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Food insecurity and mental illness: disproportionate impacts in the context of perceived stress and social isolation

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ABSTRACT

Objectives: Food insecurity is associated with elevated risk of mental illness. This risk may be further compounded by stressful life events and by social isolation. This study investigated whether the risk of mental illness is higher among individuals experiencing food insecurity along with greater stress and social isolation.

Study design: Cross-sectional self-report survey data from the 2009-10 Canadian Community Health Survey ($N = 100{,}401$).

Methods: We estimated prevalence differences of the risk of self-reported mental illness associated with food insecurity alone and in combination with stressful life events and social isolation. Sensitivity analyses were conducted on a sub-sample who completed a structured diagnostic interview.

Results: Overall, the prevalence of mental illness was 18.4% [95% CI 16.7–20.1] higher for women and 13.5% higher [95% CI 11.9, 15.2] for men in severely food insecure households compared to those reporting food security. The increased risk of mental illness associated with food insecurity was more pronounced among females and those reporting higher stress and social isolation.

Conclusions: Individuals reporting food insecurity are at increased risk of mental illness. This increased risk is further exacerbated in high stress and socially isolated environments. Policies, clinical and public health interventions must address broader constellations of risks that exist when food insecurity is present.

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Introduction

Food security 'exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.'[1] Deviations from this ideal state – or food insecurity – range from worries about access to food, to a decrease in the quality and/or quantity of food consumed.[2] Higher rates of mental illness have been observed among individuals reporting food insecurity.[3–5] The conditions under which food insecurity and mental illness co-occur have not been extensively studied. Two variables that have been suggested as important factors to consider are the roles of stress and social isolation.

Ross and Hill[6] describe food insecurity as a component of economic hardship, which is a chronic stressor. Thus food insecurity may increase risk through the association between stress and mental health.[7,8] However, a number of factors may influence how strongly individuals perceive stress, and prior stressful or adverse life events can increase both the perception of stress and vulnerability to experiencing poor mental health outcomes.[9] Thus, individuals living in food insecure households, who perceive greater levels of stress in their daily lives may be more vulnerable to experience co-occurring mental health needs.Stress may also help understand previous findings of a stronger association between food insecurity and poor health among women than among men.[10,11] Others have argued that women experience food insecurity differently than men. For example, women are more likely to be single parents, and in the context of dual parent households, they often assume primary responsibility of managing meals and thus take efforts to protect family members from food insecurity.[12,13]

A second explanation that has been provided by individuals who report food insecurity is that social isolation contributes to poor mental health. Respondents in a prior qualitative study indicated that they limited participation in social activities and in their communities.[14] In some cases, respondents reported feelings of guilt and worry about relying on others as contributing to feeling socially different and isolated. While they are the most common responses to address food insecurity, the majority of individuals reporting food insecurity in Canada do not access food banks and other community food programs.[15,16] Therefore, informal resources within the local community may play an important role in the ability of individuals reporting food insecurity to cope with their circumstances. The extent to which individuals feel connected to (or withdraw from) their local communities may therefore be an important factor in explaining the association between food insecurity and mental illness. It is also possible that stress and community belonging may interact. For example, community belonging may promote resilience to stressful life events such as food insecurity and reduce the risk of mental illness.[17]

The current study sought to understand the co-occurrence of food insecurity and mental illness by investigating this association across varying levels of stress and community belonging. We hypothesized that the association between food insecurity and mental illness would be strongest amongst those reporting high stress and weak community belonging.

Methods

This study involved secondary analysis data from the 2009–2010 cycle of the *Canadian Community Health Survey* (CCHS).[18] The CCHS is a cross-sectional, nationally representative survey of the Canadian population aged 12 years or older. The survey uses a three-stage sampling procedure, beginning with random selection of neighbourhoods, then households within these neighbourhoods, and finally a single respondent per household. The overall response rate (accounting for household and individual refusals) for the survey was 71.5%.[18] After we excluded respondents under the age of 18, or who were missing information regarding food insecurity, mental illness, stress and community belonging, the final sample size was 100,401 participants (see Fig. 1).

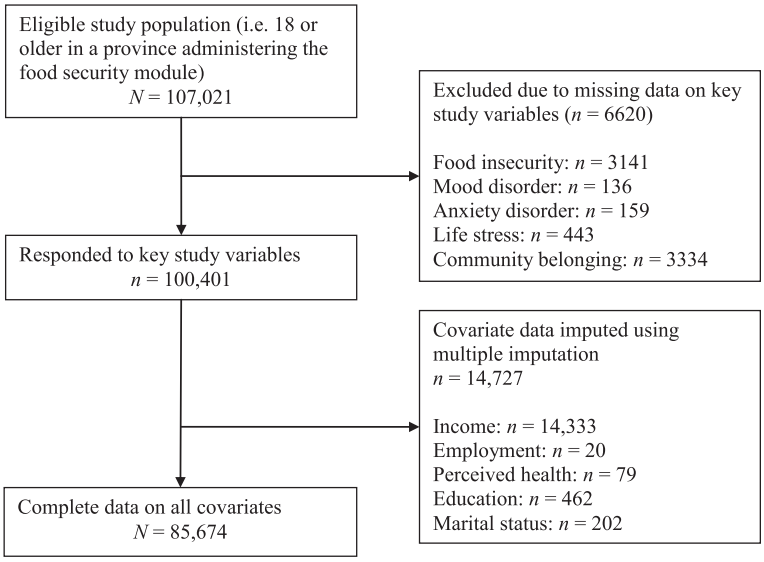

Fig. 1 – Response rates and missing data flow chart from 2009 to 10 Canadian Community Health Survey.

Food security was rated using a standardized ten-item module. Respondents were classified as residing in a food secure household if no more than one of the items regarding the food experiences of all adults in the household was endorsed (e.g. worrying about running out of food, skipping meals, etc.). Respondents' households were classified as moderately food insecure if between two and five items were reported, and severely food insecure if 6–10 items were reported. This standardized measure has been used to measure food insecurity in the United States since 1994, and has been used in occasional Canadian surveys.[19,20] Nord and Hopwood (2008)[21] reported that psychometric analyses using the Rasch method confirmed that the instrument measured the same construct in both countries. However, women may be first to experience food insecurity, may be more sensitive to food insecurity, and/or may report higher levels of food insecurity than do males in the same household.[22] To allow for the possibility that associations may differ between the sexes (either due to true differences or as the result of misclassification), separate models were fit for men and women.

The outcome variable was a self-reported mood or anxiety disorder. Following the instruction 'we are interested in long-term conditions which are expected to last or have already lasted 6 months or more and that have been diagnosed by a health professional', participants were asked if they have 'a mood disorder such as depression, bipolar disorder, mania, or dysthymia' or 'an anxiety disorder such as a phobia, obsessive-compulsive disorder, or a panic disorder?'. A subset of participants ($n = 47{,}942$) completed the short form depression module from the Composite International Diagnostic Interview, to obtain past 12 month diagnoses of major depression. To maintain statistical power, the primary outcome is self-report diagnosis.

Stress and community belonging were measured using single item Likert questions. Participants were asked: 'Thinking about the amount of stress in your life, would you say that most days are: (not at all stressful, not very stressful, a bit stressful, quite a bit stressful or very stressful)'. Community belonging was measured with the question: 'How would you describe your sense of belonging to your local community? Would you say it is: (very strong, somewhat strong, somewhat weak, or very weak)?'.

To test the hypothesis that the association between food insecurity and mental disorder is heightened in the context of higher perceived stress and lower community belonging, the study evaluated effect measure modification. Risk differences were estimated using linear regression models for the risk of mental disorders as a function of food insecurity, stress, community belonging and their two and three way interactions on an additive scale. Interaction on an additive scale is of greatest interest when exploring public health interactions.[23] Significant interactions were explored by estimating risk differences for moderate and severe food insecurity (compared to food secure) at each level of the effect modifier. To facilitate presentation and interpretation of the results, levels of stress and community belonging were reduced to the fewest number of meaningful categories that did not substantively alter the pattern of results.[23] Individuals who reported that most days are 'quite a bit' to 'very' stressful were coded as high stress, those reporting 'somewhat' were coded as moderate stress, and those reporting 'not at all' or 'a bit' were coded as low stress. Those reporting 'very strong' community belonging were coded as high, 'somewhat strong' and 'somewhat weak' were coded as moderate and 'very weak' was coded as weak community belonging.

Analyses were conducted with SAS 9.4. We used proc mi and mianalyze (with five imputed datasets) to handle missing data on covariates. Population weights and the average design effect calculated by Statistics Canada were used to account for the complex survey design.

Table 1 – Weighted prevalence of risk factors and mental illness (MI).

	Food secure		Moderate FI[a]		Severe FI	
	%	% With MI	%	% With MI	%	% With MI
Full sample	93.4	8.3	4.4	21.9	2.2	33.4
Male	49.5	6.2	44.0	15.9	43.2	27.1
Female	50.5	10.5	56.1	26.5	56.8	38.2
Age						
18–29	20.5	7.2	30.6	17.5	26.5	21.7
30–44	26.4	8.4	32.8	22.3	32.7	37.3
45–59	29.1	9.7	24.2	26.5	32.9	40.0
60–74	17.2	8.1	10.3	24.8	7.3	30.6
75+	6.8	5.9	2.1	10.0	0.6	7.2
Marital status						
Single/Separated	34.3	10.0	53.1	23.4	70.0	36.3
Married/Common-Law	65.5	7.5	46.9	20.1	29.6	26.5
Completed high school						
No	13.1	9.4	22.6	25.9	24.9	35.0
Yes	86.5	8.2	76.9	20.4	74.6	33.0
Household income						
<$20,000	5.4	13.4	25.8	29.7	41.9	43.2
$20,000–$39,999	13.4	10.0	28.9	21.8	27.9	32.7
$40,000–$59,999	14.8	8.8	15.9	18.9	11.0	26.0
$60,000–$79,999	14.4	8.0	8.8	16.7	6.7	13.8
≥$80,000	36.7	7.5	8.6	17.1	3.9	16.2
Unknown	15.3	7.0	12.0	16.3	8.6	20.5
Employed in last 12 months						
No	25.7	10.2	33.5	28.5	39.5	45.2
Yes	74.2	7.7	66.5	18.5	60.4	25.7
Physical health						
Poor	2.0	27.2	6.1	48.1	12.2	60.1
Fair	8.0	19.1	14.1	37.1	21.3	55.6
Good	27.9	10.8	35.5	23.5	32.9	29.2
Very Good	38.5	6.5	30.3	14.4	21.0	18.0
Excellent	23.5	3.0	14.0	7.2	12.7	7.0
Stress						
Not at all	11.9	3.7	7.0	7.3	5.2	10.5
Not very	23.2	4.8	14.3	9.7	12.3	20.3
A bit	42.3	8.0	44.3	21.4	33.5	25.5
Quite a bit	19.4	14.0	28.1	28.4	32.6	41.5
Very	3.2	21.2	6.4	39.9	16.5	50.4
Community belonging						
Very strong	16.9	6.8	13.0	15.0	12.1	26.8
Somewhat strong	47.8	7.6	43.6	20.0	35.3	27.1
Somewhat weak	26.5	9.0	29.5	21.1	29.9	35.4
Very weak	8.8	13.2	13.9	35.9	22.8	43.9

Note. Percentages may not add to 100% due to rounding and the exclusion of respondents with missing data.
[a] FI = food insecurity.

Table 2 – Prevalence (%) of mental illness (MI), and adjusted* risk differences (%) for food insecurity and mental illness.

	Men					Women				
	Prevalence of MI			Prevalence difference vs FS		Prevalence of MI			Prevalence difference vs FS	
	FS[a]	Mod FI[b]	Sev FI[c]	Mod FI	Sev FI	FS	Mod FI	Sev FI	Mod FI	Sev FI
Overall	6.1	15.9	27.1	**5.6 [4.4, 6.8]**	**13.5 [11.9, 15.2]**	10.5	26.5	38.2	**10.8 [9.5, 12.0]**	**18.4 [16.7, 20.1]**
Stress										
Low	3.2	7.2	14.8	1.0 [-1.3, 3.4]	**8.4 [5.0, 11.8]**	5.7	10.7	20.8	2.7 [-0.1, 5.4]	**11.4 [6.9, 15.9]**
Moderate	6.1	16.3	23.8	**7.4 [5.6, 9.1]**	**12.2 [9.4, 15.0]**	9.9	25.5	26.8	**12.2 [10.4, 14.1]**	**13.2 [10.3, 16.1]**
High	11.3	22.4	57.1	**6.7 [4.5, 8.8]**	**17.6 [15.0, 20.2]**	18.2	35.6	49.3	**13.5 [11.4, 15.5]**	**23.8 [21.5, 26.1]**
Community belonging										
Strong	5.1	6.3	17.1	−0.7 [-4.0, 2.5]	**5.3 [0.4, 10.1]**	8.4	21.4	33.4	**8.4 [5.1, 11.7]**	**18.0 [13.4, 22.7]**
Moderate	5.9	10.4	26.5	**4.6 [3.2, 6.0]**	**14.5 [12.4. 16.6]**	10.3	25.0	34.2	**9.8 [8.4, 11.2]**	**16.4 [14.3. 18.5]**
Weak	10.6	31.0	33.2	**15.9 [12.8, 18.9]**	**15.6 [12.2, 19.0]**	15.6	40.4	53.3	**19.1 [15.8, 22.5]**	**25.6 [21.9, 29.3]**

*Analyses were adjusted for age, marital status, children in house, household income, education, unemployment and self-perceived physical health. Analyses for effects of food insecurity across strata of stress are adjusted for community belonging and vice versa. Bolded prevalence differences for severe food insecurity indicate significantly higher prevalence differences for severe food insecurity (compared to food secure individuals) than for moderate food insecurity (compared to food secure individuals) at $P < 0.05$.

[a] FS = food secure.

[b] Mod FI = moderate food insecurity.

[c] Sev FI = severe food insecurity.

Results

As seen in Table 1, 4.4% of respondents reported moderate food insecurity, and 2.2% reported severe food insecurity. Respondents reporting food insecurity also reported higher rates of stress and weaker community belonging. In general, respondents reporting severe food insecurity had higher rates of these risk factors than those reporting moderate food insecurity. For example, 16.5% of the severely food insecure group reported the highest level of stress, compared to 6.4% of the moderately food insecure group and 3.2% of the food secure group. Mental illness was more prevalent among respondents reporting food insecurity. As seen in Table 2, the adjusted prevalence difference for severe food insecurity was 18.4% [95% CI 16.7–20.1] for women and 13.5% [95% CI 11.9, 15.2] for men. In other words, the prevalence of mental illness was 18.4% higher among women and 13.5% higher among men reporting severe food insecurity compared to those who reported living in a food secure household. The prevalence difference for moderate food insecurity was 10.8% [95% CI 9.5–12.0] among women and 5.6% [95% CI 4.4, 6.8] among men.

Positive interactions between food insecurity and stress and food insecurity and community belonging were all significant at $P < 0.001$, except for the interaction between food insecurity and community belonging for women ($P = 0.107$). The three-way interaction between food insecurity, stress and community belonging was not statistically significant for men ($P = 0.349$) or women ($P = 0.974$). As seen in Table 2, the prevalence differences for moderate and severe food insecurity as compared to food secure respondents increased as levels of stress increased and as levels of community belonging decreased. Among women the adjusted prevalence differences for severe food insecurity at low, moderate and high levels of stress were 11.4%, 13.2% and 23.8%. The prevalence differences for severely food insecure women reporting strong, moderate and weak community belonging were 18.0%, 16.4% and 25.6%. Similar patterns were observed for men with prevalence differences of 8.4%, 12.2% and 17.6% for increasing levels of stress and 5.3%, 14.5% and 15.6% for decreasing levels of community belonging. Prevalence differences were generally smaller for moderate food insecurity as compared to for severe food insecurity. Furthermore, for men reporting low stress or strong community belonging moderate food insecurity was not associated with mental illness.

Results based on past 12 month diagnoses of major depressive episodes showed a similar pattern, and are reported in the online supplement (see Table S1).

Discussion

We analysed data from a large, representative Canadian population based sample, using standardized measures of food insecurity, and structured interview questions regarding stress and community belonging. As expected, mental illness was more prevalent among those reporting food insecurity across strata of many important covariates.[3–5] However, larger prevalence differences among those reporting higher stress and weaker community belonging, suggest that individuals reporting food insecurity who present with additional risk factors may be more vulnerable. Therefore, while risk of mental illness is consistently higher among individuals reporting food insecurity, this risk is even greater when additional social and contextual factors are present.

While our study highlights the individual and contextual risk factors that may further our understanding of food insecurity and mental illness, its' limitations should be considered. Measurement error regarding exposures and outcomes is possible due to the fact that all data were self-reported. Furthermore, single items limited the extent to which we could explore the observed relationships. For example, we could not explore sources and types of stress and belonging or protective/resiliency factors present among those individuals

who maintain lower stress and higher belonging despite experiencing food insecurity. While food insecurity would seem to be stressful, over half of the respondents reporting food insecurity reported low stress. Similarly, differences in levels of community belonging among individuals experiencing food insecurity cannot be explained. From the single item used in the current study it is unclear to what extent community belonging reflects factors such as stigma towards people with mental illness and/or who experience food insecurity, a lack of available community resources or barriers to accessing available resources.[14]

Second, consistent with prior findings that men and women experience or report food insecurity differently,[10,12,22] the association between food insecurity and mental illness was seen at lower levels of stress and stronger levels of community belonging for women, but not men. However, given the potential for under-reporting of food insecurity by males,[22] there is a need to disentangle the extent to which these differences are real, or the result of measurement errors. For example, if men under-report food insecurity, then we might expect a greater increase in the prevalence of mental illness among men than among women within each strata since men would in fact be living a household that has an even higher level of food insecurity than they report. Alternatively, under-reporting by males would weaken the association if men with mental illness under-reported their food insecurity, thus inflating the prevalence of mental illness among men in food secure households. While the latter explanation appears more likely in the data at hand given the smaller associations between food insecurity among men than among women, further exploration of these sex differences is needed.

Finally, more complex models, such as tests of direct and indirect effects, potential reverse causality[24] or fluctuations in levels of food insecurity, stress and community belonging over the 12 month timeframe of the survey items were not considered. Recent suggestions that illness may cause food insecurity[24] are consistent with literature on social determinants of health more broadly. As the literature on potential bi-directional associations between food insecurity and mental illness is less developed, given that food insecurity is a component of economic hardship.[6] Bi-directional associations between poverty and mental health have been explained as social drift (i.e. poor health causes poverty) and as social causation (i.e. poverty causes poor health).[25] We extend these theories and offer hypotheses relating food insecurity and mental illness that would reflect social drift and social causation. In both cases, we focus on the key implication of our study that there is a need to explore the effectiveness of current policies and interventions for those who are most vulnerable and ensure that resources are prioritized for those in greatest need.

A social causation interpretation of our results would suggest the need for policies and services that increase access to food and reduce impacts of food insecurity on mental health. This is consistent with results of prior qualitative studies that food insecurity can lead to poor mental health as a result of stigma, social isolation, and stress and worry about providing for family.[14] Researchers, policy makers and service providers should consider whether findings that the majority of individuals experiencing food insecurity do not access community food programs[15] reflect a mismatch between current strategies to address food insecurity and the needs of those at greatest risk of poor health outcomes (i.e. who experience the highest stress and weakest community belonging). One potential explanation for the stronger association between food insecurity and mental illness among those with higher levels of social isolation and stress is that these additional contextual risks may reflect, at least in part, a lack of access to services and programs that seek to mitigate the impacts of food insecurity and to informal supports that may promote resiliency.

A social drift interpretation of the results would identify a need for policies and interventions for individuals with mental illness that reduce the risk of food insecurity. These might include for example, greater supports for individuals with mental illness to maintain (or resume) employment and adequate income supplements for those who do not have sufficient financial resources to maintain adequate nutrition. Given that the greatest risk of co-occurring food insecurity and mental illness appears to be among those who also experience weak community belonging and high levels of stress, efforts may also be needed to increase connections with community members and agencies. One area to explore further in this regard might be to address low levels of access to health care among marginalized populations.[26] This may require efforts to address persisting stigma towards individuals with mental illness[27] in order to increase the willingness of individuals with mental illness to seek out health and social services that may improve their prognosis.

Our findings highlight the need for policy and clinical and public health interventions that are responsive to the multiple risks faced by many individuals who experience food insecurity and mental illness. Identifying sub-groups of individuals and contextual factors that exacerbate the link between food insecurity and mental health can inform policy and clinical decision making to improve access to food and good mental health among highly marginalized segments of the population.

Author statements

Ethical approval

Not required as the study involved secondary analysis of a public use data file with no identifying information. All participants in the original study provided informed consent as per Statistics Canada documentation regarding participation rates referenced in the manuscript.

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Competing interests

None declared.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.puhe.2015.11.014.