High vulnerability to household food insecurity in a sample of Canadian renter households in government-subsidized housing

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ABSTRACT

OBJECTIVES: To determine the prevalence and severity of household food insecurity and examine household material circumstances related to food insecurity in a sample of renter households in government-subsidized housing.

METHODS: Cross-sectional data from the 2010 Survey of Household Spending were used to determine the food insecurity status of 455 renter households living in the 10 provinces and receiving a government housing subsidy. Multivariable logistic regressions were conducted to examine the relationship between household characteristics describing material circumstances and food insecurity.

RESULTS: One in two households was food insecure. Marginal, moderate and severe food insecurity affected 9.0%, 23.3% and 18.5% of households respectively. Household economic resources, as captured with after-tax income, after-rent income, or total expenditure, had an independent, inverse relationship with food insecurity. Among the other characteristics examined, more adults or children in the household, presence of a member with disability, and receipt of social assistance increased the odds of food insecurity, but receipt of social assistance lost statistical significance when controlling for total expenditure. Presence of a senior in the household was independently associated with lower odds of food insecurity.

CONCLUSION: Our findings suggest that more effective income-based interventions are needed to address food insecurity among low-income households receiving government housing subsidies. A better integration of housing and income-based policies is necessary to support household food security among government-subsidized renter households.

KEY WORDS: Food insecurity; renters; housing subsidy; Canada

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Household food insecurity, namely inadequate or insecure access to food due to financial constraints, is a potent marker of material deprivation that affected 12.6% of Canadian households in 2012, the highest rate since 2007.¹ Studies from Canada and the United States have demonstrated that household food insecurity is a major public health problem, associated with elevated health care costs² and numerous adverse health outcomes.³ The social epidemiology of food insecurity is well documented in Canada, with multiple characteristics indicative of financial vulnerability identified as risk factors, including low income^{4–7} and renting versus owning a dwelling.^{5–8} A recent multi-level analysis revealed a positive association between average rental cost in census metropolitan areas and food insecurity,⁷ suggesting that the heightened vulnerability of renter households may be influenced by the cost of rents. Although social housing programs are not designed to address household food insecurity, they may play a role in mitigating the issue, given the emerging evidence that food insecurity is sensitive to interventions that increase households' incomes.^{9–11}

In Canada, all three levels of government are engaged in social housing programs aimed at improving housing affordability for lower-income renter households.¹² Examples include public housing, rent supplement programs, and co-operative and non-profit housing. These non-entitlement programs are predominantly means tested, and the level of housing subsidy is generally determined based on the

income of the household using specific proportions of income allocated to rent (i.e., “rent-geared-to-income”) or fixed rates for different income ranges (i.e., “sliding scale”).¹² Although there is wide variability in the administration of social housing programs between jurisdictions, programs across Canada have limited availability and thus prioritize households in greatest need based on factors, such as household composition and substandard housing, and through the identification of priority groups (e.g., seniors, victims of violence, people with disabilities, homeless individuals).¹² Given the objective and the design of social housing programs, they have the potential to mitigate household food insecurity by increasing the income available for non-housing necessities, such as food,¹³ and by improving housing stability.^{14,15} However, two studies that have assessed the household food insecurity status of public housing residents living in low-income Toronto neighbourhoods¹⁶ and Inuit communities¹⁷ revealed extreme levels of food insecurity, suggesting that social housing programs may

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provide insufficient assistance to support household food security. Yet, there has been no confirmation of these study findings at a population level, nor any analysis to elucidate the determinants of food insecurity among social housing program recipients.

Considering that Canada is currently developing its first national housing strategy,¹⁸ a better understanding of the factors underlying food insecurity among households benefiting from social housing programs is timely to inform policy development. Drawing on the 2010 Survey of Household Spending, this study aims to determine the prevalence and severity of food insecurity, and to examine the impact of material circumstances on the risk of food insecurity in a broad sample of government-subsidized renter households.

METHODS

Data source and study sample

The Survey of Household Spending (SHS) is an annual cross-sectional survey collecting detailed information on the expenditures of Canadian households.¹⁹ A stratified, two-stage sampling plan is used to select a sample representative of 98% of the population living in the 10 provinces; exclusions include individuals living on First Nations reserves, residents of institutions, and members of Canadian Forces living in military camps.¹⁹

During an in-person interview, information on households' demographic characteristics, housing tenure, reasons for reduced rent, year and month in which the households moved, as well as data on expenditures are collected.¹⁹ Detailed information on household income for the year prior to the survey is either collected during the interview or obtained directly from tax files, if permitted by the respondents.¹⁹ In 2010 only, SHS included the Household Food Security Survey Module, a validated questionnaire used as a surveillance tool in Canada.¹

In 2010, the total sample size was 13 075 households.¹⁹ Missing data were generally imputed by Statistics Canada, except for the food insecurity questions. The analytical sample for this study comprised renter households with complete data on food insecurity status who responded that they paid reduced rent because they lived in federal, provincial or municipal government-subsidized housing ($n = 455$).²⁰ The question did not specify the type of government housing subsidy the households received (e.g., rent supplement; public, co-operative, or non-profit housing).²⁰ In this study, "subsidized housing" is used to refer to any rental housing that is subsidized by government through the various social housing programs.

Household food insecurity

Household food insecurity was determined using the Household Food Security Survey Module, an 18-item questionnaire capturing a range of food access problems caused by insufficient money over the past 12 months.^{1,21} The questionnaire includes two scales differentiating the experience of children and adults within the same household,^{1,21} but an error in the application of the child scale in SHS 2010 prevented its use. Given recent evidence that a single affirmative item represents a marginal experience of food insecurity, associated with heightened vulnerability,^{2,22} the severity of food insecurity was described using a 4-level variable,

with food security, marginal, moderate, and severe food insecurity respectively defined as 0, 1, 2–5, and ≥ 6 affirmative answers to the 10-item adult food security scale.^{1,21} All other descriptive and regression analyses used a binary household food insecurity status, with food insecurity defined as any affirmative answer to the 10-item scale.

Household material circumstances

The selection of indicators of household material circumstances was informed by previous literature documenting household conditions related to food insecurity^{4–7,14,15,23} and by the necessity to achieve parsimony due to the small sample size. Since food insecurity is measured at the household level, the selected characteristics described the household rather than the individual.

The number of adults and of children <18 years of age described household composition and captured the influence of household size on the consumption of economic resources. Presence of senior(s) ≥ 65 years of age identified households entitled to federally-funded old-age benefit programs; in this sample, more than 90% of households with a senior were reliant primarily on seniors' income, which has been associated with lower risk of food insecurity.^{1,6,7} Receipt of social assistance was used as a marker of financial vulnerability distinct from the low income of recipients, given the independent relationship between reliance on social assistance and food insecurity found in population-based studies.^{4–7} This heightened vulnerability may be attributed to the limited ability of social assistance recipients to draw on savings and other assets to weather unexpected financial shock,^{24,25} since welfare programs require applicants to expend most of their liquid assets for eligibility.²⁶ A household was considered to have a member with disability if a member's amount or kind of activity at home, at work, at school, or in other activities was often reduced by a physical/mental condition or health problem.²⁰ Using a similar measure of disability, a US study found that higher income was less protective against food insecurity among disabled respondents.²³ Based on US evidence,^{14,15} length of stay in subsidized housing, an indicator of stable access to more affordable housing, was expected to be inversely associated with food insecurity.

Household annual after-tax income was used to assess the effect of net income on vulnerability to food insecurity. Since the survey did not collect information on the type of housing program or amount of housing subsidy received by households, the relationship between the income left after paying for subsidized rent (after-rent income) and food insecurity was examined to account for unobserved heterogeneity in the housing assistance provided by the different programs and jurisdictions. After-rent income was calculated as annual after-tax income minus annual expenditure on rent, which may have included or excluded utilities. Finally, the relationship between total expenditure and food insecurity was assessed. Total expenditure was used as a proxy for permanent income or overall economic resources, capturing income as well as other resources used for consumption, such as savings and assets. It also accounted for the possibility that income, an important determinant of a household's total consumption, may have changed by the time food insecurity status and receipt of government housing subsidy were measured, since income was reported for the year prior to the survey. Total expenditure

included all expenditures reported during the interview, except for the expenditures reported on the 2009 tax files (e.g., income tax, employment insurance premium).

Statistical analyses

The Pearson chi-square and Student's *t* tests were used to compare the characteristics of the food-secure and food-insecure households. Logistic regression was used to predict the odds of food insecurity. Bivariate models were run for each household characteristic, and multivariable models, including the household material circumstances with either after-tax income or after-rent income or total expenditure, were conducted.

To depict the relationship between household economic resources and the risk of food insecurity, predicted probabilities of food insecurity were graphed in relation to after-tax income, after-rent income and total expenditure, while fixing the other variables at their observed values. Given that the three graphs had similar slopes, only the graph with after-tax income is presented, as it is the most policy-relevant measure of household economic resources (other graphs available upon request).

The analyses did not include the sampling weights provided by Statistics Canada, because they were not calibrated to national estimates of households receiving government housing subsidies.¹⁹ By not using the sampling weights, the results are only applicable to this sample of households, and they are not generalizable to the population of recipients.

All analyses were performed with Stata 14.0 (StataCorp, College Station, TX). The significance level was set at $p < 0.05$.

RESULTS

The overall prevalence of household food insecurity was 50.8% (Figure 1). As shown in Table 1, the percentages of affirmative answers to the 10 items in the adult food security scale varied from 42.0% of households worrying that food would run out to 6.8% of households with adult(s) who did not eat for a whole day in three or more months over the past year because of a lack of money.

Table 2 presents the characteristics of the food-secure and food-insecure households. On average, food-insecure households were larger, with more adults and children, and had shorter length of

Table 1. Percentage of affirmative responses to the 10-item adult food security scale* ($n = 455$)

Worried food would run out	42.0%
Food didn't last, and no money to get more	37.0%
Couldn't afford to eat balanced meals	41.5%
Adult(s) cut or skipped meals (yes/no)	22.2%
Adult(s) cut or skipped meals in ≥ 3 months	19.8%
Respondent ate less than should	24.4%
Respondent was hungry but could not afford to eat	15.0%
Respondent lost weight	9.2%
Adult(s) did not eat for a whole day (yes/no)	7.3%
Adult(s) did not eat for a whole day in ≥ 3 months	6.8%

* Each item specifies that the experience was caused by a lack of money for food.

stay in subsidized housing than their food-secure counterparts. Food-insecure households were less likely to include a senior and more likely to receive social assistance. Presence of a household member with disability and average after-tax income, after-rent income and total expenditure did not differ by binary food insecurity status.

Results from the logistic regression models are shown in Table 3. In the multivariable models, the odds of food insecurity rose with the number of adults and the number of children in the household. The odds of food insecurity were approximately five times lower among households that included a senior compared to households without one. Receipt of social assistance was generally associated with higher odds of food insecurity, but this lost statistical significance in the model comprising total expenditure, a proxy for permanent income. Presence of a household member with disability increased the odds of food insecurity only when controlling for the other variables. Although food-insecure households appeared to have been in subsidized housing for a shorter period, length of stay was not associated with food insecurity in any of the multivariable regression models. After-tax income, after-rent income and total expenditure all had an independent inverse relationship with food insecurity in the fully adjusted models. As shown in Figure 2, the predicted probability of food insecurity fell from 62.3% (95% CI: 54.2–70.3) to 32.5% (95% CI: 21.2–43.8), representing a 48% decline, as after-tax income rose from \$5,000 to \$45,000 and all else was held constant.

DISCUSSION

This study documented alarming levels of food insecurity in a broad sample of households living in subsidized housing, with 1 in 2 households classified as food insecure, and nearly 1 in 4 and 1 in 5 households experiencing moderate and severe food insecurity respectively. The analyses also charted the financial vulnerability underlying household food insecurity among these social housing program recipients, with income emerging as a strong predictor of food insecurity.

Although the high rates of food insecurity found in this study reflect the selection of vulnerable populations into social housing programs,^{16,27} the pervasiveness of food insecurity revealed, nonetheless, extreme experiences of material hardship among recipients. Social housing programs were never designed to address household food insecurity; yet, the magnitude of the problem in this sample is an unpromising statement about the programs' ability to foster material well-being. Given that household food

Figure 1. Prevalence of household food insecurity ($n = 455$)

Table 2. Description of the sample by binary household food insecurity status*

Characteristic	All (<i>n</i> = 455) [†]	Food secure (<i>n</i> = 224) [†]	Food insecure (<i>n</i> = 231) [†]	<i>p</i> -value
Number of adults	1.3 ± 0.7	1.2 ± 0.5	1.4 ± 0.8	0.001
Number of children <18 years of age	0.6 ± 1.1	0.4 ± 0.8	0.9 ± 1.3	<0.001
Presence of senior ≥65 years of age (%)				<0.001
Yes	33.0	53.6	13.0	
No	67.0	46.4	87.0	
Any social assistance received (%)				<0.001
Yes	44.6	31.3	57.6	
No	55.4	68.8	42.4	
Member with disability (%)				0.152
Yes	35.0	31.7	38.1	
No	65.1	68.3	61.9	
Length of stay	6.8 years ± 6.8	7.4 years ± 6.8	6.1 years ± 6.8	0.042
After-tax income	\$20,940 ± \$12,280	\$21,330 ± \$11,968	\$20,550 ± \$12,589	0.498
After-rent income	\$16,060 ± \$11,947	\$15,840 ± \$11,956	\$16,280 ± \$11,960	0.696
Total expenditure	\$17,830 ± \$11,393	\$17,930 ± \$10,892	\$17,730 ± \$11,881	0.853

* Values are means ± standard deviation or column percentages.

[†] Column percentages may not add to 100% due to rounding.

insecurity and the severity of the experience are strongly related to poor health,^{2,3} the high levels of food insecurity documented here highlight the importance of additional interventions to tackle the issue among subsidized housing recipients.

Our analyses revealed that income was a strong and independent predictor of food insecurity. Although the inverse relationship between income and food insecurity is well documented in population-based studies,^{4–7} our finding significantly adds to current understanding by demonstrating that income predicts food insecurity even among highly vulnerable low-income households. The probability of food insecurity was halved from one end of the observed after-tax income distribution to the other. The probability of food insecurity remained fairly high at the upper end of the income distribution, likely because of the prioritization of vulnerable households into social housing programs. The critical role of household economic resources in reducing risk of food insecurity was further demonstrated by the independent effects of after-rent income and total expenditure on food insecurity. While a housing subsidy could be viewed as a form of income supplement, our findings suggest that additional policy interventions aimed at raising income are needed to address food insecurity among the low-income households living in subsidized housing. Empirical evidence indicates that the risk of food insecurity among

low-income households may be drastically reduced by restructuring income assistance programs to reduce the financial vulnerability of recipients¹¹ and by implementing a guaranteed annual income to create an income floor.⁹ Public health associations have been actively advocating for provincial and federal governments to implement effective income-based interventions, such as a universally accessible guaranteed annual income, to reduce household food insecurity²⁸ and poverty in Canada.^{29,30} Our findings on the relationship between income and food insecurity among vulnerable low-income households will strengthen these advocacy efforts.

The results of our multivariable analyses suggest that the financial resources necessary to achieve household food security are influenced by the composition of the household. The presence of a household member with a disability predicted food insecurity independent of income, suggesting these households require greater economic resources to meet basic standards of living.²³ Similarly, the independent relationships between number of adults or children in the household and food insecurity possibly captured the financial pressures exerted by additional members. The heightened vulnerability of households with more children in this study is worrisome considering the lasting health consequences of experiencing severe levels of food insecurity during childhood.³

Table 3. Odds ratios for household food insecurity, in relation to material circumstances (*n* = 455)

Variable	Crude OR (95% CI)	Adjusted OR (95% CI) [†]		
		After-tax income	After-rent income	Total expenditure
Number of adults	1.63 (1.19–2.23)**	2.01 (1.17–3.46)*	1.79 (1.05–3.05)*	1.92 (1.23–2.99)**
Number of children <18 years of age	1.62 (1.34–1.97)***	1.62 (1.26–2.09)***	1.53 (1.19–1.95)**	1.54 (1.21–1.97)***
Presence of senior ≥65 years of age (yes vs. no)	0.13 (0.08–0.21)***	0.22 (0.13–0.38)***	0.21 (0.12–0.35)***	0.19 (0.11–0.33)***
Any social assistance received (yes vs. no)	2.99 (2.03–4.39)***	1.60 (1.01–2.54)*	1.73 (1.11–2.72)*	1.53 (0.98–2.40)
Member with disability (yes vs. no)	1.33 (0.90–1.95)	1.85 (1.17–2.91)**	1.89 (1.20–2.98)**	1.87 (1.18–2.95)**
Length of stay [‡]	0.97 (0.94–1.00)	1.00 (0.97–1.04)	1.00 (0.97–1.04)	0.99 (0.96–1.03)
After-tax income [‡]	0.99 (0.98–1.01)	0.96 (0.93–0.99)**	–	–
After-rent income [‡]	1.00 (0.99–1.02)	–	0.97 (0.94–1.00)*	–
Total expenditure [‡]	1.00 (0.98–1.01)	–	–	0.96 (0.93–0.99)**

Note: OR = odds ratio; CI = confidence interval.

* *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001.[†] Logistic regression models adjusted for the variables in the column.[‡] Odds ratios reported for a 1-year increment in length of stay and a \$1000 increment in after-tax income, after-rent income and total expenditure.

Figure 2. Predicted probability of household food insecurity in relation to after-tax income

Note: Predicted probabilities calculated from multivariable logistic regression with the other variables fixed at the observed values. Range of after-tax income based on the 5th and 95th percentile values rounded to nearest \$5000.

Several studies have documented an increased risk of food insecurity among social assistance recipients, independent of their income.^{4–7} One interpretation for this independent association is that social assistance recipients have minimal savings and assets to draw upon in time of financial constraint,^{24,25} because of the eligibility requirements of welfare programs.²⁶ Our results appear to support this interpretation. Specifically, receipt of social assistance lost statistical significance when accounting for total expenditure, which compared to income may better capture the difference between the overall economic resources of households that received social assistance and those that did not.

Consistent with previous studies,^{6,7} households with a senior were found to have lower risk of food insecurity independent of income. This may partly be related to having retirement savings, which are not included in the asset limit to determine eligibility for social housing programs in certain jurisdictions.¹² However, presence of a senior in the household remained significant when accounting for total expenditure, suggesting that this reduced vulnerability was not only related to greater assets. Other factors that may explain this independent association are seniors' entitlement to an inflation-adjusted guaranteed annual income, creating an income floor and decreasing the risk of income shocks,^{9,24} and access to public and private sector discounts for seniors (e.g., public transportation, retail savings), lowering the cost of living.

We found no evidence that longer stay in subsidized housing, an indicator of stable access to more affordable housing, was related to food insecurity status. One potential explanation is that for many households, longer stay in subsidized housing reflected a persistent experience of poverty. It is also possible that the greatest effect of subsidized housing on the risk of food insecurity occurs when households gain access to such housing, but once households live in subsidized housing, length of stay does not influence food

insecurity status. We were unable to test this hypothesis because few households in the sample had moved into their dwelling during the last year.

One important limitation of this study is the inability to identify the type of social housing program received by households. Certain social housing programs may be more effective than others at mitigating household food insecurity. It is also possible that services accessed through social housing programs may reduce vulnerability to food insecurity. We tried to account for some of the unobserved heterogeneity in the programs by including after-rent income in the analyses, but this would only have accounted for monetary differences in the subsidy. The high prevalence of food insecurity found in this sample is consistent with previous studies that comprised households living in public housing,^{16,17} but to our knowledge there is no examination of food insecurity status among households benefiting from other types of social housing program in Canada. Future research should evaluate different types of social housing program in relation to household food insecurity to better inform programs' development.

CONCLUSION

The high prevalence of food insecurity documented in this study is concerning. Given the centrality of financial circumstances on the risk of food insecurity in this sample, income-based interventions appear to be needed to address the problem among the low-income households targeted by social housing programs. The development of Canada's first national housing strategy represents a unique opportunity to better integrate housing and income-based policies to support household food security among government-subsidized renter households.

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RÉSUMÉ

OBJECTIFS : Déterminer la prévalence et la gravité de l'insécurité alimentaire des ménages et examiner les conditions matérielles des ménages liées à l'insécurité alimentaire au sein d'un échantillon de ménages locataires vivant dans des logements subventionnés par l'État.

MÉTHODE : Nous avons utilisé les données transversales de l'Enquête sur les dépenses des ménages de 2010 pour déterminer le statut d'insécurité alimentaire de 455 ménages locataires vivant dans les 10 provinces et touchant une subvention gouvernementale pour le logement. À l'aide de régressions logistiques multivariées, nous avons examiné les liens entre les caractéristiques des ménages décrivant les conditions matérielles et l'insécurité alimentaire.

RÉSULTATS : Un ménage sur deux était aux prises avec l'insécurité alimentaire. L'insécurité alimentaire marginale, modérée et grave touchait respectivement 9 %, 23,3 % et 18,5 % des ménages. Les ressources économiques des ménages, saisies à l'aide du revenu net d'impôt, du revenu après le loyer ou des dépenses totales, affichaient une corrélation inverse indépendante avec l'insécurité alimentaire. Parmi les autres caractéristiques examinées, le nombre d'adultes ou d'enfants dans le ménage, la présence d'un membre ayant une invalidité et le fait de toucher des prestations d'aide sociale augmentaient la probabilité d'insécurité alimentaire, mais le fait de toucher des prestations d'aide sociale perdait sa signification statistique après l'ajustement pour tenir compte des effets des dépenses totales. La présence d'une personne âgée dans le ménage était indépendamment corrélée à une probabilité d'insécurité alimentaire plus faible.

CONCLUSION : Nos constatations indiquent qu'il faut améliorer l'efficacité des interventions fondées sur le revenu pour aborder l'insécurité alimentaire dans les ménages à faible revenu touchant des subventions gouvernementales pour le logement. Une meilleure intégration des politiques de logement et des politiques fondées sur le revenu est nécessaire pour favoriser la sécurité alimentaire des ménages locataires dont le logement est subventionné par l'État.

MOTS CLÉS : insécurité alimentaire; locataires; subventions au logement; Canada