Food Insecurity and Hunger Are Prevalent among HIV-Positive Individuals in British Columbia, Canada

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ABSTRACT Hunger and food insecurity are important factors that may affect an individual’s nutritional state and should therefore be assessed in nutrition surveillance activities. The objective of this study was to determine the level of food insecurity and hunger among HIV-positive persons accessing antiretroviral therapy in British Columbia. A cross-sectional study was performed in the BC HIV/AIDS drug treatment program, a province-wide source of free-of-charge antiretroviral medications. In 1998–1999, participants completed a questionnaire focusing on personal information, health, and clinical status. Food and hunger issues were evaluated with the Radimer/Cornell questionnaire. Overall, 1213 responding men and women were classified as food secure (52%), food insecure without hunger (27%), or food insecure with hunger (21%). In both categories of food insecurity, individuals were significantly more likely to be women, aboriginals, living with children, and to have less education, a history of recreational injection drug and/or alcohol abuse, and an unstable housing situation (P < 0.05). In logistic multivariate modeling, income ≤ Can$10,000 [adjusted odds ratio (AOR) 3.78, 95% CI (2.53–5.65)], shared household with children [AOR 3.68, 95% CI (1.98–6.84)] and unemployment [AOR 3.15, 95% CI (1.94–5.13)] were the strongest predictors of hunger. In HIV-positive individuals, the occurrence of food insecurity was nearly 5 times higher than in the general Canadian population. The results should stimulate further research to identify to what extent hunger-associated factors are reversible with interventions built on nutritional and/or social strategies.


KEY WORDS: • food insecurity • hunger • human immunodeficiency virus • body mass index • antiretroviral therapy

Wasting has long been established as a strong predictor of mortality in HIV-infected patients (1–4). Data from the Tufts Nutrition for Healthy Living study suggested that the occurrence of HIV wasting syndrome increased during the 1990s (5). The prevalence of 5% weight loss from a previous visit was shown to be 35% greater in the more recent years of highly active antiretroviral therapy (HAART)3 from 1998 to 2003, than in the earlier years of HAART from 1995 to 1997 (5). Weight loss and wasting therefore remain important problems for adults and children with HIV, even in the modern era of potent antiretroviral therapy (6).

Clinically, HIV-related malnutrition develops as a result of either starvation or cachexia (7). Both states lead to a depletion of active body cell mass as well as fat cells, decreasing CD4 counts, and increasing viral load as a result (8). HIV infection increases the consumption of energy and protein, most likely via proinflammatory cytokines (9,10). Elevated expression of cytokines such as tumor necrosis factor-α and interleukin-1 leads to a slightly elevated resting energy expenditure, which still triggers slow and chronic weight loss in people with HIV (10). HIV-positive individuals therefore have a higher demand for dietary quality in terms of energy, protein quality, and individual nutrients (11). The likelihood that HIV-positive individuals can control the quality and amount of food they consume is dependent on their sources of food and whether they are exposed to hunger.

Assessments of determining factors of food insecurity and hunger are important in defining strategies to allow the early identification of people at risk. With this study, we explored possible associations between demographic and clinical variables with food insecurity and hunger within a well-characterized cohort of HIV-infected adults receiving antiretroviral therapy. It was hypothesized that risk factors for food insecurity in the general Canadian population such as female gender, low income, low education, and aboriginal ethnicity also would have predictive power in an HIV-positive population. Moreover, it was assumed that the prevalence of food insecurity...
rity among HIV-positive would be higher than in the general population because the prevalence of some of the known risk factors for food insecurity is greater among HIV-positive people compared with the general population.

SUBJECTS AND METHODS

Ethical approval for this study was applied from and granted by the research Ethics Board at St. Paul’s Hospital. This study was conducted within an environment in which the treatment, laboratory monitoring, and medical care are fully covered by the provincial health care system. The BC Drug Treatment Program provides antiretroviral therapy (ART) free of charge to eligible HIV-infected residents of BC. Currently, this is the only source of free HIV medications for patients in the province of British Columbia. Individuals are entered into the program automatically the first time they are prescribed ART. At baseline, a complete history of ART use, current CD4 counts, and plasma viral loads are recorded. Follow-up visits take place every 1–3 mo to renew prescriptions and monitor HIV progression through laboratory tests.

The present study was based on individuals who participated in a survey during 1998–1999 by responding to a self-administered questionnaire. The survey was sent out to the treating physician of the patient, who in turn provided the patient with the questionnaire. Written instructions of how to fill in the questionnaire were provided with the survey. After completing the questions, the participant was asked to return the survey to the BC Center for Excellence of HIV/AIDS in a prestamped envelope, which was provided with the survey.

The survey contained 64 questions about personal information, lifestyle, health and clinical status, as well as food and hunger issues. Ten questions addressed food insecurity and hunger. The questions were selected from the original 13 questions of the validated Radimer/Cornell questionnaire (12). Three questions of the original questionnaire were excluded due to space restrictions in the questionnaire.

Food insecurity is defined as the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways (13). Hunger is the most extreme consequence of food insecurity (14,15). The original 13 questions covered 2 conceptualizations of hunger, 1 narrow and 1 broad. The first addressed the direct effects, such as insufficient food intake and going without food, including the physical sensation of hunger pangs. The broader concept encompassed problems with household food supply, quality of diet, feelings about the situation, and what effort was made to maintain household food supplies (12). The chosen questions dealt with psychological, quantitative, and qualitative components of food insecurity at a household and individual level because food insecurity is experienced differently at the household level compared with the level of the individual adult or child. The social component was not dealt with here, nor were the qualitative aspects of the children’s situation. The focus was kept on food insecurity at the individual level because this is the most likely situation that would lead to malnutrition in a short-term scenario and therefore might affect the clinical outcome. All questions from the original questionnaire were used except questions addressing qualitative aspects of the children’s situation as well as one question addressing the individual’s food anxiety level. People were categorized as food insecure if they gave a minimum of 1 positive answer (often/sometimes/yes) to any of 8 statements about problems with household food supply, quality of diet, feelings about the situation, and what effort was made to maintain household food supplies (12). The method of classification was described by Kendall et al. (12). Subjects were categorized as food insecure with hunger if they answered often or sometimes to a minimum of 1 statement in each of 2 subsets about insufficient food intake and going without food, including the physical sensation of hunger pangs.

Other variables included in the survey included sociodemographic characteristics such as age, gender, ethnicity, income, housing status, employment, and education; clinical variables included AIDS diagnosis, CD4, plasma viral load, and ART experience. The use of recreational injection drugs and source of HIV transmission was also assessed. For the purpose of this analysis, unstable housing was defined as living in a hotel, boarding house, group home, jail, in the street, or having no fixed address.

Data are presented within categories as frequencies [n (%)] or as median and interquartile range (IQR). Categorical variables were compared between groups using Pearson’s χ² test. Contingency tables that contained ≤1 expected counts of <5 were analyzed by Fisher’s exact test. Comparisons of continuous variables were carried out using Wilcoxon’s rank-sum test. Forward stepwise logistic regression was used to calculate unadjusted and adjusted odd ratios (AOR) to identify independent factors associated with individual hunger. Variables that were significantly different in the univariate analysis were made available for entry into the stepwise model. All reported P-values were two-sided with a level of 0.05 chosen for significance.

RESULTS

In total, 1213 subjects (1116 men and 97 women) filled in and submitted their surveys. The overall response rate was 31%. Compared with nonresponders (n = 2655), responders were more likely to be male (92.1 vs. 82.2%, P < 0.001), have been diagnosed with AIDS (5.1 vs. 2.3%, P < 0.001), be older [40 (35–46) vs. 37 (33–44) y, P < 0.001], have higher CD4 counts [350 (210–510) vs. 330 (180–500) cells/mm³, P = 0.016], have lower viral load [475 (400–17000) vs. 10000 (400–89000) copies/L, P < 0.001], and have longer duration of ART [22 (7–41) vs. 8 (0–22) mo, P < 0.001].

Of the responding group, 52% (n = 629) were categorized as food secure, whereas 27% were food insecure without hunger and 21% (n = 332) were food insecure with hunger (Table 1). In total, 48% (n = 584) reported being food insecure when no consideration was made for status of hunger.

When comparing all categories, there were significant trends for an increased risk of food insecurity by being female, having slightly younger age, aboriginal, ever having used recreational injection drugs, ever having been in an alcohol or drug treatment program, having lower high school education, living alone or with children, and having an income of ≤Can$10,000/y. Of the responding women, 33% were in the hunger category compared with 20% of all men (P = 0.003). Age was also significantly different with slightly younger age 38 y (34–44 y) in the hunger category, 41 y (36–47 y) in the food insecure without hunger category compared with the 42 y (36–48 y) of the food-secure category (P < 0.001). Non-Caucasian ethnicity was more common among food insecure and hungry individuals than in food secure. In the hunger category, 33% had aboriginal or another non-Caucasian ethnicity compared with 14% of the food-secure category (P < 0.001). Of individuals who reported experience of recreational injection drugs, 44% were found in hunger category vs. 23% in the food-secure category (P < 0.001).

Alcohol abuse, as indicated by having participated in an alcohol or drug treatment program, was more common with an increasing degree of food insecurity. Of individuals reporting hunger, 31.4% had been in a treatment program compared with 19.1% of the individuals reporting food insecurity without hunger and 9.9% of those reporting food security (P < 0.001). A lower level of education was more common in the hunger category, with a majority reporting (56.8%) having less than a high school education. Of the food secure without hunger, 45.8% reported a lower level of education compared with 32.3% of the food secure (P < 0.05).

Unstable housing was more common among food-insecure individuals with 14.0% of hunger-reporting individuals and 5.3% of individuals in the food insecure without hunger category compared with 2.1% of the food-secure individuals (P < 0.001). Housing arrangements, i.e., living alone or with others, seemed to have less importance and did not differ...
among the 3 groups (P = 0.582). In contrast, a higher frequency of children in the household was found in the food-insecure category with hunger (13.5%), with slightly fewer among food secure without hunger (5.1%) and food secure (5.6%, P < 0.001).

A low annual income was more common in hunger-reporting individuals with a majority (66.5%) of people having ≤Can$10,000 annually compared with 38.9% of food insecure with hunger and 10.9% of food secure individuals (P < 0.001). Only 61% of hunger-reporting persons had full-time employment compared with 18.2% of food insecure without hunger and 48.0% of the food secure (P < 0.001). For source of HIV transmission, men having sex with men was more common among the food-secure individuals than food insecure reporting (P < 0.001), whereas the frequency of past or current recreational injection drug users increased from food secure (4.9%) to food insecure without hunger (16.0%) and with hunger (27.4%, P < 0.001).

Factors related to nutrition status, disease progression, and therapy differed among categories of individuals with different food access (Table 2). The food insecure with hunger had a BMI of 22.6 kg/m² (IQR 20.8–24.9) compared with 23.1 kg/m² (IQR 21.5–25.7) among food insecure without hunger and 23.7 kg/m² (IQR 21.9–25.7) among food-secure individuals (P < 0.001). Weight change, defined as a positive response to a question about a gain or loss of ≥4.5 kg within the past year, was common in all categories. In total, 72.6% of hunger-scoring individuals responded positively to that question compared with 66.5% among the food insecure without hunger and 49.3% among the food secure (P < 0.001). HIV progression differed somewhat among the 3 different categories. There was a negative trend from food secure to food insecure which could be seen as decreasing upper IQR range of CD4 counts (P = 0.012), and increasing upper IQR range of current viral load (P = 0.059). The groups did not differ in the proportion having had a previous AIDS diagnosis (P = 0.286). The differences in HIV progression were reflected by the lower median duration of any kind of therapy among food-secure individuals with hunger (24 mo) compared with 30 mo for food insecure without hunger and 34 mo among food-secure people. Similar trends were found for the use of nucleoside reverse transcriptase inhibitors (P < 0.001), protease inhibitors (P = 0.034), and HAART (P = 0.017).

There were a number of factors that were strongly associ-
Unstable housing situation, and age. Those experience of ever being a recreational injection user, were associated with individual hunger in the applied regression model. 3.15 (95% CI, 1.94 – 5.13). Other factors significantly associated included children [AOR 3.68 (1.98 – 6.84)] and unemployment [AOR 4.68 (3.43– 6.38), respectively. Also when adjusting the results, an annual income of ≤ Can $10,000 gave an unadjusted OR of 7.73 (95% CI, 5.62–10.64) for food insecurity with hunger. Unemployment was second most important with an unadjusted OR of 6.89 (95% CI, 4.73–10.03) for experiencing food insecurity with hunger. Unstable housing and experience of having used recreational injection drugs had unadjusted ORs of 4.90 (95% CI, 2.93–8.18) and 4.68 (95% CI, 3.43–6.38), respectively. Also when adjusting the results, an annual income of ≤ Can $10,000/y. The lack of absolute value on income makes comparisons with other studies difficult because they normally use the average income rather than the categories used here. An objective for a future study could be to compare the effect of annual income on food insecurity between HIV-positive people and the general population. Both categories of food insecurity were associated with a lower and decreased weight, although the mean weight was still in the recommended weight range. It was suggested that

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Unadjusted clinical information of people according to category of food security status</th>
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<tbody>
<tr>
<td></td>
<td>All</td>
</tr>
<tr>
<td>n</td>
<td>1213</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>23.4 (21.6–25.5)</td>
</tr>
<tr>
<td>Weight change</td>
<td>Yes 677 (58.8)</td>
</tr>
<tr>
<td>No 475 (41.2)</td>
<td>304 (64.0)</td>
</tr>
<tr>
<td>AIDS Diagnosis</td>
<td>Yes 62 (5.1)</td>
</tr>
<tr>
<td>No 1151 (94.9)</td>
<td>593 (51.5)</td>
</tr>
<tr>
<td>HIV status</td>
<td>CD4, cells/mm³</td>
</tr>
<tr>
<td>Viral load, copies/L</td>
<td>400 (400–1,900)</td>
</tr>
<tr>
<td>Duration of antiretroviral therapy, mo Any 50 (31–86)</td>
<td>34 (18–58)</td>
</tr>
<tr>
<td>NRTI 30 (15–49)</td>
<td>34 (17–58)</td>
</tr>
<tr>
<td>NNRTI 0 (0–3)</td>
<td>0 (0–3)</td>
</tr>
<tr>
<td>PI 14 (0–24)</td>
<td>16 (0–24)</td>
</tr>
<tr>
<td>HAART 15 (5–25)</td>
<td>16 (4–25)</td>
</tr>
</tbody>
</table>

1 Values are n (%) or median (IQR).
2 Defined as a positive response to a question about a weight change of 4.5 kg (gain or loss) over the last year.
3 Abbreviations: NRTI, nucleoside reverse transcriptase inhibitor; NNRTI, non-NRTI; PI, protease inhibitor.

DISCUSSION

Our analysis showed that almost half of the individuals who were eligible for ART in British Columbia in 1998–1999 and who responded to this survey were food insecure, and that 1 of 5 reported occasional or frequent hunger. Thus, the prevalence of food insecurity in the present study was almost 5 times higher than in the general Canadian population because the prevalence of food insecurity among Canadians was estimated to be ~ 10% (16). Our estimate of food insecurity with hunger appeared to be even more exaggerated in the population studied, i.e., > 17 times more HIV-positive individuals were categorized as food insecure with hunger, compared with the National Longitudinal Survey of Children and Youth, which estimated that 1.2% of 57,000 Canadian families fit the same description (17). As in the general population, risk factors for food insecurity with and without hunger in HIV-positive individuals were female gender, low income, low education, and aboriginal ethnicity (18,19). Experience of abuse of recreational injection drugs and/or alcohol, unstable housing, and having children at home were other risk factors for food insecurity with and without hunger in HIV. The strongest predictor was, as expected, annual income, and HIV-positive individuals earning ≤ Can $10,000 (≤ US $7,600)/y had almost a 4 times higher risk of being hungry than individuals with an income of > Can $10,000. It is not known whether the high frequency of food insecurity found in the present study would be expected to a relatively high proportion of responders having a very low income or whether HIV would be a risk factor in itself. In our study, income was assessed as either more or ≤ Can $10,000/y. The lack of absolute value on income makes comparisons with other studies difficult because they normally use the average income rather than the categories used here. An objective for a future study could be to compare the effect of annual income on food insecurity between HIV-positive people and the general population. Both categories of food insecurity were associated with a lower and decreased weight, although the mean weight was still in the recommended weight range. It was suggested that

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>Multivariate logistic regression model: factors associated with individual hunger</th>
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<tbody>
<tr>
<td></td>
<td>Unadjusted OR (95% CI)</td>
</tr>
<tr>
<td>Age (per year)</td>
<td>0.95 (0.94–0.97)</td>
</tr>
<tr>
<td>Unstable housing (Yes vs. No)</td>
<td>4.90 (2.93–8.18)</td>
</tr>
<tr>
<td>Unemployed (Yes vs. No)</td>
<td>6.89 (4.73–10.03)</td>
</tr>
<tr>
<td>Income ≤ Can $10,000 (Yes vs. No)</td>
<td>7.73 (5.62–10.64)</td>
</tr>
<tr>
<td>Lifetime injection drug user (Yes vs. No)</td>
<td>4.68 (3.43–6.38)</td>
</tr>
<tr>
<td>Living with children (Yes vs. No)</td>
<td>2.73 (1.73–4.31)</td>
</tr>
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the general population experiences 2 opposing influences of food insecurity on body weight (20). The first would be that food insecurity without hunger increases the risk of overweight and obesity, whereas food insecurity with hunger causes people to lose weight. Basiotis (21) developed a behavioral model for this phenomenon in which individuals faced with diminishing incomes first consume less expensive foods to maintain energy intakes at a lower cost. A later step in this model takes place when income diminishes further and causes the individuals to reduce dietary energy to intakes below daily requirements, which results in overt deprivation. It was suggested that obesity follows a socioeconomic gradient such that the obesity rates are higher among people with limited financial resources and the poor (22). This has been shown to be true only for women, who have higher obesity rates associated with low incomes and low education levels (23–26). Among men, the association of obesity with low socioeconomic status has been less consistent (23,24). A similar pattern seems to exist for food-insecure men and women. Women have higher risks of obesity when they are categorized as food insecure without hunger (20,27–29), whereas studies do not support the same for men (20). Overweight is less common among people with severe food insecurity (scoring hunger as frequently occurring) than in the food secure and the food insecure without hunger or occasional hunger (20,27). In people with HIV, food insecurity seemed to affect only weight and BMI in a negative way. In our study, the food insecure without hunger also had lower BMI than the food secure, which is consistent with the fact that the population studied consisted almost entirely of men (20,27). The differences in BMI were not alarmingly high, but with time, the differences may increase further and affect the risk of morbidity and mortality among HIV-positive individuals in a negative way. Recently published longitudinal data from an American cohort study of HIV-positive persons showed that underweight and normal weight women had an increased risk of an AIDS diagnosis, and underweight women had an increased risk of HIV-related death, compared with HIV-positive obese women (30). Moreover, any AIDS-defining condition during the 6 mo before a study visit was associated with a decrease in BMI to <20 kg/m² (31), aggravating the relative risk for mortality ever further. There was no difference in previous AID diagnosis between people who had scored positive or negative to hunger despite differences in CD4 counts and plasma viral loads. Although speculative, the reason for this may be that larger differences in BMI than the ones found in our study may be required to detect a difference in AIDS diagnoses.

To our knowledge, food insecurity has not previously been assessed in a Canadian population with HIV. However, Kim et al. (32) assessed dietary adequacy in an HIV-positive population with the wasting syndrome in the United States. That study showed that ~38% of the population had inadequate energy intakes (compared with U.S. recommended dietary allowance), which was associated with female gender and injection drug use. In the same study, Woods et al. (33) showed that macronutrient intake was significantly and inversely associated with decreasing CD4 cell counts, again confirming the importance of diet in a population with HIV. Minorities, participants with dependent children, individuals without an adult caregiver, and those without food-shopping assistance had less adequate dietary intakes (32), confirming our findings that ethnicity and income affect an HIV-positive individual’s access to food sources.

The participation rate of this study was fairly low, which may be explained by a number of factors, e.g., the length of the questionnaire and the overexposure to research that many HIV-positive individuals experience. Moreover, participation in a survey similar to the ones used in our study requires literacy in the English language, which may restrict the participating group. The nonresponders constituted a relatively younger group with more women, without diagnosis of AIDS, but with lower CD4 counts and higher viral load due to a shorter ART duration. The lower participation of this group is expected because it may reflect the fact that these individuals have a less well-established contact with their health care providers who usually are responsible for the distribution of the questionnaire. Although it may have increased the participation, the survey was not sent directly to the HIV-positive individuals because this might have restricted the confidentiality. Assessing the few facts we know about the nonresponders, it is quite clear that they had an increased frequency of some of the predicting factors of food insecurity. Our survey may therefore have underestimated the actual frequency of food insecure with and without hunger.

We conclude that in HIV-positive individuals, the occurrence of food insecurity was nearly 5 times higher than in the general Canadian population. The results should stimulate further research to identify to what extent hunger-associated factors are reversible with interventions built on nutritional and/or social strategies.

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LITERATURE CITED


