate of missing data in the sample and using complete case deletion would have resulted in a substantial loss of cases (25.0% of the sample). Second, results from the missing values analysis indicated that the data were not missing at random. Thus, complete case deletion would likely introduce bias into the analyses. Third, multiple imputation would be an inappropriate strategy because there was a high rate of missing data for several independent variables. We conducted a sensitivity analysis between a sample that included a 'missing' category for variables with a high rate of missing data and a sample that included only complete cases (i.e., complete case deletion of missing data). The results from the multivariate logistic regression analyses were quite similar and the statistical inferences from the two sets of data were the same. We concluded that the retention of cases using the 'missing' response category far outweighed the loss of data that would be incurred using complete case deletion.

[4] Approximately 11% of the sample was excluded from the analyses. The majority of the excluded respondents had missing data on the HFSSM and/or the dependent variables.

[5] The HFSSM was adapted from the measurement tool developed by the United States Department of Agriculture (USDA; Bickel et al., 2000; Hamilton et al., 1997). The USDA Food Security Module has been established as a well-validated and reliable multiple-indicator measure of income-related household food insecurity.

[6] The Health Canada (2007) criterion classifies a household as food insecure if the respondent provides two or more affirmative responses to the items on the HFSSM. This is a less conservative threshold than that used in the standard USDA standard (Bickel et al., 2000), which requires three or more affirmative responses. The Health Canada scoring method has been used by Statistics Canada in recent iterations of the CCHS, and by Canadian researchers in the area of household food insecurity (see Tarasuk & Vogt, 2009). Thus, the Health Canada method was used in the present study to be comparable with existing estimates of household food insecurity in Canada.

Appendix

Description of Variables

Independent Variables

Respondent characteristics. Four variables were selected to denote the individual characteristics of the respondent: age, sex, Aboriginal identity, and immigrant status. The age variable was grouped into four intervals and corresponding categorical labels: 12 to 17 years of age (youth), 18 to 44 years of age (young adults), 45 to 64 years of age (middle-aged adults), and 65 years of age and older (older adults).

Aboriginal origin or identity was determined based on the respondent's self-identification as a North American Indian, Métis or Inuit person, or as having Aboriginal origins. The variable was dichotomized to indicate 'non-Aboriginal' identity or 'North American Indian/ Métis/ Inuit' identity.

Immigrant status was derived based on the respondent's self-reported country of birth. Respondents who were born outside of Canada were also asked about his or her length of time in Canada since immigration. These two variables were used to categorize respondents into three groups: recent immigrant (less than 5 years since immigrant), immigrant (5 years or more since immigration), and Canadian-born (non-immigrant).

Household economic status. Four variables were selected to reflect the economic status of the household: adjusted household income, main source of household income, household ownership, and highest level of educational attainment for any member of the household. Adjusted household income was determined based on the reported total household income from all sources and the relationship of that income-level to the low-income cut-off (LICO). Statistics Canada derived an income ratio that provided a relative measure of the purchasing power of the

household compared that of other households with similar features (e.g., size, community location). The income ratios were standardized using National-level weighted data and distributed into similar sized deciles from lowest to highest income. For the present study, the deciles were initially grouped into five household income categories: lowest, lower-middle, middle, upper-middle and highest income. Given the low frequency of household food insecurity in the upper-middle and highest income groups, these categories were collapsed to increase the cell size for the statistical analyses. The final adjusted household income variable had four categories: lowest, lower-middle, middle, and upper-middle/highest household income.

Main source of household income was re-categorized into four groups: (a) wages/salaries or self-employment; (b) social assistance (i.e., provincial or disability income support), employment insurance or worker's compensation; (c) pension or senior's benefits (i.e., Canada or Quebec pension, retirement pension, or old age security/guaranteed income supplement); and (d) other income source (i.e., dividends/interest, child tax benefit, child support, alimony, other or no income).

Household ownership was determined based on the respondent's report of whether at least one member of the household owned the dwelling. The variable was dichotomized as either 'owner' (*yes*) or 'non-owner/tenant' (*no*).

The level of educational attainment represented the highest level of educational attainment of any member of the household. The variable was grouped into four categories: less than secondary school graduation, secondary school graduation, some postsecondary education, and postsecondary graduation.

Household composition. Two variables were selected to represent the composition of the household: household/family type and presence of children in the household. Household/family

type represented the 'economic family status' of the household, which was based on the sex of the respondent and his or her relationship to other members in the household (i.e., parent, child, unrelated). Statistics Canada derived 17 categories that reflected three main household types: single/unattached individuals, households with children less than 25 years of age (lone or two-parent) and couple households (children over 25 years of age or no children). Because the items for 'household with children' on the HFSSM were designed to measure the experience of children younger than 18 years of age (Bickel et al., 2000), the original categories for households with children were re-categorized to reflect this criterion (Health Canada, 2007).

A household was classified as having a dependent child(ren) if at least one member residing in the household was less than 18 years of age. Households originally classified as having a child(ren) between 18 and 25 years old were re-categorized as a 'couple household, living with others.' In addition, given the low frequency of female lone and male lone parent households, these two household types were collapsed as 'lone parent with children' to increase the cell size and to provide more robust estimates. Lone parent households with child(ren) 18 years or older were categorized as an 'other' household type. The final household type variable reflected five household types: (a) single/unattached, living with or without others; (b) couple without a dependent child(ren), living with or without others; (c) couple with dependent child(ren) younger than 18 years old, with or without others; (d) lone parent with a dependent child(ren) younger than 18 years old, with or without others; and (e) 'other' household.

Presence of children in the household was derived by summing the values of the following variables in the CCHS: number of persons 15 years of age or less in household, and number of dependents 16 or 17 years old in household. The derived variable was grouped into three categories: no children, 1 or 2 children, and 3 or more children.

Dependent Variables

General self-rated general health. The general health module was designed to measure the respondent's self-rated general health status using a 5-point rating scale from *poor* to *excellent* health. The five categories of general self-rated health were dichotomized to reflect 'excellent/very good/good' or 'fair/poor' self-rated health. Research by Idler & Benyamini (1997) indicated that self-rated health was a consistent predictor of mortality in community-based samples.

General self-rated mental health. The general mental health module was designed to measure the respondent's self-rated mental health status using a 5-point rating scale from *poor* to *excellent* health. The five categories for general self-rated mental health were dichotomized to reflect 'excellent/very good/good' or 'fair/poor' self-rated health.

Chronic health conditions. The chronic health conditions module assessed for the presence of a physical or mental health condition. To be characterized as a chronic health condition, the condition must have been diagnosed by a health care professional and have been present for, or expected to last, at least 6 months or more. The module consisted of *yes* or *no* questions for the following chronic health conditions: food allergies, other allergies, asthma, arthritis or rheumatism, back problems, high blood pressure, migraine headaches, chronic bronchitis, emphysema, chronic obstructive pulmonary disease, sinusitis, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects of stroke, urinary incontinence, bowel disorders, Alzheimer's disease or other dementia, cataracts, glaucoma, thyroid condition, chronic fatigue syndrome, multiple chemical sensitivities, schizophrenia, mood disorder, anxiety disorder, autism or any other developmental disorder, learning disability, eating disorder or any other long-term condition. Following previous research (Che & Chen, 2001; Vozoris & Tarasuk,

2003), we derived a dichotomous variable that identified whether the respondent reported 'has multiple chronic conditions' (three or more affirmative responses) or 'does not have multiple chronic conditions' (zero to two affirmative responses).

The chronic health conditions module was also used to identify the presence of the following chronic physical and mental health conditions: heart disease, high blood pressure, diabetes, food allergies, mood disorder (i.e., depression, bipolar disorder, mania or dysthymia), and anxiety disorder (i.e., phobia, obsessive-compulsive disorder, or panic disorder). The derived dichotomous variables represented whether the respondent 'has' (*yes*) or 'does not have' (*no*) the selected chronic physical or mental health conditions.

Distress. The distress module was adapted from a well-validated measure of non-specific psychological distress known as the Kessler-10 (K-10; Kessler et al., 2002). The 10-item scale was developed to assess the presence of symptoms indicative of distress (e.g., worry, depressed mood) in the past month using a 5-point rating scale. A sample item is as follows: "during the past month, that is from [date one month ago] to yesterday, about how often did you feel so nervous that nothing could calm you down?" The response options were assigned a value from 0 (*none of the time*) to 4 (*all the time*). The total score was generated by summing these values (range: 0-40). Higher scores denote higher levels of distress. Using the total score, the distress variable was categorized into four categories: no to low distress (0-5), moderate distress (6-11), high distress (12-19), and very high distress (20-40). This methodology for classifying severity of distress has been used elsewhere (Australian Bureau of Statistics, 2008; Andrews & Slade, 2001; Ministry of Health, 2008). The distress variable was dichotomized as no/low/moderate distress (0-11) and high/very high distress (12-40).

Depression. The derived depression scale was based a on a sub-set of items from the Composite International Diagnostic Interview (CIDI-SF; Kessler, Andrews, Mroczek, Ustun, & Whittchen, 1998). The measure provides an estimate of whether the respondent would have met the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-III-R*) diagnostic criteria for a major depressive episode (MDE) in the past 12 months. The depression scale was structured to first assess two core features of depression (sadness and anhedonia), and if the respondent reported that either of these symptoms were present at least "most of the day" and "almost every day" for a period of two weeks in the previous 12 months, he/she was then asked a series of follow-up questions about other depressive symptoms (e.g., sleep, appetite). A sample item is as follows: "during the past 12 months, was there ever a time when you felt sad, blue or depressed for 2 weeks or more in a row?" The response options are assigned a value of 0 (*no*) or 1 (*yes*) and summed to derive the total scale score (range: 0-8). Higher total scores indicate higher levels of depressive symptomatology. Because respondents with a total scale score of 5 or more were classified as having a 90% likelihood of a diagnosed MDE (Statistics Canada, n.d.), a cut-off point of five was used to dichotomize the depression variable: 'unlikely to have met criteria for a major depressive episode' (0-4) or 'likely to have met criteria for a major depressive episode' (5 or more). It is important to note that the depression scale does not assess the clinical significance of the depressive symptoms. Thus, high scores on the depression scale might signify depressive symptoms stemming from Major Depression Disorder, physical conditions, milder forms of depression, or bereavement (Patten, Brandon-Christie, Devji, & Sedmak, 2000).

Running Head: URBAN AND RURAL FOOD INSECURITY

Chapter 4: Study 3

Food Insecurity in Urban and Rural Households: Does Place of Residence Matter?

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Abstract

The potential contributors to and consequences of food insecurity have been well-documented in the literature; however, to date, few studies have examined whether and how place of residence might influence household food insecurity. The purpose of the present study was to explore household food insecurity from the perspective of residents in urban and rural areas in Eastern Ontario. We conducted semi-structured interviews with 26 individuals who resided in food insecure households. An inductive approach was used to analyze the qualitative data. Findings showed that urban and rural residents identified similar experiences and consequences of food insecurity. However, the different environmental features of the urban and rural settings influenced how people managed these experiences. The findings suggest that examining the ecological contexts of the household and the local environment can enhance our understanding of the individual experiences of food insecurity, and provide direction for interventions and policies to address food insecurity.

Food Insecurity in Urban and Rural Households: Does Place of Residence Matter?

Food insecurity is an important public health issue that affects the lives of many Canadians (Dietitians of Canada, 2005; Health Canada, 2007). Defined as the uncertain or variable access to sufficient, safe and nutritious food (Anderson, 1990), food insecurity[1] was experienced in 1.06 million households or by 2.5 million people in Canada in 2011 (Tarasuk, Mitchell, & Dachner, 2013; T. Boston, personal communication, October 8, 2013). Our conceptual understanding of the components and dimensions of food insecurity at the individual-level and household-level originates from qualitative research that explored the lives of low-income individuals and families. Radimer and colleagues (1990, 1992) highlighted the dynamic, managed, and sequenced process of household food that involves quantitative, qualitative, psychological, and social aspects. For example, food insecurity manifests as an insufficient food supply, nutritionally unsuitable and inadequate food intake, acquisition of food in socially unacceptable ways, personal feelings of deprivation and anxiety, and disrupted eating patterns (Radimer, Olson, & Campbell, 1990; Radimer, Olson, Greene, Campbell, & Habicht, 1992).

Similar characteristics and consequences of food insecurity have been identified and expanded on by others, and include use of coping and augmentation strategies, alienation and social exclusion, disruptions to sociofamilial behaviours and poor health and well-being (e.g., hunger and physical impairment, psychological suffering; Ahluwalia, Dodds & Baligh, 1998; De Marco, Thorburn, & Kue, 2009; Hamelin, Beaudry, & Habicht, 2002; Runnels, Kristjansson, & Calhoun, 2011; Williams et al., 2012). Qualitative descriptions of physical, mental, and social effects have been substantiated by quantitative studies that have found a significant, independent association between household food insecurity and poor health (Che & Chen, 2001; Vozoris &

Tarasuk, 2003). Evidently, the experience of household food insecurity has far reaching effects that extend beyond the immediate challenge of food acquisition for low-income households.

Given the significant impact of food insecurity on the lives of those who experience it, considerable research has been conducted to identify the underlying risk factors that affect household food insecurity. A recent review by Gorton and colleagues (2009) summarized the economic, physical, sociocultural, and political factors associated with household food insecurity, and affirmed the position held by many researchers that food insecurity involves a complex interplay of factors that result in adverse outcomes (Alaimo, 2005; Cohen, Andrews, & Kantor, 2002; Garasky, Morton, & Greder, 2004; Hamelin, Mercier, & Bédard, 2011; Morton, Worthen, & Weatherspoon, 2004; Tarasuk, 2001b). One domain that has received less attention is the role of 'place' in the experience of household food insecurity. It is important to address this gap in the literature because place of residence situates the economic, social and environmental resources that can define one's course in life and determine one's exposure to the risk and protective factors that influence health and well-being (Williams & Kulig, 2012; Macintyre, MacIver, & Sooman, 1993).

Economic and Social Conditions of Urban and Rural Areas

The economic and social characteristics of urban and rural areas differ (Fairbairn & Gustafson, 2006; Rural Secretariat, 2005; Williams & Kulig, 2012). Although the factors that contribute to socioeconomic disadvantage are likely the same in both urban and rural settings, it has been argued that the depth of the challenges associated with these conditions vary by place of residence (Burns, Bruce, & Marlin, n.d.). In Canada, rural residents are more likely to report lower household incomes, more persistent low-income status, higher unemployment rates, fewer full-time job opportunities, and lower educational attainment than their urban counterparts

(Alasia, 2003; Burns et al., n.d.; CIHI, 2006; Kirby & LeBreton, 2002; Pampalon, Martinez, & Hamel, 2006; Rothwell, 2001; Rupnik, Thompson-James, & Bollman, 2001; Rural Secretariat, 2005; Singh, 2004; Vera-Toscano, Phimister, & Weersink, 2001). In contrast, measures of social capital, such as the availability of social support and perceptions of belonging to one's community, are rated more strongly by residents of rural settings (Canadian Institute for Health Information [CIHI], 2006; Nelson & Park, 2012; Romans, Cohen, & Forte, 2011), highlighting the value of informal social networks in rural environments (Fairbairn & Gustafson, 2006). These economic and social resources have been associated with household food insecurity as risk (Gorton, Bullen, & Mhurchu, 2009) and protective factors (Martin, Rogers, Cook, & Joseph, 2004; Morton, Bitto, Oakland, & Sand, 2005).

Availability of and Accessibility to Food in Urban and Rural Settings

Research investigating the influence of 'place' on food behaviours has focused on the availability, physical accessibility and affordability of food in urban and rural settings. In the United States, rural food environments are typically characterized by a limited number of food stores, and a greater ratio of small grocery and convenience food stores to supermarket and discount food stores (Kaufman, 1999; Morris, Neuhauser, & Campbell, 1992; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). These food environment features are associated with decreased availability and variety of nutritious foods and higher food costs (Bustillos, Sharkey, Anding & McIntosh, 2009; Gantner, Olson, Frongillo, & Wells, 2011; Jithitikulchai, Dean, & Sharkey, 2012; Liese, Weis, Pluto, Smith, & Lawson, 2007; Morris et al., 1992; Ramadurai, Scharf, & Sharkey, 2012). Less is known about the food environment of rural areas in Canada. A few studies have shown that rural residents might lack sufficient access to healthy, reasonably priced and varied food items (Atlantic Health Promotion Research Centre, 2004; Beaulac,

Kristjansson, & Cummins, 2009; Drouin, Hamelin, & Ouellet, 2009; Nova Scotia Participatory Food Security Projects [NSPFSP], 2013; Pouliot, & Hamelin, 2009; Travers et al., 1997). These factors, in turn, have important implications for food purchasing and food consumption because the high cost and unavailability of healthy foods have been identified as barriers to eating healthful diets, especially for low-income households (Beaulac et al., 2009; Cassady, Jetter, & Culp, 2007; Drewnowski, 2010; Drewnowski & Barratt-Fornell, 2004; Hamelin et al., 2002; Monsivais, Aggarwal, & Drewnowski, 2011; Stevens, 2010; Travers, 1996; Yousefian, Leighton, Fox, & Hartley, 2011).

Physical accessibility to food stores might also vary depending on place of residence. By definition, urban and rural areas are delineated based on population size and density (Statistics Canada, 2002a). Rural households are more dispersed than their urban counterparts, increasing the distance between many households and necessary goods and services (Fairbairn & Gustafson, 2006). Consequently, private transportation has been identified as a necessity of rural living (Burns et al., n.d., Fairbairn & Gustafson, 2006; Garasky, Morton, & Greder, 2006; Ramadurai et al., 2012; Yousefian et al., 2011). Without adequate transportation, rural households are forced to rely on local food stores that are typically more expensive and lack adequate food selection (Atlantic Health Promotion Research Centre, 2004; Bustillos et al., 2009; Drouin et al., 2009; Gorton et al., 2009; Sharkey & Horel, 2008). Such transportation challenges might exacerbate food acquisition problems for rural, food insecure households (Garasky et al., 2006; Holben, McClincy, Holcomb, Dean, & Walker, 2004; Olson, Rauschenbach, Frongillo, & Kendall, 1997). Furthermore, even when private transportation is available, it might pose a financial burden on the constrained budgets of low-income households (Clifton, 2004; Morton et al., 2004; Olson et al., 1997). The balance between food and

transportation costs might be less challenging for urban residents because the wider availability of public transportation and closer proximity to food stores could result in more modest transportation costs (Kirkpatrick & Tarasuk, 2010; Marshall & Bollman, 1999). Distance to food stores might also be an important factor in dietary patterns. For example, a study by Dean and Sharkey (2011) found that increased distance to the nearest large food retail outlet was associated with lower fruit and vegetable intake among rural, but not urban residents.

There is little doubt that food security is, at least partly, dependent on sufficient access to food stores that supply affordable and healthy foods. Preferences aside, one can only choose from what is available and accessible (Bustillos et al., 2009; Dowler, 1998; Raine, 2005). Nevertheless, the results from studies examining food access and its association with household food insecurity have been inconsistent. For example, Kirkpatrick and Tarasuk (2010) found no significant association between proximity to a discount supermarket and household food insecurity in a sample of families residing in low-income, urban neighbourhoods. In contrast, residents' perceptions of high food prices and inadequacy in the number of food stores in the local food environment were positively associated with household food insecurity in a sample of households located in rural and small towns in Iowa; households that shopped in areas outside of their local environment were less likely to be food insecure (Garasky et al., 2006). Although methodological differences might explain the inconsistent results, it could also suggest that food accessibility and availability have different affects on household food insecurity in rural and urban settings. Further research is needed to determine whether place effects have an independent contribution to household food insecurity beyond what can be explained by financial limitations (Kirkpatrick & Tarasuk, 2010).

Household Food Insecurity in Urban and Rural Areas

In Canada, residents in urban settings reported higher rates of household food insecurity than their rural counterparts (8.1% and 6.1%, respectively; Health Canada, 2011). This statistic does not take into account important sociodemographic and -economic features of rural and urban environments, and thus, provides only a snapshot of the number of households that experienced household food insecurity. To date, there is a dearth of research exploring household food insecurity from the perspective of urban and rural residents. This research would assist in elucidating whether differences exist in the way in which food insecurity is experienced by individuals and households within each setting. We found only one qualitative study from the United States that compared the perspectives of urban and rural residents (De Marco et al., 2009). In this study, urban and rural participants expressed similar themes regarding the contributors that influenced household food insecurity and the mechanisms that helped to improve household food security. However, rural residents were more likely to identify themes related to social isolation, geographic location (e.g., higher cost of food, transportation challenges), and use of alternative food sources, such as hunting and fishing (DeMarco et al., 2009). More research is needed to understand whether there are unique aspects of urban and rural settings that influence the expression, management, and consequences of household food insecurity.

We sought to address this gap in the literature by conducting a qualitative exploration of household food insecurity in urban and rural households in Eastern Ontario. The goals of the study were: (a) to explore how food insecure individuals experience household food insecurity, including perceived contributors, connection with health and well-being, and potential influence

of place of residence; and (b) to examine whether the themes that emerged from the individuals' descriptions of their experience differed based on place of residence.

Method

Participants and Settings

A convenience sample of self-identified food-insecure adults was recruited to participate in the study ($N = 27$). Individuals were eligible to participate if they met the following inclusion criteria: (a) at least 18 years of age; (b) had worries or concern about getting enough food for the household; (c) reported having "sometimes not enough to eat" or "often not enough to eat" on the food security screening question; (d) were the principal food purchaser or food preparer in the household and thus knowledgeable about the household food supply; and (e) resided in either the urban area or one of the rural areas. We sought a sample that had a range of individual and household circumstances to obtain diverse perspectives on household food insecurity. One eligible participant was excluded from the sample due to concerns about informed and free consent. Our final analytic sample size was $N = 26$.

The study took place in one urban area (Ottawa), and five rural areas (Lanark, Merrickville, Mountain, Portland and Smiths Falls) in Eastern Ontario. A description of the sociodemographic and economic characteristics of the urban and rural settings can be found in Table 1.

Table 1

Sociodemographic and Economic Characteristics of the Urban and Rural Study Settings

Variable	Urban Setting	Rural Settings				
	Ottawa (CMA)	Lanark[a] (Village)	Merrickville (Village)	Mountain[b] (Hamlet)	Portland[c] (Village)	Smiths Falls (Small Town)
Population size (#)	846,802	—	2,867	—	—	8,777
Median age	38.4	45.6	45.1	40.6	47.1	42.9
Median household income ($)[d]	69,991	52,974	54,036	55,719	55,722	42,446
Low income status – after tax (%)	12.0	5.8	3.5	5.3	4.8	11.7
Educational Attainment (%)[e]						
No certificate, diploma or degree	15.6	26.4	21.9	25.7	23.0	29.7
High school certificate	24.6	28.8	27.4	28.4	29.0	27.7
College or other degree/diploma[f]	28.2	33.8	32.7	36.1	35.1	34.3
University degree/diploma	31.6	11.0	17.9	9.7	12.9	8.3
Household type (%)						
Single/unattached	27.0	22.3	25.1	21.4	20.3	33.7
Couple without children	27.3	39.1	31.8	32.9	41.1	27.7
Couple with children	29.5	29.9	30.9	34.0	28.3	21.5
Other[g]	16.2	8.8	12.1	11.6	10.4	17.0
Dwellings in need of major repairs (%)	6.2	11.4	9.4	8.4	7.9	10.1
Unemployment rate (%)	5.8	4.2	3.7	4.1	5.2	9.8

Note. Data source 2006 Census Data (Statistics Canada, 2007a; 2007b; 2007c; 2007d; 2007e; 2007f). CMA = census metropolitan area. Dash indicates that datum was suppressed due to non-representativeness of census population size to specific community. [a] Census data for Lanark Highlands Township. [b] Census data for North Dundas Township. [c] Census data for Rideau Lakes Township. [d] All household types. [e] Persons 15 years of age and older. [f] 'Other' includes apprenticeship, college, CEGEP, university below bachelor degree, or other non-university certificate/diploma/degree. [g] 'Other' includes lone parent, multiple family and non-family households.

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Sample description. The total sample included 15 participants from the urban setting and 11 participants from the rural settings.[2] Twenty participants were women (77%) and six were men (23%). Participants ranged in age from 25 to 58 years; the average age was 42 years old. Household size ranged from 1 to 7 members. In households with children (n = 14), parents reported having between 1 and 4 children. Table 2 presents the sociodemographic characteristics of participants and their households. With respect to self-rated health, most participants rated both their general health status and mental health status as 'good, very good, or excellent' (56% and 64%, respectively).[3]

Table 2

Sociodemographic Characteristics of Participants and their Households (*N* = 26)

	n	%
Annual household income[a]		
Less than $10,000	12	48.0
$10,000-14,999	6	24.0
$15,000-19,999	1	4.0
$20,000-24,999	2	8.0
$25,000-29,999	1	4.0
$35,000-39,999	2	8.0
$40,000-49,999	1	4.0
Highest level of education[a]		
Less than high school graduation	3	12.0
High school graduation	10	40.0
College degree	9	36.0
University degree	2	8.0
Other[b]	1	4.0
Household Type		
Single/unattached individual	7	26.9
Living with partner	2	7.7
Two-parent family with children	6	23.1
Single parent with children	8	30.8
Other§	3	11.5
Presence of children[c]		
1 or 2 children	9	64.3
3 or more children	5	35.7
Presence of children ≥ 5 years of age[c]		
Yes	8	57.1
No	6	42.9

[a] Data missing for one participant (*n* = 25). [b] 'Other' includes living with parent(s), other family member(s), friend(s) or other. [c] Data for households with children under 18 years of age (*n* = 14).

All households were classified as food-insecure[3] and the majority of adults experienced severe food insecurity (88%).[4] In the households with children, most child members experienced moderate food insecurity (46%). A number of other children were classified as 'food insecure, severe' (31%) and nearly a quarter of them were 'food secure' (23%).[5]

Materials

Semi-structured interview. A semi-structured interview protocol was developed based on the study objectives, consultation with the research team, and our previous research on household food insecurity (Runnels et al., 2011). Ten open-ended questions focused on the household experience of lack of food (e.g., severity, course, and personal reactions), potential contributors to household food insecurity, physical, emotional and social responses to lack of food and perceived relationship(s) between food intake and health, and the perceived influence of place of residence on the household food situation (e.g., advantages and disadvantages of where one lives). Additional probes were provided to facilitate an in-depth understanding of the household food situation. Closed-ended questions about the household size, relationship between household members, and number of children younger than 18 years of age were used to describe household composition (Appendix A).

Sociodemographic questionnaire. A short sociodemographic questionnaire was developed to obtain basic information about the participant and his or her household. Questions pertained to sex, age, highest level of education, annual household income from all sources, and household type (e.g., single, two-parent). Two items were included to assess the participant's self-rated general and self-rated mental health status using a 5-point scale from 'poor' to 'excellent' (Appendix B).

Household food security status. Household food security status was assessed using the *USDA Household Food Security Survey Module* (HFSSM), a comprehensive measure of household food security (Bickel, Nord, Price, Hamilton, & Cook, 2000; Hamilton et al., 1997a). The HFSSM was designed to assess the severity of household food insecurity in the past 12 months due to income constraints. The self-report questionnaire consists of 18 items that focus

on the uncertainty, insufficiency or inadequacy of the household food supply, and associated disrupted eating patterns and personal reactions that may result as an outcome of these constraints (Health Canada, 2007). Ten items relate to the experience of adults in the household and 8 items assess the independent experience of children under the age of 18 living in the same household. Items use a 3-point rating scale from "often true" to "never true." Questions regarding frequency of household food insecurity use a 3-point rating scale from "almost every month" to "only 1 or 2 months." A sample item is as follows: "the food that you bought just didn't last, and there wasn't any money to get more" (Appendix C).

The HFSSM was initially validated by the authors of the measure (Hamilton et al., 1997a) and it showed appropriate face validity, construct validity and convergent validity. Reliability estimates (Spearman-Brown) ranged from .89 to .90 for all households and households with children, respectively. Additionally, internal consistency estimates (Cronbach's alpha) ranged from .86 for all households to .88 for households with children (Hamilton et al., 1997b). The HFSSM has since been validated for use with a range of populations (Pérez-Escamilla et al., 2004; Derrickson, Fisher, & Anderson, 2000). It has also been adapted for use in the Canadian Community Health Survey (CCHS; Health Canada, 2007) and has been used by Canadian researchers with community samples (Runnels et al., 2011; Tarasuk, 2001c; Tarasuk & Beaton, 1999b).

We used the scoring protocol for classification of household food security status developed by Health Canada (2007). This methodology uses a less conservative threshold to classify a household as food insecure than that used in the standard USDA method (two affirmative responses vs. three affirmative responses; Bickel et al., 2000). The Health Canada scoring method also divides the questionnaire into an adult scale (10-items for adult members)

and a child scale (8-items for child members), with each scale scored separately to determine the food security status of adults and children. Household food security status is derived by considering the combined food security status of all members of the household. Higher scores denote greater severity of household food insecurity.

The total number of affirmative responses was used to derive three categories of food security status: food secure; food insecure, moderate; food insecure, severe. 'Food secure' denotes no or minimal difficulty with food access for both adults and children (adult and child scale scores: 0 or 1). 'Food insecure, moderate' denotes compromise in the quality and/or quantity of food consumed in the household by either adult or child members, or both adult and child members (adult scale score: 2 to 5; child scale score: 2 to 4). 'Food insecure, severe' denotes reduced food intake and disrupted eating patterns for either adults or children in the household (adult scale score: ≥ 6; child scale score: ≥5; Health Canada, 2007).

In the present study, we excluded the item pertaining to adult weight loss. This decision was made based on research suggesting that food insecurity can be associated with higher body mass index (i.e., overweight and obese; Dinour, Bergen, & Yeh, 2007; Lyons, Park, & Nelson, 2008). It is also in line with other researchers that have used the HFSSM in community samples (Tarasuk, 2001c; Tarasuk & Beaton, 1999b). Because the 'weight loss' item is indicative of greater severity of food insecurity (Health Canada, 2007), excluding the item might have resulted in classifying some adult(s)/households as 'food insecure, moderate' who may have been classified as 'food insecure, severe' using the full scale.

Procedure

Data collection was approved by the University of Ottawa Social Sciences Research Ethics Board. Prior to recruitment, we consulted with community workers to select the research

settings and to identify suitable recruitment sites. We decided to include one large urban area (Ottawa, Ontario) and, initially, three rural areas (Merrickville, Portland, and Lanark County, Ontario).[6] We later included two additional rural areas (Mountain and Smith Falls, Ontario) to facilitate recruitment of the rural sample. Recruitment was completed through poster advertisements and distribution of study flyers at six community health/resource centres (3 urban; 3 rural) and three food distribution sites (1 urban; 2 rural). The recruitment documents included two main questions: problems with getting enough food for self and/or family, and responsible for purchasing or preparing food in the household (Appendix D). Interested participants were invited to contact the first author and were subsequently screened for eligibility by telephone. This process ensured that our self-identified sample included households that were indeed food insecure. Data collection took place between December 2009 and August 2010.

Eligible participants were recruited for the study on a first-come basis until we achieved our sampling goals.[7] Each participant completed an in-person, individual interview with the first author who was trained by the research team in qualitative interviewing. Interviews took place in a community health/resource centre, food distribution site, or university research office.[8] Participation in the study was voluntary and informed consent was obtained prior to conducting the interview (Appendix E). The interviews were tape recorded, and lasted between 60 and 120 minutes. The sociodemographic questionnaire and HFSSM were completed in written format at the outset of the interview. An honorarium of $25 was given for participation, and, if applicable, transportation and child-care costs were reimbursed.[9] Participants also received a brochure containing information about community resources in their area. Handwritten notes were taken during the interview, and the interviewer's observations and personal reflections were recorded in a separate document post-interview. Tape recordings were subsequently transcribed verbatim

into a word-processing document. All raw data (e.g., questionnaires, tape recordings) were de-identified by assigning an ID number and documents that had personal information (e.g., consent forms) were kept separate from other materials. Data were kept secure in a locked cabinet in a research office at the University of Ottawa.

Data Analysis

Descriptive statistics were used to determine the frequency and severity of household food insecurity, and to describe the sociodemographic characteristics of the participants. Qualitative data analysis followed a general inductive method (Thomas, 2006) and was based on the analytic steps of grounded theory (Charmaz, 2004, 2006; Strauss & Corbin, 1990, 1998). First, a subset of transcripts was reviewed to highlight content that was interesting and relevant to the research questions. Analysis then proceeded to open coding by reviewing the transcripts line-by-line. Text was separated into discrete units that captured a single idea or meaning, and a preliminary list of codes was developed. Coding was iterative with the purpose of establishing, adding, revising and finalizing codes that emerged from the full set of interview data. The coding scheme underwent six iterations. Once significant progress was made in the open coding process, axial coding was used to identify connections between categories and sub-categories based on groupings of codes that reflected a significant theme from the data (Charmaz, 2004, 2006; Saldaña, 2009; Strauss & Corbin, 1990, 1998). QDA Miner 4.0 data management software (Provalis Research, Montreal, QC, 2011) was used to assist in the text analysis and to group the codes into larger categories. Although our analysis and interpretation was guided by our research questions and knowledge of household food insecurity, the identification of themes and categories was dependent on the findings that emerged from the data (i.e., participants' accounts of their experiences).

All interviews were coded by the first author. This allowed for an in-depth review of the interviews, which was supported by the first author's acquaintance with the data, personal reflections, and knowledge of the transactional aspects of the interview (e.g., non-verbal communication between interviewer and interviewee). Specific efforts were made to ensure the trustworthiness of the data analysis (Lincoln & Guba, 1985). An audit trail was kept of the raw data (interview protocols, transcriptions) and data analysis materials (codebooks and memos). Discussions with the research team were ongoing, and the coding scheme and category development were revised to incorporate feedback. In addition, a comprehensive peer review was conducted with a senior colleague with expertise in qualitative research methods. These two processes enhanced reflexivity by exploring different ways to organize the data, by discussing contrasting points of view, and by identifying new insights from the data.

Findings

The qualitative analysis suggests that the ecological contexts in which people live play an important role. The experiences of food insecurity were situated within broader insecure household environments. Participants reported lacking income, employment, education, and health and wellness. The lack of these resources compromised their abilities to protect themselves and their families from a wide range of threats to their physical, emotional, social, and economic well-being. These insecurities were expressed in a prominent theme of constraint that was felt in many aspects of their lives and that led to everyday challenges in meeting their needs. Constraints influenced a variety of everyday decisions, including how to allocate resources, the nature and amount of social interaction with others, methods to maximize and extend limited resources, and the selection of foods for the household. The interaction of these factors, in turn, affected the diet, and the health and well-being of the individual. Place of

residence provided an additional level of context. Although urban and rural participants described similar conditions, processes, and consequences of their experience of food insecurity, the local environment influenced the management of existing resources by further constraining or easing the challenges encountered by the household.

In the following section, we present our findings by describing the conditions of the household and its relationship to food insecurity, and by outlining the categories that are embedded in this context as processes and consequences. We conclude the section by examining the role of place of residence as a secondary context in the experience of household food insecurity.

Living in a Household with Limited Resources: Affect on Household Food Insecurity

Participants situated discussions of food insecurity within the larger context of their household, making frequent references to the constraints that were inherent in a household with limited resources (e.g., income, employment, education). In many cases, the household was regarded as a place of struggle, hardship and deprivation. All participants considered their household income to be the most significant barrier to obtaining food. Most participants received government-issued financial assistance (e.g., Ontario Works, Ontario Disability Support Program). Household income was typically described as limited, "tight" and insufficient to meet needs, and was associated with minimal or exhausted financial assets (e.g., savings). Participants were acutely aware of their household expenses and provided, what appeared to be, precise estimates of the cost of each necessity (e.g., food, shelter, utilities, clothing). In light of their limited income, many described having to make tough decisions about how to allocate their income among competing priorities. Said one participant, "regardless of how good I do at budgeting, there's still not enough to go around. You've got to pick and choose sometimes"

(urban). Another said: "if I'm going to have a balanced food diet…then that means I've got to do without in another area" (rural).

Food budgets ranged from $75 to $600 per month, although, most households allotted between $100 and $125 for their food expenses. These food budgets were often used for more than just food items, and included personal hygiene products, household supplies (e.g., toilet paper, cleaning products) and medication costs. As one participant noted: "we might say that it's our grocery fund, but it's our 'everything' fund" (rural). Thus, compared to other fixed or predictable expenses (e.g., rent), the food budget was a flexible part of the larger household budget that could be expanded or contracted based on competing demands and available funds. Indeed, for many, "…if anything happens…then it comes right out of the grocery budget" (rural).

Having 'enough' or 'not enough' food in the household. Most participants described their household food situation as "stressful", "difficult", and a "challenge." About half of the participants reported having 'not enough' food in the household: "the fridge is often empty" (urban); "you never have enough" (urban). In these situations, doing without was identified as a common experience, and reflected compromises in both the quantity and the quality of the household's food supply. For the remaining households, participants indicated having 'enough' to make do with what was on hand: "I buy…kernels of popcorn so you never starve" (rural); "we always have soup in our cupboards" (urban). In these situations, participants knew that their focus on quantity would result in undesired, yet largely unavoidable, compromises in the quality of food in the household.

Many participants described their challenges with food as ongoing with monthly, and sometimes weekly, concerns about obtaining an adequate amount of food to meet the needs of all

members of the household: “I can’t sit here and tell you that in April we’re going to have enough to eat, because I haven’t got a clue” (urban). In these cases, food concerns were most pronounced before the receipt of income support payments when the household supply and available funds were typically at their lowest. Participants who identified some variation in their experience attributed the changes in their food supply to adjustments in their household income, which was often associated with a change in their employment status, acquisition of irregular sources of income (e.g., working “under the table”, government sales tax rebate) and/or unexpected expenses that depleted their financial assets.

Managing the Everyday Aspects of Household Food Insecurity

Managing a household with limited resources was a constant and dynamic process that required frequent adjustments. Participants made use of strategies, learned new skills and adapted to their situations as a way to ‘survive’, and to try to minimize the impact of their circumstances on themselves and their families. As a few participants explained: “I think when you’re in this position, you’re always evaluating it, you’re always adjusting it, you’re always taking stock of it, and you’re always trying to make it better” (rural); “it is a normal outcome of being in this situation. You learn skills to cope with your money and try to make things as good as you can with what you have” (urban); “it’s kind of like seeing the storm coming and you know it’s coming, so you’re trying your best, but it’s still going to come, just minimize the impact” (rural).

Some participants remarked on the considerable effort involved in managing their household’s food situation, describing it as a “full-time job.” As one woman living in a rural setting noted, “I do what it takes to get food in the house and sometimes it’s a lot of work.” Participants commonly referenced to a ‘lack of choice’: “I don’t think there’s a choice, you have

to do what you have to do, what's handed to you…you've still got to survive" (rural). For the most part, participants focused on managing the everyday challenges in their household rather than on long-term solutions that would enable them to exit from their current circumstances.

Maximizing and extending household resources. Most participants tried to make the most out of their limited financial and food resources. For some, learning what worked and what did not work was a 'trial and error' process that took time. Thinking and planning ahead were often described as essential skills for achieving at least some degree of food sufficiency. As one rural woman explained, "If you don't do a good job with your planning…you're never going to get out of that cycle, never." Commonly cited strategies focused on food specific methods, such as "stretching" the household food supply by being creative, cooking in bulk, baking and freezing food items, monitoring, allocating and conserving food over the month, making meals from scratch and not wasting anything, and growing a garden. In households with children, parents emphasized the need to put limits on their children's food selection and consumption to ensure that the food they had would last: "[my children] don't have the luxury of just looking through my cupboards and just eating whatever they want" (urban).

With constrained budgets, participants made efforts to minimize food costs while maximizing their food supply by employing specific budgeting skills. Participants purchased food on sale, selected 'no name' products, used coupons, purchased expired food products, shopped at multiple food stores to extend the food budget, and delayed purchasing certain food items (e.g., spices). Budget strategies in other areas, such as limiting purchases of 'extras', buying second-hand items (e.g., clothing) and delaying or forgoing payment of other expenses (e.g., household bills) helped to increase the amount of disposable income available in the

household. A few participants disclosed that they had resorted to stealing and buying 'black market' food (i.e., stolen foods that were being resold). As one urban woman described:

> That is how much the stress of not having enough food is. That you go and do something that is completely out of character in order to feed yourself and your family. What would you do exactly to get food? I would do just about anything if it meant that my kids aren't hungry.

Accessing community-based food, social and cultural resources. Many participants were quite knowledgeable about the food, social and cultural resources that were available to them in their communities. Almost all participants reported regularly using a food bank and/or other community food resources (e.g., soup kitchen). Some were dependent on these resources: "quite frankly, if it wasn't for the food bank and other food provision methods, we wouldn't survive" (urban). Only one participant reported that she had not used a food bank because of her concerns about the stigma attached to them. Despite the limited selection of food items, and, at times, low-quality of food, participants identified food banks as an important means to supplement their household food supply.

Giving and Receiving Social Support

Participants had varied perceptions about the availability and quality of their social networks. About half reported having poor, limited or no social support from family and/or friends. They felt isolated and lonely, and were more vulnerable to adversity: "if we had family, if we had the support…the snowball might not have rolled down the hill" (rural).

In contrast, several participants received ongoing, positive social support from their social network. Participants received tangible support (e.g., income assistance), informational support (e.g., information about community resources), and emotional support (e.g.,

encouragement). In these cases, social support helped with managing the challenges that they faced. They often formed friendships with others who were in a similar situation, which resulted in mutually supportive and reciprocal interactions: "A lot of my friends are in the same boat…I really try to surround myself with people that make me feel good and understand because they're similar to me, or have similar experiences" (urban). These participants shared resources, provided social support, volunteered, and advocated for others. As one rural female explained, "for your well-being it's important, too, that you feel you've helped other people. You're accomplishing, you're sharing; all of that good feeling stuff is important."

For some participants, receiving tangible support from family and friends was accompanied by feelings of embarrassment and loss of independence. Consequently, some preferred to keep their experiences private rather than disclosing it to others: "I don't let other people know that I'm hard up" (rural); "we try not to complain, you know, to keep ourselves and to be in silence…" (urban); "you don't want to tell everybody, you just want to do it yourself and not have other people know" (urban). The perceptions of family and friends contributed to some participants' decisions to limit what they shared with others. For example, some participants did not reveal the gravity of their situation with others: "that's a little stressful to keep up with, to make it look like you're keeping up with the Joneses' and you're not there at all" (rural). In a couple of cases, participants expressed concern that their fitness as a parent would be judged, raising fears of the involvement of child protection services.

Socializing with others in and out of the home. Social contact was generally seen as important for well-being and some participants made efforts to be connected to others. However, participation in activities with others raised concerns when food or additional costs were involved. Participants tended to not invite others into their home because they did not have food

or drinks to offer guests, or what they had to offer would not be appreciated: "when people come over I can't offer them a drink or anything, because if I do, then I'm taking from my kids and I won't do that" (rural). Other participants stated that they were unable to participate in common social activities, such as eating at a restaurant, seeing a movie in a theatre, or enrolling their children in extracurricular activities: "we can't get out to social events, we can't go to a restaurant. What the heck is a restaurant? I haven't been to a restaurant in years. That's a luxury way gone" (urban). Social activities that are common for many were rare events for these participants: "we can't participate in things that should be just … that you don't even have to think about" (urban).

The Connection Between Food Selections and Personal Diets

Participants struggled with acquiring enough food for their households as a result of their limited budgets and their attempts to stretch the funds that they had. The participants were more concerned with having or not having enough food, and, typically, resigned to food that was lacking in quality. Most participants purchased only the "basics," "essentials" and "staples." The foods they could afford were considered "cheap" and of low-quality, such as processed and canned foods, "fillers" and unhealthy food (e.g., 'junk' food). Although healthier foods were preferred, they were unaffordable or "expensive." The healthier alternatives included fresh fruits and vegetables, lean meats, fish, dairy products (e.g., milk, cheese), and special "treats" (e.g., desserts, snack foods): "it has been awhile since I have had fresh vegetables" (urban); "I haven't had a fruit in a long time" (rural); "…the stuff that you actually need, like the healthy, the meats, the cheeses…the milk and stuff like that, they're always hard to come by…" (urban). According to one rural participant:

> It's great for everybody to want to eat healthy. Yeah, well I hate to say it, but eating healthy costs more. It's less expensive for me to go and buy a box of chicken nuggets and French fries…than it is for me to go out and buy boneless skinless chicken breasts.

Participants suggested that their food selection[10] lacked spontaneity and was restricted to only what was needed in the household: "You don't get to go the grocery store and pick the foods you want to eat" (urban); "you can never have anything you want" (rural); "I don't go to the grocery store thinking, 'oh well, throw this in my cart'…I have to plan it and know what I have to get" (rural). Despite these restrictions, some participants made efforts to occasionally treat themselves and their families to special foods: "That's a treat to [my children], you know, that I made microwave popcorn" (rural); "sometimes I treat my kids, once a month or special times...I treat my kids so they feel a little bit different, a little bit happy, let them feel that mommy is feeling about them, that mommy is not forgetting about them" (urban).

According to some parents, their constrained food selections affected how they saw themselves as providers: "…it breaks my heart to tell my kids that they can't have watermelon" (rural); "I feel guilty because I'm just not able to always provide to them everything that they want and I wish I could…I feel bad always saying no to them" (urban). Although parents struggled to provide what their children wanted, all of them acted as providers by self-sacrificing their own needs to meet those of their children. As one participant described: "if I buy a bag of milk I won't drink any of it. I always save it for the kids…always it's about the kids when it comes to the food" (rural). This experience was particularly the case for the female head of the household: "that's the real meaning of mommy, mother, to sacrifice for my kids" (urban); "I'm the one who sacrifices and not because anybody asks me to" (rural).

As a result of limited food selections, personal diets were largely unbalanced, monotonous, and nutritionally insufficient. For some participants, the meaning of food had changed for them. Rather than a source of pleasure or personal expression, food represented survival and satiation: "you are eating to survive. Meals don't have that same thing anymore" (urban); "we're eating just to eat and to be full" (rural). Participants and their families adapted to the limited quantity of food by reducing the size and frequency of their meals: "there's a good number of days that the only meal I eat is dinner" (rural); "sometimes I can be without food, just cup of coffee in morning until evening" (urban). A few participants still made efforts to eat regular meals of sufficient quality and quantity to meet their nutritional needs, though, this goal was sometimes difficult to achieve.

The Physical and Emotional Consequences of Household Food Insecurity

The challenges of meeting their needs and the needs of other members in the household took a toll on the participants' physical and emotional well-being. They described their personal and household experiences with food as "depressing", "frustrating", "stressful" and "discouraging," and even "scary", "disturbing", and "humbling."

Physical health and well-being. For the majority of participants, their physical health status was directly or indirectly connected to the food that they ate: "not eating properly does affect your whole health" (urban). Reduced intake and compromises in nutrition were believed to affect their physical health status, and physical health issues, particularly disabilities, were themselves barriers to getting adequate food (e.g., reduced mobility). Only a small number of participants were unsure or believed there was no connection between the food that they ate and their physical health.

Those who did draw a connection between food consumption and physical health spoke about a variety of effects, including fatigue and weakness (e.g., feeling tired, having low-energy, being lethargic), susceptibility to illness (e.g., colds, flu), loss, gains or fluctuations in weight, gastrointestinal issues (e.g., poor digestion, vomiting), sleep issues, poor skin and hair condition, fluctuations in appetite, headaches, dental problems (e.g., tooth decay), and decreased overall physical fitness. A small number of participants spoke specifically about feelings of hunger.

Several participants indicated that they had been diagnosed with a chronic health condition. A wide range of conditions were cited, but, most frequently, participants reported having diabetes, high blood pressure, anemia, and heart disease (i.e., diet-related conditions). Many of those with a chronic health condition reported difficulties adhering to dietary and medication treatment recommendations because their limited resources constrained their ability to purchase medication and to select healthier foods: “I was told to stop eating salty foods, and that’s a little hard when you’re eating from cans” (rural); “there’s certain things I’m not supposed to eat, and I sometimes have to eat them anyway” (urban).

Emotional health and well-being. Emotional well-being was mentioned frequently during the interviews, suggesting that negative feeling such as worry, stress, sadness, anxiety, frustration, fear, embarrassment and anger were constant, salient and, at times, intense. Only one participant focused on positive emotions of happiness and joy, expressing gratitude for the privileges that she had in life (e.g., family, safe home). Those who had been diagnosed with a chronic mental health condition, such as major depressive disorder or anxiety disorder, shared that the stress of living in a resource constrained household created fluctuations in their mental stability and capacity to manage their personal and household challenges.

Most participants connected their emotional well-being directly to their food insecurity: "I'm afraid I'm not going to be able to care for my kids. So yeah, I'm depressed and stressed" (rural); "it's almost a scary feeling when you don't have food and you can't figure out how you're going to get it. Because food is a necessity…you need it. So when you need something that badly, it's hard" (urban); "if my fridge is bare and my cupboards are bare, yeah, I have major anxiety because I've got to have food in the cupboards" (rural); "it's like when you don't get enough food and can't afford enough food, then you begin to get flustered, aggravated" (urban). The persistence and unpredictability of household challenges were important factors in emotional distress. As one urban woman explained: "…once you pay your rent you can stop worrying about it until next month…but food, it's a constant worry. Even after the food is bought and the food is in the cupboard, the worry is still there."

Although reported less frequently, some participants discussed issues relating to their sense of self and identity. Their sense of self appeared to be tied to their perceptions of how well they were managing their household constraints. They characterized themselves as "survivor/fighter," "resourceful," "self-reliant," "responsible," "selfless" and "failure."

Coping with the effects of household constraints. Participants described the many ways they tried to deal with their stressful situations. Most expressions of coping were focused on reducing negative emotional responses (i.e., emotion-focused) rather than addressing the source of the distress (i.e., problem-focused; Lazarus, 1993). Some participants tried to keep "strong" and relied on their faith. Others focused on addressing challenges one day at a time. Trying to maintain a positive outlook reduced their worries and increased their appreciation for what they did have in their lives: "I believe wholeheartedly that no matter what, I will be fine" (rural); "we're healthy, we are capable, and a lot of people don't have those privileges" (urban).

A few participants tried to manage their emotions by avoiding thinking about their troubles: "I don't want to think about anything, because then I cannot cope with it" (urban). A small number of participants benefited from knowing that others encountered similar challenges: "…it makes me feel better knowing that I am not the only person who is struggling" (urban). For others, knowing that some households faced more difficult situations gave them perspective: "I know that there are people worse off than me…there are worse situations to be in" (urban). In some cases, coping meant bearing with a difficult situation: "we just maintain and plod along and keep getting up every morning and saying well, at least we're here today…" (rural).

For some participants, looking to the future and envisioning a resolution to their current challenges helped to justify their current sacrifices. As one urban female stated, "At least I can see that down the road, even though it will be hard, at least I see that there will be an end for me." However, many participants felt stuck in their current circumstances and thought that they would never be able to escape them: "regardless of what you do, you just can't step over that line, you're always right at it" (urban); "it's hard to look ahead or get ahead" (rural).

Situating Household Food Constraints in the Broader Context of Place of Residence

The conditions, processes, and consequences of household food insecurity were similar for rural and urban participants. The inclusion of urban and rural voices in the abovementioned categories demonstrates that many of the experiences and constraints were shared by both groups.

Few participants discussed place of residence[11] as part of their everyday experience of household food insecurity. Those who did were predominantly from the rural settings and their comments reflected the additional constraints that came from where they lived, such as limited availability and accessibility to food stores, transportation challenges, and few employment

options. However, when directly asked to consider whether and how where they lived influenced their experience with food insecurity, participants reported advantages and disadvantages of place of residence. Many, though not all, discussed themes related to the availability and accessibility of food and community services, transportation and the social and economic features of the setting. In general, what was considered to be an advantage in the urban setting was regarded as a disadvantage of living in a rural setting, and vice versa.

Living in an urban setting. Urban participants noted several advantages of where they lived in relation to their household circumstances. Only one participant, who experienced very severe food constraints, reported that there were no advantages of where she lived. These benefits included close proximity to food stores, the variety of food store options (e.g., lower cost stores, many sales), the availability of multiple food and social service community resources, and the availability of public transportation. As one urban participant stated, "I consider myself lucky in one way to be living in the area that I do live in…I am closer to a lot more options." These features of urban settings helped participants to maximize their existing resources, to secure additional resources, and to access places within their community. Nevertheless, a few participants noted that accessibility to food was more important than availability: being close to a variety of food stores did not necessarily mean that the food options were affordable.

Half of the urban participants indicated that there were no apparent disadvantages of where they lived. A few urban participants shared concerns about the cost of public transportation, about how using public transportation added difficulties for food procurement (e.g., unable to purchase large amounts of food), and about their challenges in getting to some places in the city by public transportation (e.g., taking multiple bus routes). An urban participant

who lived outside of the urban core stated that she had difficulties accessing food and social services that were located in the city centre. A couple of participants described the depersonalized and isolating nature of city life, and how this might impact their awareness of specific programs and community supports:

> Everybody gets kind of put into the same ring…you're not easily identified as an individual but just as another one…I think that's a disadvantage to living somewhere as big as Ottawa because people don't know your situation, so people don't tell you about things or share information with you.

Living in a rural setting. Although a small number indicated that there were no apparent advantages of where they lived, most rural participants focused on the social and economic features of rural settings as advantages. Participants remarked on the close-knit social environment, the individualized support provided by community-based service providers, perceived safety and quietness of where they lived, and the cheaper cost of living. As one rural woman explained, "I know that the people in my community care and that really goes a long way…it really makes you feel like you are still part of this community no matter how much money you have." Rural participants also spoke about greater opportunities for gardening to augment their household food supply. In combination, these community features were regarded as positive resources for quality of life and for the management of household food insecurity.

Most rural participants identified disadvantages of where they lived. A few noted that there were few community-based social services and limited employment options in rural settings. However, the majority focused on the poor availability and limited accessibility to food in rural areas. Themes included high cost of food, long distances to food stores, limited number and variety of food stores, and reduced food selection and quality of food items (e.g., expired

food, poor quality produce): "[food is] a bit pricier so that money doesn't go as far"; "it's a 45 to 50 minute walk to walk from my house to the closest grocery store; "in all the rural [areas in this region], you're lucky if you have one store." Geographic dispersion and concentration were important factors in the relationship between place of residence and the food environment. In particular, participants who lived in the countryside or dispersed areas cited greater challenges with availability and accessibility to food than those who lived in the larger rural centres.

Rural participants frequently discussed aspects of transportation. Many participants explained that owning a vehicle or relying on others for transportation was vital to life in a rural area: "I wouldn't be able to survive without a vehicle"; "people without cars are ten times worse." Participants who owned a vehicle spoke about the flexibility it gave them to travel outside of their community to purchase better quality, lower cost foods and to access community support services. Owning a vehicle, however, led to additional costs (e.g., insurance, gasoline, maintenance) that had to be balanced with other household expenses. Participants tried to minimize costs by planning in advance (e.g., going when there are sales) and by coordinating shopping trips with others (e.g., ride sharing). In contrast, participants without regular access to private transportation reported having reduced mobility and accessibility to food stores because they had to walk everywhere, often for long distances. Some noted that paying for a taxi was not feasible as it would further constrain their food budget: "I can't afford to take a cab because they're like $10.00 something just to get in the taxi, it's ridiculous." Consequently, these participants were more likely to access only what was available in the local food environment.

Discussion

The purpose of the present study was to explore the experience of household food insecurity in urban and rural households. An ecological perspective helped to ground our

understanding of food insecurity by illustrating the interrelated and dynamic connections between the individual, and his or her household and place of residence. Participants' experiences of food insecurity were situated within household contexts that were largely unpredictable and poorly resourced. Most participants lacked the resources, such as income, education, employment and health, that are instrumental in protecting people from poor outcomes (Raphael, 2004, 2011). Indeed, food was just one of the many areas of insecurity in the household (Alaimo, 2005; Hamelin et al., 2002, 2011; Rainville & Brink, 2001; Tarasuk, 2005). In this insecure context, participants encountered constraints and deprivation that shaped their behaviour in the household and their interactions with the broader social system, which, ultimately, affected their health and well-being. We found similar conditions, processes and consequences of household food insecurity in our urban and rural samples, as well as with other qualitative investigations of food insecurity (Ahluwalia et al., 1998; De Marco et al., 2009; Hamelin et al., 2002, 2011; Radimer et al., 1992; Runnels et al., 2011; Tarasuk & Maclean, 1990; Williams et al., 2012). This supports the proposition that these aspects represent common dimensions and potential consequences of household food insecurity (Coates et al., 2006; Hamelin et al., 1999; Tarasuk, 2001b), and are likely to manifest regardless of place of residence.

Our findings revealed a connection between household resources, individual management strategies, and food selection patterns. As a material commodity, food purchases were largely contingent on the financial security of the household and the allocation of income to other, more fixed household expenditures (DeVault, 1991; Kirkpatrick & Tarasuk, 2003; Power, 2005; Travers, 1996; Williams et al., 2012). Many households had food budgets that were well below what would be needed to afford a nutritious and balanced diet (e.g., $745/month for a family of four; Ottawa Public Health, 2012), a reality that was reflected in the participants' accounts of

personal diets that were low in quantity, nutritionally insufficient, monotonous, and unsatisfying. Within a household context of limited resources, participants engaged in active, complex, and highly effortful management strategies to maximize and to augment existing financial and food resources, a finding similar to other studies of low-income (DeVault, 1991; Kempson, 1996; Rose, 2011; Tarasuk & Maclean, 1990; Travers, 1996; Zachary, Palmer, Beckham, & Surkan, 2013; Zenk, Dallas, & Hoskins-Wroten, 2011) and food-insecure households (De Marco et al., 2009; Hamelin et al., 2002; Williams et al., 2012). In general, participants were thoughtful, resourceful and knowledgeable, which challenges the perception that household food insecurity is an outcome of an inadequacy of skills and/or knowledge to manage household demands (Hamelin, Mercier, & Bédard, 2010; McLaughlin, Tarasuk, & Kreiger, 2003; Power, 2005).

Lister (2004) has posited that management behaviours represent an often unrecognized form of agency or capacity to act on one's circumstances. Our study has shown that many food insecure households are "getting by" (Lister, 2004, p.130) and that their everyday, personal actions are, of necessity, focused on surviving within the constraints of their circumstances (DeVault, 1991; Hamelin et al., 2002). In practice, the strategies that people used were concomitant with compromises in the quantity and quality of the food that was acquired for the household. In spite of their best efforts, all participants in our sample struggled to obtain foods that were perceived to be healthy and desired. Thus, though important for meeting basic food needs, the 'acts of agency' provided only short-term supplementation of resources and were generally insufficient to protect the household from recurrent episodes of food insecurity. Our findings highlight the primary role of adequate household resources (e.g., income, education, employment) in attaining and maintaining household food security (Dietitians of Canada, 2005; Hamelin et al., 2011; Tarasuk & Vogt, 2009; Tarasuk, 2005).

Household Food Insecurity, Physical and Mental Health, and Social Relationships

Respondents' constrained capacity to meet their needs and the needs of their family members, and the persistence of these constraints played an important role in the relationship between their food insecurity and their physical and mental health. Participants in our sample directly linked their experience of food insecurity to a wide range of adverse physical and emotional reactions, as well as to their difficulties in managing their chronic physical and mental health conditions (and related exacerbations of existing health and food concerns). These findings build support for our earlier work that conceived of health effects as both potential causes and consequences of household food insecurity (Runnels et al., 2011), and also provides theoretical propositions for extant literature that has found an association between household food insecurity and poor health (Che & Chen, 2001; Hanson & Olson, 2012; Seligman, Laraia, & Kushel, 2010; Siefert, Heflin, Corcoran, & Williams, 2004; Stuff et al., 2004; Vozoris & Tarasuk, 2003). Based on the participants' accounts, potential pathways between household food insecurity and poor health might occur via compromised nutrition, constrained capacity to adhere to dietary and medication treatment recommendations for chronic health conditions (i.e., high cost of adherence), functional barriers to securing adequate resources to prevent food insecurity (e.g., disability), and exposure to chronic and cumulative stressors. Research is needed to further test these pathways in order to identify areas for intervention that would help to improve the physical and mental health of those who are food insecure.

The perceived connections between household food insecurity and social relationships were complex. Most participants encountered some degree of exclusion from common forms of social participation, a finding that is similar to that from other studies (Atlantic Health Promotion Research Centre, 2004; Hamelin et al., 2002; McIntyre, Officer, & Robinson, 2003; Runnels et

al., 2011; Tarasuk & Maclean, 1990; Williams, McIntyre, & Glanville, 2010; Williams et al., 2012). Despite these barriers, some participants engaged with their social network in ways that provided opportunities for reciprocal support, and that also helped to buffer the negative effects of household food insecurity through the provision of tangible and informational support (Swanson, Olson, Miller, & Lawrence, 2008). In contrast, others intentionally limited their opportunities for support due to feelings of embarrassment, concerns about being dependent on others, and perceptions of being judged unfairly by others. These experiences have been described elsewhere (Ahluwalia et al., 1998; Hamelin et al., 2011; Runnels et al., 2011; Williams et al., 2010; 2012), suggesting that the interaction between food insecure individuals and their social networks can engender negative emotions. In our study, there appeared to be a negotiation between managing household challenges, desire for personal autonomy, need for connectedness and self-presentation. These factors might have an important role in how social support is given and received in the context of food insecurity, and whom, if anyone, within the person's social network, is allowed to bear witness to their personal challenges. Although we were unable to fully explore these hypotheses within our study, future research that focuses on the meaning and purpose of individual's social behaviours would help to understand the dynamic interplay between social support and household food insecurity.

The Role of Place of Residence in Household Food Insecurity

The findings from our study suggest that place of residence was a secondary context that interacted with household constraints to affect household food insecurity. We found that the features of the local environment, even those that were regarded as beneficial, were not sufficient to ensure food security or to counteract the negative effects of food insecurity. Indeed, all of the households in our study were food insecure regardless of their geographic location. Nevertheless,

place of residence had an important role in the participants' management of their existing household resources by further constraining or easing the challenges that were experienced within the household.

Although urban and rural residents cited advantages and disadvantages of where they lived, the rural residents described broader disadvantages that highlighted the complexity of being food insecure in a rural area. Similar to other investigations, the rural settings in our study were low-resourced environments with limited availability and accessibility to food and community-based services (Atlantic Health Promotion Research Centre, 2004; Drouin et al., 2009; Halseth & Ryser, 2006; NSPFSP, 2013; Pouliot & Hamelin, 2009; Travers et al., 1997; Williams et al., 2012). With few food stores available and limited physical accessibility to reasonably priced food options, rural residents were more likely than their urban counterparts to travel long distances for food and to be dependent on private transportation. These realities of rural living had implications for the planning and time devoted to food shopping trips, the allocation of existing financial resources (Marshall & Bollman, 1999), and the feasibility of accessing food and social resources for those without adequate transportation options (Clifton, 2004; Drouin et al., 2009; Pouliot & Hamelin, 2009; Powell et al., 2007). These challenges were more pronounced for rural residents who lived in more dispersed areas (e.g., countryside) than those who lived in the concentrated centre of their rural community (Yousefian et al., 2011), which suggested a link between spatial dispersion and the availability and accessibility of food. Overall, our findings suggest that rural food insecure households may encounter unique environmental and transportation barriers that impact their ability to adequately manage their food concerns. Additional research is needed to determine whether our findings translate to other urban and rural contexts.

Study Limitations

Our sample was primarily recruited through convenience sampling at food distribution centres. Research has suggested that households that use these services might be more vulnerable and have higher needs because they lack the financial and social resources to maintain their food security (Garasky et al., 2004; Hamelin et al., 2011). This was evident in our sample as most of the households were classified as severely food insecure and they encountered a high degree of household challenges. Given that data from national population surveys and community samples suggest that only 20-35% of individuals and households that report food insecurity access food banks (Che & Chen, 2001; Kirkpatrick & Tarasuk, 2009; Loopstra & Tarasuk, 2012; McIntyre et al., 2000; Rainville & Brink, 2001; Vozoris & Tarasuk, 2003), it is also possible that our sample does not reflect the experiences of those who address their food concerns in other ways. In addition, participants in our sample were self-selected and might have had particular attributes (e.g., age, ethnic/cultural background) or personal experiences that influenced their interest in participating in our study. Together, these methodological factors might have reduced the representativeness of sample to other food insecure households. However, given the similarity of our results and other qualitative investigations of household food insecurity, the effect of convenience sampling and self-selection might be minimal. Finally, the co-constructive nature of the interviews could have introduced demand characteristics that influenced the participants' interaction with the interviewer, as well as their interpretations of the study purposes and subsequent responses to questions. Efforts were made to minimize the effect of demand characteristics by avoiding leading questions, by using the participant's own words, by interacting with the participants in an empathic manner, and by adopting an open approach to the interview so that participants could introduce their own ideas.

Conclusions

The present study contributes to the literature by providing insight into the experience of food insecurity in urban and rural households. Our findings suggest that the challenges and consequences of living in a food insecure household are similar for urban and rural residents; however, the local social and food environment of urban and rural areas have an important role in the way in which individuals manage household food insecurity. Overall, our research highlights the interrelationship between the individual and the contexts in which he or she lives, and points towards the importance of adopting a systemic approach to developing policies and interventions to address food insecurity in urban and rural areas. For example, interventions aimed at promoting healthy eating might not be effective unless consideration is given to the constraining contexts that surround food insecure individuals (Runnels et al., 2011; Raine, 2005; Travers, 1996). Although further research is needed to explore the extent to which features of the social and food environment effect food security (Kirkpatrick & Tarasuk, 2010), our findings suggest that modifying the food environment, such as increasing the number of food stores and improving access to transportation, might have limited success in reducing the barriers experienced by those who are food insecure. To be effective, we suggest that policies and interventions that are designed to enhance food security need to focus on improving access to the resources, such as adequate household income, that promote health and well-being (Dietitians of Canada, 2005; Mikkonen & Raphael, 2010; Raphael, 2004, 2011; Tarasuk, 2005).

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Footnotes

[1] The authors include a third category, marginal household food insecurity, in their estimates of household food insecurity in Canada in 2011 (Tarasuk et al., 2013). This less conservative category is indicative of one affirmative response on the HFSSM. To be comparable with the Health Canada (2007) scoring method, we report the prevalence estimate for households reporting moderate to severe food insecurity.

[2] Although there was some variation in the sociodemographic characteristics of participants living in urban and rural settings, there were no significant differences between the groups (data not shown). Therefore, we present the aggregate data for the full sample.

[3] Data was missing for one household (n = 25).

[4] Household food security status is equivalent to adult food security status (with and without children in the household).

[5] In households where child members were classified as either moderately or severely food insecure, adult members had an equal or more severe level of food insecurity.

[6] We received fewer telephone contacts from rural residents to take part in the study. The reason for this was unclear, although, it was suggested that the limited access to the recruitment sties (e.g., transportation challenges) and peoples' potential concern about anonymity and confidentiality might have been factors in the recruitment of the rural participants.

[7] Recruitment took place simultaneously in the urban and rural settings. This allowed us to monitor and to adjust the pace of recruitment. In the urban setting, we stopped recruiting once we had recruited and completed interviews with 16 participants, and observed in the interviews that it appeared that no new themes were being raised. In the rural setting, we continued recruiting until our efforts led to no new participants. This resulted in 11 rural participants, fewer

than in the urban sample. However, we also observed that no new themes were being raised by the rural participants.

[8] To ensure participant confidentiality, staff members at the interview sites were not informed about the purpose of the meeting between the interviewer and the participant.

[9] Both the honorarium and additional compensation were given regardless of whether the participant withdrew from the interview at any time.

[10] We use the term 'selection' rather than 'choice' because it more accurately captures the process of selecting food from what is available and affordable versus choosing from an unlimited number of options.

[11] For ease of presentation, we report themes based on urban and rural residence; however, what participants considered to be 'where I live' was diverse. Most often, participants focused on concrete and proximal representations of place (e.g., household, neighbourhood), and less so on abstract and distal representations (e.g., community, urban/rural).

Appendix A

Semi-Structured Interview Protocol

Introductions: introduce self, ad lib.

Introduction to the interview: Over the next hour, I would like to talk to you about the food in your household over the past 12 months. I am interested in learning from you about any worries and/or concerns that you might have about food and potential challenges that you might face when trying to get enough food for yourself and your family.

Again, all of the information that you give me is completely confidential.

We will begin by going through the consent form to make sure that you are comfortable with everything and then move on to the questions [**Go through consent**]

Now, are you ready to get started?

I will ask you some questions that are yes/no types of questions. For other questions, you might wish to reply in more detail, telling me about your experiences.

Household Food Security Situation

1. How many people are currently living with you? _____

2. How many of these are children under 18 year of age? _____

3. For each person who lives with you, can you please tell me their relationship to you?
   Interviewer: Draw diagram with interviewee

4. **Tell me about your household food situation.**
   (probe questions a, b, c, and d – if necessary)

   a. Do you have enough food to eat in your household? Tell me more.

   b. What is that experience like for you [not getting enough food]?

   c. When did you first experience this situation [not getting enough food]?
      i. What was happening in your life at that time?
         (probe for risk factors: e.g., loss of job, new family member)

   d. How often do you have difficulty getting enough food for your household?
      (probe: if periodic - what is different during these times?)

Contributors to Food Security/Insecurity

In this group of questions, I want you to think about the things that effect your food situation.

5. **What do you think contributes to the fact that your household lacks food? Tell me more.** (Probe: risk factors, contextual factors)

6. **What would you need in order to ensure that your household always has enough food?**

Relationship with Health (Physical, Mental and Social)

The next group of questions is to help us understand how you feel about these issues. For example, how you feel physically, mentally/emotionally and socially. If possible, I'd like you to tell us about some specific examples or things that you remember.

7. **How do you feel when you do not have enough food?**

8. **Does not having enough food affect your health and well-being? If so, how?**
   Probe for:
   i. Physical, mental/emotional, and social effects
   ii. Consider medical diagnoses (chronic conditions, etc.)

Community Situation

I would now like you to switch your thinking a bit to where you live.

9. **Do you think living in _____ affects your food situation? If so, how?**
   (probe: advantages/disadvantages, connections to access and availability)

Conceptual Model

In our talk today, you have told me about things that contribute to the lack of food in your household, how not having enough food effects your health and well-being, and the role that where you live might play in understanding your food situation.

I'd like to take some time now to talk about if, and how, these things may be related to each other. Here are the things that you told me about earlier (Interviewer: list out contributors and health effects).

10. **Do you think that the things we have spoken about today are connected? If so, how?**
    (Draw diagram – use arrows to show cause/effect, explore relationships in greater detail)

11. **What are the most significant to you [elements in diagram]?**

Conclusion of Interview

That ends the questions that I prepared for us today. I just want to make sure that we have covered all of the issues around food that are important to you. Is there anything else that you would like to add?

We'll be writing a short report on this. Would you like a copy of it?

C***onclude interview, thank interviewee for time and participation. Give honorarium and have participant sign the receipt book.***

Appendix B

Sociodemographic Questionnaire

The following questions will us get a picture of the people that we are talking to. Please be assured that, like all of the information you have provided, your answers will be kept strictly confidential.

Fill in your answer or circle your response on this sheet.

1. What is your gender? _____

2. How old are you? _____ years

3. What is your highest level of education? _____

4. What best describes your living arrangement?
   a. living alone
   b. living with spouse or partner
   c. single parent with children
   d. two-parent family
   e. living with parents, other family or friends
   f. other (please specify): _____

5. What is your annual household income from all sources (e.g., job, social security, disability payments)?

a. less than $10,000	b. $10,000 - 14,999
c. $15,000 - $19,999	d. $20,000 - $24,999
f. $25,000 - $29,999	g. $30,000 - $34,999
h. $35,000 - $39,999	i. $40,000 - $44,999
j. $45,000 - $49,999	k. $50,000 - $59,999
l. $60,000 - $69,999	m. 70,000 or more
n. don't know	

6. In general, would you say your health is:
   a. Poor
   b. Fair
   c. Good
   d. Very good
   e. Excellent

7. In general, would you say your mental health is:
   a. Poor
   b. Fair
   c. Good
   d. Very good
   e. Excellent

Appendix C

USDA Household Food Security Survey Module

The following questions are about several statements that people have made about their food situation. For each question, we would like you to think about your food situation in the past 12 months and mark [x] your response in the box provided.

Please be assured that, like all of the information you have provided, your answers will be kept strictly confidential.

These questions refer to several statements people have made about the food situation for **adults** in the household.

1. We worried whether our food would run out before we got money to buy more. Was that often true, sometimes, or never true for your household in the last 12 months?
   [ ] Often true
   [ ] Sometimes true
   [ ] Never true
   [ ] Don't know

2. The food that we bought just didn't last, and we didn't have money to buy more. Was that often true, sometimes, or never true for your household in the last 12 months?
   [ ] Often true
   [ ] Sometimes true
   [ ] Never true
   [ ] Don't know

3. We couldn't afford to eat balanced meals. Was that often true, sometimes, or never true for your household in the last 12 months?
   [ ] Often true
   [ ] Sometimes true
   [ ] Never true
   [ ] Don't know

4. In the last 12 months, did you or other adults in your household ever cut the size of your meals or cut meals because there wasn't enough money for food?
   [ ] Yes
   [ ] No (Skip to question 5)
   [ ] Don't know (Skip to question 5)

4a. 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
   [ ] Don't know

5. In the last 12 months, did you or other adults in your household ever eat less than you felt you should because there wasn't enough money for food?
   [ ] Yes
   [ ] No
   [ ] Don't know

6. In the last 12 months, were you or other adults in your household ever hungry but didn't eat because there wasn't enough money for food?
   [ ] Yes
   [ ] No
   [ ] Don't know

7. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
   [ ] Yes
   [ ] No (Skip to question 8)
   [ ] Don't know (Skip to question 8)

7a. 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
   [ ] Don't know

The next group of questions refers to statements that people have made about the food situation of **children, under the age of 18**, in the household.

8. I relied on only a few kinds of low-cost food to feed the children because I was running out of money to buy food. Was that often true, sometimes, or never true for your household in the last 12 months?
   [ ] Often true
   [ ] Sometimes true
   [ ] Never true
   [ ] Don't know

9. I couldn't feed my children a balanced meal, because I couldn't afford it. Was that often true, sometimes, or never true for your household in the last 12 months?
   [ ] Often true
   [ ] Sometimes true
   [ ] Never true
   [ ] Don't know

10. My children were not eating enough because I just couldn't afford enough food. Was that often true, sometimes, or never true for your household in the last 12 months?
    [ ] Often true
    [ ] Sometimes true
    [ ] Never true
    [ ] Don't know

11. In the last 12 months, did you ever cut the size of any of your children's meals because there wasn't enough money for food?
    [ ] Yes
    [ ] No
    [ ] Don't know

12. In the last 12 months, did any of the children ever skip meals because there wasn't enough money for food?
    [ ] Yes
    [ ] No (Skip to question 13)
    [ ] Don't know (Skip to question 13)

12a. 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
    [ ] Don't know

13. In the last 12 months, were any of your children ever hungry but you just couldn't afford more food?
    [ ] Yes
    [ ] No
    [ ] Don't know

14. In the last 12 months, did any of your children not eat for a whole day because there wasn't enough money for food?
    [ ] Yes
    [ ] No
    [ ] Don't know

END OF QUESTIONNAIRE

Appendix D

Recruitment Document

DO YOU HAVE
DIFFICULTY GETTING ENOUGH FOOD
FOR YOU AND/OR YOUR FAMILY?

If you answered ***YES***, you may be able to take part in an interview!

Complete confidentiality is guaranteed.

Who Are We? Researchers at the University of Ottawa who are interested in understanding your experiences with not having enough food.

Why Are We Doing This? We are interested in your ideas on whether and how your household circumstances, your health and where you live might be related to your experience.

The interview should take about **1½ hours**.

To participate, you must be **at least 18 years of age** and be able to speak **English**.

We value your time!

Will cover transportation and child care costs, and offer you a **grocery voucher**.

Call now to take part in an interview
Participation is limited.

For more information, please call:

Melissa at **1 (877) 868-8292, Ext. xxxx**

THANK-YOU!

uOttawa

L'Université canadienne
Canada's university

Appendix E

Consent Form for Participation

Melissa Calhoun, Doctoral Student
University of Ottawa, School of Psychology
125 University Private
Ottawa ON Canada K1N 6N5
(613) 562-5800 ext. xxxx

Elizabeth Kristjansson, PhD, Supervisor
University of Ottawa, School of Psychology
125 University Private
Ottawa ON Canada K1N 6N5
(613) 562-5800 ext. xxxx

You have been asked to participate in an interview as part of a project entitled: *University of Ottawa Food Study on Risk Factors and Health*. The goal of the study is to better understand what it means to not have enough food. We are interested in hearing about the food situation in your household, and to get your ideas on whether and how certain factors, such as your health and where you live might be related to your experience of not getting enough food.

If you agree to participate, we will do an in-person individual interview with you today. The interview will last about 1 ½ hours. You will be asked several questions about your household food situation, contributors to your lack of food, your health and well-being, where you live, and the relationships between these topics. As part of the interview, you will also be asked to complete a questionnaire about your household food situation, and to provide demographic information, like your age and living situation. You may share as little or as much as you would like, and can take the time that you need to answer the questions.

The interview will be audio-taped and the interviewer will take hand-written notes to ensure that we do not miss any important information from you. The audio-tape will only be listened to by the members of the research team, and will be used exclusively for research purposes. Your identity and all identifying information you give will be kept strictly confidential.

There are minimal risks to taking part in this interview. For example, you may get tired during the interview. Feel free to ask for a break at any time as needed. Also, the questions that you are asked to answer might be upsetting or difficult to discuss. If you feel uncomfortable at any time during the interview, you are free to stop the interview or to not answer any specific question without giving a reason. At the end of the interview, you will be given information on services that may interest you.

There are no immediate benefits to participating in the study. The information collected during the interview will be used to help us understand the experiences of individuals in our community. We also hope to learn how household situations, health and where people live might be related to their ability to access enough food for themselves and their households. Your participation in this interview might lead to more community attention and research on this important issue.

As a thank you for your participation, you will be given a $25 grocery voucher for the grocery store of your choice. You will also be given money for your transportation equivalent to bus fare and for child care costs, if necessary. The grocery voucher, transportation and child-care reimbursements are yours to keep even if you decide to stop the interview at any time.

Your participation or non-participation in this study will be kept confidential. To protect your confidentiality, all interviews will be given an ID number that in no way can be linked to your name or other identifying information. Your signed consent form and any other identifying information will be kept separate from your interview materials (e.g., questionnaire, audio-tape). All information you provide will be kept in a secure research office at the University of Ottawa for 7 years and only authorized members of the research team will have access to the information.

The information you provide in the interview will be used for research purposes only. The results of the study, as well as any direct quotes that we use from your interview, will be presented in a way that protects your identity and the identity of people or services that you talk about. If you are interested, you may also obtain a summary of the study results.

If you have any questions about the study, you can contact one of the researchers (see front side).

If you have questions related to the ethics of the project, you may also contact the research ethics board at the following address: Research Grants and Ethics, 550 Cumberland, Room 159A, University of Ottawa, Ottawa, ON Canada K1N 6N5, (613) 562-5841.

Consent

I acknowledge that the research study described above has been explained and my questions about the study have been answered. I am aware of my right to refuse to participate or withdraw from the study at any time without providing a reason. I have been informed that, if I choose to withdraw from the study, I will receive the grocery voucher, transportation and child-care reimbursements. I have been assured that the information related to my participation will be kept confidential, and my identity will not be released or printed without my permission.

By signing this consent form, I understand and agree to the above information. I will be asked to sign two copies; one will be kept by the research team and the other will be mine to keep.

□ ____ (initial) I consent to have the interview audio-taped.

_____ _____

Signature of Participant Date

_____ _____

Signature of Interviewer Date

Chapter 5: General Discussion

Food security is a public health concern (Dietitians of Canada, 2005; Health Canada, 2007) and an important social determinant of health (McIntyre, 2004; Public Health Agency of Canada [PHAC], 2004; Raphael, 2004, 2010; Robertson, Brunner, & Sheiham, 2006; Tarasuk, 2004, 2005). Considerable research has been devoted to understanding what contributes to and what are the potential consequences of household food insecurity. Much of this research, however, has been focused on urban samples or aggregate samples of urban and rural residents. Consequently, to date, we know very little about the nature of household food insecurity in rural areas, and how urban and rural settings might affect the experience of household food insecurity (Morton, Worthen, & Weatherspoon, 2004). Accordingly, the main objective of this dissertation was to examine and to understand the relationship between risk factors, household food insecurity, and health in urban and rural populations. The dissertation used a mixed methods design, which allowed for the integration of large-scale aggregate data with an in-depth exploration of the qualitative experience of household food insecurity in urban and rural households. In this discussion, I first present a summary of the key findings from each of the three studies, and then I provide an integration of the quantitative and qualitative findings.

Summary of Key Findings

In study one, I used secondary data from a large sample of Canadian households to conduct multivariate logistic regression analyses with the aim of identifying the household-level factors that were associated with household food insecurity and examining whether place of residence moderated these relationships. Consistent with previous research in Canada (Che & Chen, 2001; McIntyre, Connor, & Warren, 2000; Rainville & Brink, 2001; Tarasuk & Vogt, 2009; Vozoris & Tarasuk, 2003), the results showed that the likelihood of reporting household

food insecurity was highest among households in the lowest income category, recipients of social assistance, employment insurance or worker's compensation, those with lower educational attainment, tenants, single/unattached individuals, lone parents with children, and households with three or more children. The strongest associations were found for household income, main source of income, and home ownership. These findings provided further evidence of the economic constraints encountered by food insecure households (Hamelin, Mercier, & Bédard, 2011; Tarasuk & Vogt, 2009). Results indicated that, once the sociodemographic characteristics of urban and rural households were controlled, rural residence had an independent contribution to the likelihood of household food insecurity (i.e., unmeasured aspects of rural areas). The majority of the moderation analyses were non-significant, indicating that the magnitude and direction of the association between the household-level factors and household food insecurity was not dependent on place of residence. Evidence of a moderation effect was, however, found for household-level educational attainment. Specifically, secondary school graduation was associated with an increased likelihood of household food insecurity among urban households, but it was protective for rural households. Although the reason for this difference could not be explored in the analyses, it could be argued that a qualitative difference exists in the role of education and related factors (e.g., employment status, income) in the manifestation of household food insecurity in urban and rural areas.

In study two, I used multivariate logistic regression analyses to examine the association between household food insecurity and poor general, physical and mental health, and to investigate whether place of residence moderated the relationship between household food insecurity and poor health. I used secondary data from a large sample of individuals residing in Canadian households. Results indicated that living in a food insecure household was

independently associated with an increased likelihood of reporting poor self-rated general and mental health, multiple chronic conditions, diabetes, high blood pressure, heart disease, food allergies, elevated distress, major depressive episode, mood disorder and anxiety disorder. These findings are consistent with previous research in Canada (Che & Chen, 2001; Gucciardi, DeMelo, Vogt, & Stewart, 2009; Vozoris & Tarasuk, 2003; Wu & Schimmele, 2005). Moderation analyses found no evidence of urban-rural differences in the relationship between household food insecurity and poor general, physical and mental health.

In study three, I conducted semi-structured interviews with 26 individuals who resided in food-insecure households in urban and rural settings in Eastern Ontario. The aim was to explore their experiences of household food insecurity (e.g., contributing factors, health, where they lived), and to investigate whether different themes emerged for urban and rural residents. Overall, urban and rural residents described similar conditions, processes and consequences of household food insecurity. Regardless of place of residence, participants reported having limited resources to meet their needs and the needs of other members of their household. The lack of resources influenced how people managed their everyday decisions (e.g., allocation of resources), their strategies to maximize and to extend their limited resources (e.g., adapting, accessing community resources), their social interactions with others, and their food selection. These behaviours, in turn, were connected to potential consequences to the quality and quantity of their personal diets, as well as to their physical and emotional well-being. These themes are similar to those found in previous qualitative investigations of household food insecurity (Ahluwalia, Dodds, & Baligh, 1998; De Marco, Thorburn, & Kue, 2009; Hamelin, Beaudry, & Habicht, 2002; Radimer, Olson, Greene, Campbell, & Habicht, 1992; Runnels, Kristjansson, & Calhoun, 2011; Williams et al., 2012). Place of residence played an important role as a distal

context that interacted with existing household resources to influence the management of household food insecurity (i.e., further constrained or eased household challenges). Although urban and rural residence was associated with certain advantages and disadvantages, the findings suggested that rural food insecure households might encounter unique environmental and transportation barriers.

Mixed Methods Integration and Interpretation of the Findings

A mixed methods design was selected with the goal of: (a) expansion: extending the breadth and range of inquiry; (b) complementarity: elaborating and enhancing of results from one method with the other; and (c) triangulation: converging and corroborating results from the two methods (Creswell & Plano Clark, 2007; Greene, Caracelli, & Graham, 1989). An examination of the findings identified areas of convergence and enhancement. First, both sets of quantitative data suggested a strong connection between limited household resources and the occurrence of household food insecurity, and the qualitative findings provided elaboration on how the constraints of limited resources impact the course, intensity, and management of household food insecurity. Second, both sets of data highlighted the relationship between household food insecurity and poor health. The quantitative results showed that household food insecurity was strongly related to multiple measures of poor health, which suggests that limited or uncertain access to food can have far reaching effects. The qualitative findings underscored the range of emotions and physical symptoms that are felt by food insecure individuals and the negative impact of these symptoms on their quality of life. The constant worry and stress from managing food insecurity and other household challenges (Hamelin et al., 2002; Radimer et al., 1992; Runnels et al., 2011), as well as the consequence of compromises in the quality and

quantity of food intake (Kirkpatrick & Tarasuk, 2008b) might explain the stronger likelihood of poor health for people who reside in food insecure households.

Third, the unique environmental and transportation barriers to food access in rural areas might explain the finding that rural residence was associated with an increased likelihood of household food insecurity. Specifically, the rural areas were characterized by a low number of food stores, limited physical and economic accessibility to food, and dependency on private transportation. These realities of rural living had important implications for the allocation of already constrained resources and the feasibility of food access for those without private transportation. Given that availability and accessibility to food are determinants of healthy eating (Raine, 2005), these factors could result in an increased vulnerability to household food insecurity for rural residents. Nonetheless, because place of residence, as a quantitative variable, represents many interacting factors in a given setting (e.g., community structure, culture; Canadian Institute for Health Information [CIHI], 2006; Macintyre, Ellaway, & Cummins, 2002; Pong et al., 2012), other aspects of place of residence that were not measured or identified by the participants might also contribute to the increased likelihood of household food insecurity in rural areas.

Finally, the similar lived experience of the urban and rural residents emphasizes the primary contribution of inadequate household resources in the manifestation of food insecurity. This might explain why there was no evidence of urban-rural differences in the relationship between household food insecurity and poor health, and limited support that place of residence moderates the relationship between risk factors and household food insecurity. Indeed, it could be argued that as long as the resources within the household are limited, then the relative influence of these constraints on the likelihood of household food insecurity, and the resulting

effect of household food insecurity on health and well-being will be similar regardless of where the household is located. Essentially, the demands and consequences (e.g., social isolation) that come with living in a poorly resourced, food insecure household override other environmental factors. Place of residence does appear to influence how people manage household food insecurity by further constraining or easing household challenges, but it does not modify the significant connections between risk factors, household food insecurity, and poor health.

Implications

The results of this dissertation provide support for Campbell's (1991) model that posits a connection between risk factors, household food insecurity, and health. Although Campbell included primarily one-way direct and indirect pathways between these aspects, results from the qualitative study and the extant literature (Huddleston-Casas, Charnigo, & Simmons, 2008) indicates that the model could be updated to account for potential bidirectional relationships between household food insecurity and poor health. In addition, place of residence, as a secondary context, could be added to the model as contributor to the management of household food insecurity, possibly as a pathway between risk factors and household food insecurity. More research is needed to test this pathway in other urban and rural contexts.

The results of this dissertation also emphasize the importance of considering the interrelated, ecological contexts in which people live to obtain a robust understanding of individual-level experiences (McGrath & Johnson, 2003; Nelson & Prilleltensky, 2005). The consistency of findings between urban and rural households and with past research suggests that the issues of household food insecurity are related to systemic, multilevel problems. At present, the dominant social intervention for addressing household food insecurity focuses on the provision of food through food banks (Tarasuk, 2001a, 2001b, 2005). Although this intervention

helps to mitigate the immediate issue of a low food supply and hunger, it fails to address the wider issues that influence the onset, progression, and consequences of household food insecurity (Atlantic Health Promotion Research Centre, 2004; Dietitians of Canada, 2005; Nova Scotia Participatory Food Security Projects [NSPFSP], 2013; Tarasuk, 2001a, 2005).

The three studies of this dissertation highlight the contribution of many social determinants of health to the manifestation of household food insecurity. Food insecure households lacked the resources, such as adequate income, education and stable employment, which are needed to ensure health and well-being (Raphael, 2004, 2010). The qualitative findings illustrated that the process of navigating a poorly resourced household context was all-consuming, and despite respondents' knowledge and skills, their acts of agency were largely directed at "getting by" within their circumstances (Lister, 2004, p. 130). The amount of time and energy that is required to get by with limited resources represents a substantial barrier to increasing the resources that are necessary to escape household food insecurity (e.g., "getting out"; Lister, 2004, p. 144; Rainville & Brink, 2001). Overall, the findings from this dissertation support calls to focus research and advocacy efforts at modifying the macrolevel structural, economic and cultural factors, and social policies that impact household food insecurity (e.g., income supports, unemployment; Atlantic Health Promotion Research Centre, 2004; Dietitians of Canada, 2005; Health Canada, 2007; Riches, 1999; Tarasuk & Vogt, 2009). This point echoes Nelson & Prilleltensky's (2005) position that, "for as long as we try to address only the consequences of uneven allocation of resources, without looking at the problem's root cause, we confront only the surface of the issues" (p. 62). Without targeted efforts to ensure equitable and sufficient access to resources within society, there will be little chance for lasting, meaningful change for those who are food insecure.

Future Research

This dissertation has raised interesting questions that could be explored in future research. A follow-up study could be conducted to explore the quantitative finding that, compared to postsecondary education, secondary school graduation increased the risk of household food insecurity in urban households, but was protective for rural food-insecure households. A sequential mixed methods design could be used to determine the factors that are associated with educational attainment in urban and rural areas (e.g., employment status, gender, work sector, type of employment [part-time, full-time, seasonal], income level), and then to expand on these results with a purposive qualitative sample of postsecondary and high school graduates residing in urban and rural food insecure households. This design would assist in elucidating the role of education in household food insecurity in urban and rural households.

Future research could also be directed at building our awareness of urban and rural food environments in Canada. Although research investigating urban food environments is growing (e.g., existence of 'food deserts'; Beaulac, Kristjansson, & Cummins, 2009), more research is needed to identify the characteristics of urban and rural food environments and their potential contribution to food selection, food shopping behaviours, and food security/insecurity. The findings from this dissertation suggest that urban and rural settings might play a role in household food security/insecurity; however, the social, economic and environmental mechanisms that are involved remain unclear. Research that seeks to elucidate these mechanisms could involve quantitative studies that investigate informal and formal social supports, nutritious food basket pricing, and spatial mapping of food stores, as well as qualitative studies that explore the role of local environments from the perspective of food secure and food insecure residents from a wide range of urban, suburban, rural and remote communities in Canada. Adopting a

participatory research approach could enhance these studies by working collaboratively with people who are food insecure to build our understanding of the processes of household food insecurity, to facilitate community building and personal empowerment, and to determine where intervention efforts could be directed in urban and rural areas (see NSPFSP, 2013, for example).

Much of the current research investigating household food insecurity uses cross-sectional designs, which restricts our understanding to associations and does not permit investigation of the causal pathways between risk factors, household food insecurity, and health. Given that household food insecurity is not monitored longitudinally at the national-level, future research could be directed toward the development of a longitudinal panel study (Runnels et al., 2011). The purpose of this research design would be to track at-risk individuals over time to determine the processes of entry into and exit from household food insecurity. This research could assist in the identification of the causes and outcomes of household food insecurity, the evaluation of the role of place of residence in these relationships and processes, and the development of interventions and policies to address household food insecurity.

Lastly, future research is warranted that explores multiple ecological contexts (e.g., microsystem, mesosystem, exosystem, macrosystem, chronosystem) and their impact on the expression, management, and consequences of household food insecurity (see Green-LaPierre et al., 2012, for example). In the qualitative study, the ecological model (Bronfenbrenner, 1979) was used as a theoretical underpinning that grounded my rationale for exploring the role of place of residence in the experience of household food insecurity. Although the importance of ecological contexts emerged as a theme in study three, the data were not explicitly analyzed using an ecological lens. Using the ecological model to identify the contexts that influence household food insecurity would assist in the development of a comprehensive and multi-system

approach (e.g., household-level interventions, social policy) to addressing household food insecurity in Canada.

Limitations

There were a number of limitations to this dissertation research. First, all quantitative data were cross-sectional, which precludes the discussion of causal relationships between risk factors, household food insecurity, and health. Although the qualitative findings suggested some directionality between components, causality cannot be attributed without an investigation that uses a longitudinal research design. Second, using a secondary data source for the quantitative studies constrained the analyses to the measures and data that were available. The design of the Canadian Community Health Survey (CCHS; Statistics Canada, 2006) was a particular issue because household food insecurity and other measures (e.g., risk for depression) were optional content. Consequently, the sample size was reduced and the representativeness of the results was limited to specific regions in Canada. It was also not possible to explore the contribution of sociocultural and environmental (e.g., food environment) components of urban and rural areas in household food insecurity because these factors were not included in the survey questionnaire.

Furthermore, data constraints resulted in a narrow classification of place of residence that did not take into account the heterogeneity that exists within urban and rural areas (du Plessis, Beshiri, Bollman, & Clemenson, 2001; Williams & Kulig, 2012). Differences might exist in the relative contribution of risk factors to and associated health effects of household food insecurity based on degree of urbanization (e.g., near urban centre vs. remote areas) or on sociocultural categorizations of urban and rural areas. Although the rural settings that were selected for the qualitative study had different levels of rurality, specific analyses were not conducted to examine the variations in urban and rural areas in either the quantitative or the qualitative dataset.

Finally, in the qualitative analyses, using convenience sampling through mainly food distribution centres might have reduced the representativeness of sample to certain population groups (e.g., young to middle aged adults) and to specific food security backgrounds (e.g., severe, chronic). In addition, limiting our sample to only food insecure households might have resulted in an underestimation of the contribution of place of residence for food security/insecurity. For example, features of the local food and social environment might help to protect at-risk households from becoming food insecure (e.g., 'safety net'), or conversely, contribute to the challenges that a household might face in staying food secure. These questions could not be explored in detail in the qualitative study.

Conclusions

Although food is a basic need and a fundamental right (Dietitians of Canada, 2005; Riches, 1999; United Nations, n.d.), many individuals and households in Canada have a limited or uncertain access to food. This dissertation has contributed to the literature by advancing our knowledge of household food insecurity in Canada, confirming previous research on the associations between risk factors, household food insecurity and poor health, and shedding light on the common and unique experiences of individuals living in urban and rural food insecure households. The main findings of this dissertation suggest that place of residence does have an important role in the manifestation and management of household food insecurity. However, the influence of urban and rural settings appears to be secondary to the primary contribution of inadequate resources in the household context. More research is needed to identify and to understand the social, economic, and environmental mechanisms that explain the contribution of place of residence in household food insecurity.

Overall, I recommend that place of residence be added to the discussions about household food insecurity in Canada. It is with the knowledge of the contexts in which people live that we can best understand and change the connections between risk factors, household food insecurity, and poor health.

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