

UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

**Literature and Best Practices Review: Measuring Food Insecurity at the University of British Columbia**

**Sara Kozicky**

**University of British Columbia**

**VOL 500**

**Themes: Food, Community, Wellbeing**

**February 2019**

*Disclaimer: "UBC SEEDS Sustainability Program provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student research project/report and is not an official document of UBC. Furthermore, readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Sustainability Program representative about the current status of the subject matter of a project/report".*

The background image shows a large, reflective pond at the University of British Columbia. In the foreground, the words "THE UNIVERSITY OF BRITISH COLUMBIA" are spelled out in large, white, three-dimensional letters that are partially submerged in the water. The water reflects the letters and the surrounding environment. In the background, there are trees and a building, with a bright sunset or sunrise sky. A semi-transparent white box is overlaid on the upper part of the image, containing the title text.

# **Literature and Best Practices Review: Measuring Food Insecurity at the University of British Columbia**

**Prepared by: Sara Kozicky, RD, MPH Student, UBC Sustainability Scholar  
2018/19**

**Prepared for: UBC Wellbeing and SEEDS**

**February 2019**

## Table of Contents

<b>Executive Summary</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>6</b>
UBC Wellbeing and the Food and Nutrition Committee.....	6
Purpose.....	6
<b>Background</b> .....	<b>7</b>
What is food (in)security? .....	7
How is food insecurity measured in Canada?.....	8
How common is food insecurity? .....	9
What determines food insecurity? .....	10
Why is food insecurity an issue?.....	10
What is being done about food insecurity?.....	10
Food insecurity in the University context .....	11
The University of British Columbia context .....	12
<b>University Food Insecurity Measurement: Literature Review</b> .....	<b>16</b>
Methods .....	16
Results .....	16
Discussion .....	19
Limitations.....	22
<b>Recommendations</b> .....	<b>22</b>
<b>References</b> .....	<b>23</b>
<b>Appendix A: CCHS HFSSM</b> .....	<b>31</b>
<b>Appendix B: Literature Review Results Table</b> .....	<b>36</b>
<b>Appendix C: Literature Review Results Table – Associated Factors and Recommendations</b> ...	<b>42</b>

## Executive Summary

### Introduction

UBC Wellbeing is a collaborative effort to make the University a better place to live, work and learn through a systems-wide approach to wellbeing across campuses. The work of UBC Wellbeing is guided by the Okanagan Charter, a shared call to action for partners, leaders, and community members to embed health and wellbeing into all aspects of the institution and lead wellbeing promotion actions locally and globally.

The UBC Food and Nutrition Committee is a diverse group of faculty, staff and students with interest and expertise in food systems and food security. The committee developed an Action Framework for a Nutritionally Sound Campus (1), which in turn informed the food and nutrition targets within the draft UBC Wellbeing Strategic Framework (currently in development - February 2019). Both frameworks identified food insecurity as an area of focus and were informed by Goal 2 of the United Nations Sustainable Development Goals (2)

Given the Action Framework and Wellbeing Strategic Framework, there is a need to establish a baseline and ongoing measure to monitor food insecurity prevalence within the UBC community – which includes students, staff and faculty. Additionally, the measure will be useful to determine if current and future interventions have a potential impact on food insecurity prevalence.

To achieve this goal, a literature and best practices review was conducted to inform recommendations for measuring food insecurity prevalence within the UBC community.

### Background

Household or individual food insecurity is defined as “the inadequate or insecure access to food due to financial constraints” (3). Household food insecurity is a social determinant of health, which is closely linked with income (another determinant of health) (4). Food insecurity is distinct from community level food security, which is defined as “when all community residents obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes healthy choices, community self-reliance, and equal access for everyone,” which is focused primarily on food systems as opposed to individual households (4).

The prevalence of food insecurity in Canadian Universities from the work of Meal Exchange is approximately 40% (5), which is four times as high of than in the general Canadian population (approximately 10%) (6). University students face many factors that contribute to a risk of food insecurity, including high rates of unemployment, rising cost of tuition and textbooks, inadequate student assistance, poor availability of summer jobs, and high population prevalence of unattached individuals and renters (4). Despite high rates of unemployment compared to the general Canadian population, more and more students are working during the school year (7) to cover essentials like food, housing and tuition, which has seen an increase of 238% since 1991 (8). Additionally, students that are international, graduate, Indigenous or have children are more likely to be food insecure (5).

Food insecurity (especially over many years) can contribute to a higher risk of poor physical and mental health (anxiety, depression, other mental health disorders) in University students (9), because of stress and poor diet quality, just as with the general Canadian population. Being food insecure is also a concern

in the University population because it can negatively impact academics over many years (9) and social wellbeing (5).

University institutions have implemented various interventions to combat food insecurity, in addition to the strategies individual students may employ. Universities may have campus food banks, food skills programs, community gardens, subsidized restaurants/cafeterias and meal card programs which all can be considered downstream interventions that are essentially community food security interventions (as described above), meant to help those who are already food insecure. Universities (specifically students unions) also partake in advocacy efforts to reduce the cost of studying and living, which is a financial-based intervention that would have an impact on food insecurity.

In Canada, household food insecurity has been measured as part of the population-based cross-sectional Canadian Community Health Survey (CCHS) since 2004, using a series of questions called the Household Food Security Survey Module (HFSSM) (adapted from the United States Department of Agriculture (USDA) Household Food Security Survey Module) (10). The prevalence of food insecurity amongst the University student population is currently not measured nationally in Canada. However, although not extensive, some research has been conducted at some Canadian institutions, including a multi-site measure conducted by the non-profit organization Meal Exchange (5).

At UBC, a variety of tools and methods have been used to measure food insecurity. Although not all validated tools for the general Canadian population or University setting, prevalence of food insecurity measured ranges from 37-56% (11-13), which is similar (although a bit higher) than food insecurity estimates at institutions across Canada conducted by Meal Exchange (5).

The UBC Undergraduate Experience Survey is an institutional survey on the student experience. The survey collects information on a variety of indicators, including those related to health and wellbeing. Beginning January 2019, the survey will include questions on food insecurity, specifically using the 6-item HFSSM (shortened version from full version presented above). To date, no survey has collected information from UBC students, staff, or faculty on food insecurity with a validated tool (for general Canadian population). Additionally, currently under development, the Canadian Campus Wellbeing Survey (CCWS) will provide population-level health and wellbeing data for and across Canadian post-secondary institutions. The CCWS will include a validated food insecurity measure (for general Canadian population).

### Summary of Results

After reviewing 40 publications measuring food insecurity in the University population, it was found that the majority (35/40) utilized versions of the USDA tool (including Canadian version, HFSSM) to measure prevalence of food insecurity. Studies also added additional questions to the core tool, depending on the study goals. Aspects of survey administration, such as number of questions (version of USDA tool), period of recall, and population included varied from study to study, with some studies adapting the original instructions/aspects of the USDA/HFSSM tool. Two studies included the entire University community (students, staff, faculty) in assessment, however the quality of food insecurity measure was poor for one study and staff/faculty results not stratified for one study. Food insecurity prevalence ranged from 13-59 percent. Food insecurity recommendations in the literature included interventions for community food security (short term relief, capacity building and empowerment, sustainable food systems) and food insecurity interventions that are income based (advocacy and policy change). Overall,

a key limitation discussed by studies included the fact that the USDA/HFSSM tool is not validated in the university population specifically and would be a valuable future step in research and practice.

### Conclusions and Recommendations

The current review contributes to a greater understanding of food insecurity measurement in the University population and provides a context-specific review of existing programming within the UBC setting. From this review, it is recommended that UBC Wellbeing:

- Continue to support the regular inclusion, analysis and dissemination of results from a food insecurity module in campus community surveys (ex. the UES Survey, CCWS, other), for the purpose of monitoring prevalence and, most importantly, the use of information for programming and advocacy efforts (income-based solutions to food insecurity to higher levels of government).
- Utilize the Canadian HFSSM survey tool to measure food insecurity, for the purpose of comparability with other work (national measures in CCHS and other universities). Additionally, context specific needs of the survey should be determined (ex. number of questions, reflection time, population).
- Support the validation of the HFSSM survey tool in the University population, as it is only validated for use in the general Canadian population.
- If possible, include University staff and faculty as part of the food insecurity measure, as prevalence data is limited in this population. Both the *UBC Wellbeing Strategic Framework* and the *Action Framework for a Nutritionally Sound Campus* goal encompass the entire community, including staff, and thus should be included in measurement.
- Explore the assessment of community food security at UBC. The assessment could contribute to context specific evidence to inform already existing campus food programming that can be categorized as short-term relief and capacity building and empowerment and sustainability interventions.
- Support food (in)security literacy on campus, and the use of appropriate terminology for food related interventions, to inform University policy and programming.

Overall, the study and measurement of campus food insecurity is complex; only recently has work focused on the University population. As an institution, committing to the evidence-informed measurement of campus food insecurity is a positive step towards understanding the true burden experienced in this specific context at UBC and towards achieving goal four of the Action Framework for a Nutritionally Sound Campus, that no community member experiences severe food insecurity.

### **References**

1. FN\_Action\_Framework\_2017.pdf [Internet]. [cited 2019 Jan 18]. Available from: [http://wellbeing.sites.olt.ubc.ca/files/2016/10/FN\\_Action\\_Framework\\_2017.pdf](http://wellbeing.sites.olt.ubc.ca/files/2016/10/FN_Action_Framework_2017.pdf)
2. dpicampaigns. About the Sustainable Development Goals [Internet]. United Nations Sustainable Development. [cited 2019 Jan 3]. Available from: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

3. Household Food Insecurity in Canada – PROOF [Internet]. [cited 2019 Jan 18]. Available from: <https://proof.utoronto.ca/food-insecurity/>
4. HFI-Background-DC-FINAL.pdf [Internet]. [cited 2018 Dec 19]. Available from: <https://www.dietitians.ca/Downloads/Public/HFI-Background-DC-FINAL.aspx>
5. Hungry for Knowledge [Internet]. Meal Exchange Canada. [cited 2019 Jan 18]. Available from: <https://www.mealexchange.com/what-we-do/hungryforknowledgereport/>
6. PROOF – Research to identify policy options to reduce food insecurity [Internet]. [cited 2018 Dec 19]. Available from: <https://proof.utoronto.ca/>
7. Neill C. Rising student employment: the role of tuition fees. *Educ Econ*. 2015 Jan 2;23(1):101–21.
8. Frank L. “Hungry for an Education”: Prevalence and Outcomes of Food Insecurity Among Students at a Primarily Undergraduate University in Rural Nova Scotia. *Can J High Educ*. 2018 Aug 31;48(2):109–29.
9. Lee SD, Hanbazaza M, Ball GDC, Farmer A, Maximova K, Willows ND. Food insecurity among postsecondary students in developed countries: A narrative review. *Br Food J* [Internet]. 2018 Aug 7 [cited 2018 Oct 2]; Available from: <https://www.emeraldinsight.com/doi/10.1108/BFJ-08-2017-0450>
10. Canada H, Canada H. The Household Food Security Survey Module (HFSSM) [Internet]. aem. 2010 [cited 2018 Oct 2]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/household-food-insecurity-canada-overview/household-food-security-survey-module-hfssm-health-nutrition-surveys-health-canada.html>
11. AES Report 2018.pdf [Internet]. Dropbox. [cited 2018 Nov 28]. Available from: <https://www.dropbox.com/s/a8vu7budsmef74s/AES%20Report%202018.pdf?dl=0>
12. 2018\_GSS\_funding.pdf [Internet]. [cited 2019 Jan 2]. Available from: [https://ubyssey.storage.googleapis.com/media/files/2018/11/2018\\_GSS\\_funding.pdf](https://ubyssey.storage.googleapis.com/media/files/2018/11/2018_GSS_funding.pdf)
13. Rideout C and James C. Sociodemographic Predictors of University Students’ Food Insecurity: Insights From a Large University in Canada [Internet]. 2017 [cited 2018 Oct 2]. Available from: [https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFSFS\\_0.pdf](https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFSFS_0.pdf)

## Introduction

Food insecurity in the University setting is an emerging field of study in North America and a topic on the agenda of Universities, due to the impacts on the health and wellbeing of students. Household food insecurity has been measured across the Canadian population since 2004, however has not specifically focused or specified information for the student population. When considering student food insecurity as a concern, it is first important to understand the definition and root causes of food insecurity in addition to having a quality population measure to assess prevalence over time. The focus of this document will be to introduce food insecurity, specifically in the University population, and provide a review of tools in the literature being used to measure food insecurity. The purpose will be to inform the selection of a tool and considerations to measure food insecurity for the University population.

This work is supported by UBC Wellbeing, in the form of a Sustainability Scholar position through UBC Sustainability. For more information on the UBC Sustainability Scholars program, please visit: <https://sustain.ubc.ca/get-involved/students/applied-research-and-internships/ubc-sustainability-scholars-program>.

### UBC Wellbeing and the Food and Nutrition Committee

UBC Wellbeing is a collaborative effort to make the University a better place to live, work and learn through a systems-wide approach to wellbeing across campuses. The work of UBC Wellbeing is guided by the Okanagan Charter, a shared call to action for partners, leaders, and community members to embed health and wellbeing into all aspects of the institution and lead wellbeing promotion actions locally and globally.

UBC Wellbeing plays an active role in supporting work around 5 priority areas for wellbeing: food and nutrition, physical activity, social connection, built and natural environment and mental health and resilience, including through cross-institutional committees.

The UBC Food and Nutrition Committee is a diverse group of faculty, staff and students with interest and expertise in food systems and food security. The committee developed an Action Framework for a Nutritionally Sound Campus (1), which in turn informed the food and nutrition targets within the draft UBC Wellbeing Strategy\Framework (currently in development - February 2019). Both the Action Framework and the draft Strategy identified food insecurity as an area of focus and were informed by Goal 2 of the United Nations Sustainable Development Goals (2).

Given the Action Framework and Wellbeing Strategy, there is a need to establish a baseline and ongoing measure to monitor food insecurity prevalence within the UBC community, including students, staff and faculty. Additionally, the measure will be useful to determine if current and future interventions have a potential impact on food insecurity prevalence.

### Purpose

The main purpose of this document is to provide a best practices and literature review of food insecurity, specifically including best tools used to measure food insecurity, all with a specific focus on the University setting. This review will provide evidence-informed recommendations for measuring food insecurity for University student, staff and faculty populations. Additionally, this document will provide a

brief summary of work to date at UBC, which is context specific to this institution and can be used as a reference for future work.

## Background

### What is food (in)security?

The primary focus for this paper is the term food insecurity, however defining both household food insecurity (terms defined as a household, as opposed to an individual) and food security with precision is important, as it has implications for interventions.

#### *Food Security*

The current definition adopted by Health Canada for food security is from the Food and Agricultural Organization (FAO) and defined as “food security exists when all people, at all times have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (3). Four dimensions of food security has been extracted by the FAO and demonstrated in figure X: physical availability of food (supply of food), economic and physical access to food, food utilization (such as ability to cook and existence of food storage facilities) and stability of the three dimensions over time (3). The FAO describes food security being achieved if all four dimensions exist at the same time (3).

“**Food security** exists when all people, at all times have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”

*FAO World Food Summit 1996*

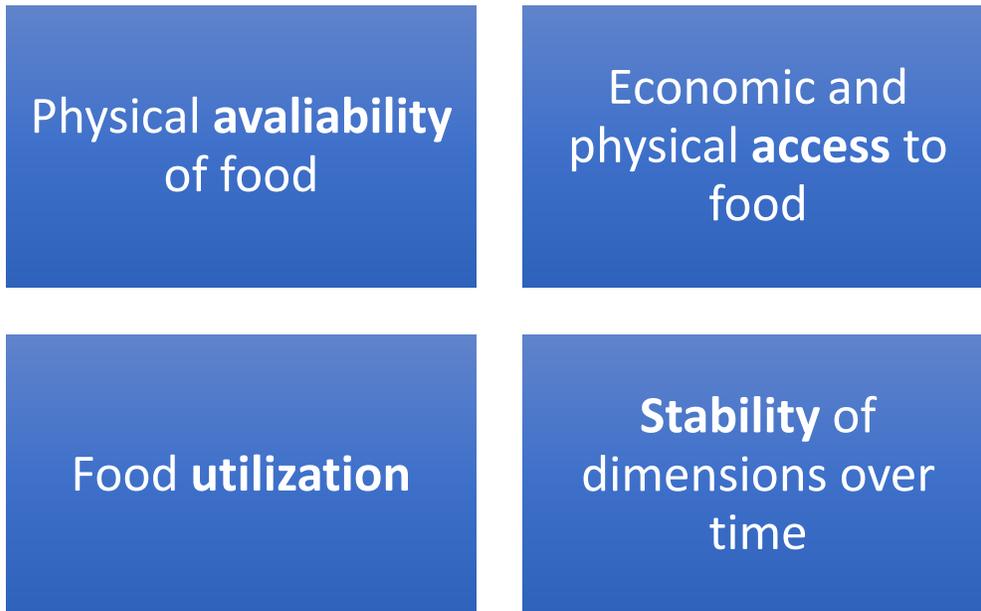


Figure 1. Four domains of food security (3)

*Food Insecurity*

Household food insecurity (which is the focus of this document) is defined as “the inadequate or insecure access to food due to financial constraints” (4). Food security includes financial access to food as one of four domains, however being food insecure only includes issues with financial access to food.

**Food Insecurity** is “the inadequate or insecure access to food due to financial constraints”

*PROOF*

*Community Food Security*

Another distinction that is important to make is that of community level food security, which is defined as “when all community residents obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes healthy choices, community self-reliance, and equal access for everyone,” which is focus primarily on food systems as opposed to individual households (5), thus not equivalent to the definitions of household food insecurity or food security.

**Community Food Security** is “when all community residents obtain a safe, personally acceptable, nutritious diet through a sustainable food system that maximizes healthy choices, community self-reliance, and equal access for everyone”

*Dietitians of Canada*

How is food insecurity measured in Canada?

In Canada, household food insecurity has been measured as part of the population based cross-sectional Canadian Community Health Survey (CCHS) since 2004, using a series of questions adapted from the United States Department of Agriculture (USDA) Household Food Security Survey Module (6). Both tools are very similar, but their terminology and classification of food insecurity differ (4). The Canadian tool is called the Household Food Security Survey Module (HFSSM) and it is a validated tool to measure household food insecurity as opposed to individual food insecurity (6). Both tools have an optional module that include children if relevant and the USDA tool also has a 6-item short form (7). Questions of the Canadian HFSSM (for households without children) can be found in Table 1. A copy of the full Canadian HFSSM (including children) can be found in appendix A. These tools only measure the domain of food access, specifically financial, thus are a measure of household food insecurity.

Table 1. Condensed HFSSM questions (not including children) (8)

<b>Worry food run out</b> before money to buy more
Food bought <b>didn't last</b> and not enough money to get more
Couldn't afford to eat <b>balanced meals</b>
Ever <b>cut size of meals or skip</b> because not enough money? How often?
<b>Eat less than you should</b> because not enough money
<b>Hungry</b> because couldn't afford enough food
<b>Lose weight</b> because not enough money for food
<b>Ever not eat for a full day</b> because not enough money for food? How often?

Both the HFSSM and the USDA tool determines if a household is food insecure (and to what extent) based on the number of affirmative responses to the questions (8,9). Figure 2 displays the classification

systems of the HFSSM and the USDA tool (8,9). Of note, the Canadian HFSSM includes moderate and severe in the classification of a household as food insecure. In the USDA tool, low and very low food security are grouped as food insecure.

The Canadian HFSSM defines moderate food insecure as “compromised food quality or quantity because of not enough money for food” and severe as “missing meals, reduce food intake, and at the most extreme go day(s) without food” (4). The PROOF research group, which is a prominent research group in Canada for food insecurity lead by V. Tarasuk has considered an additional classification for the HFSSM, which is used in their research, which is marginal food insecurity, defined as “worry about running out of food and/or limited food selection due to a lack of money for food” (4).

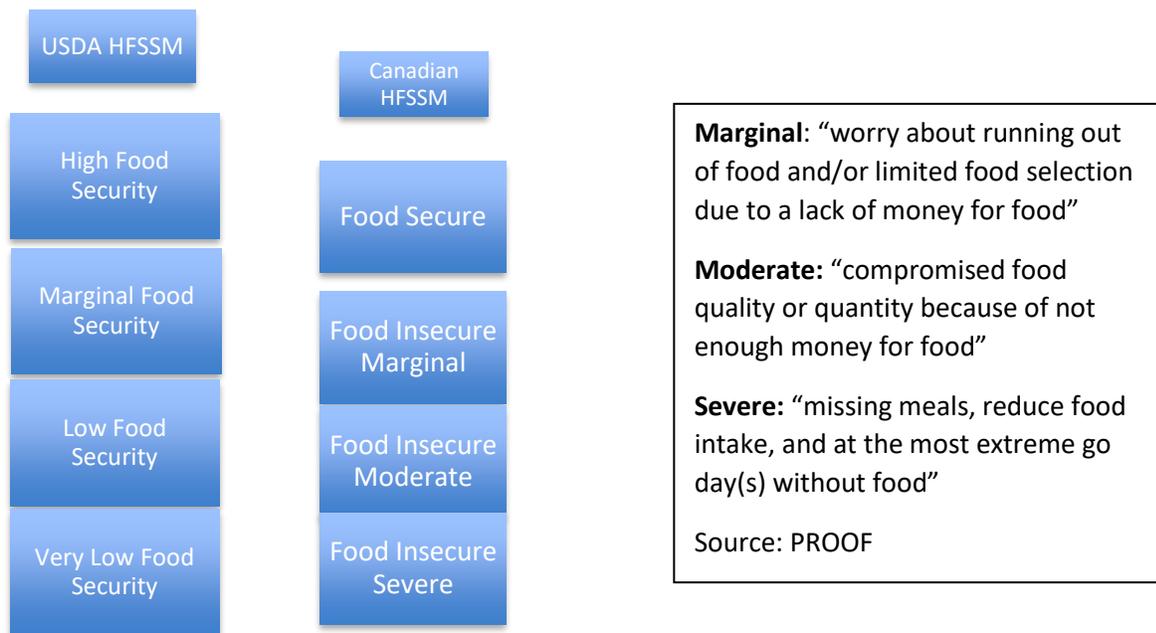


Figure 2. Classification of food insecurity in the USDA and Canadian HFSSM (8,9)

How common is food insecurity?

Over the years, not all provinces have participated in the food insecurity module of the CCHS. In 2012, which is the most recent year that all provinces and territories participated, 1 in 8 Canadian households (12.5%) were considered food insecure (10). This equates to over four million Canadians and 1.15 million children (10). Data from the most recent CCHS in 2015-2016 demonstrates 10.2% of British Columbia households are food insecure, with specifically 3.1% severe, 4.8% moderate and 2.3% marginal food insecure (11).

PROOF produced a British Columbia specific report in 2016 called Priority Health Equity Indicators for British Columbia: Household Food Insecurity Indicator Report (12). Data from 2011-12 indicated 11.8% of British Columbia households were food insecure, with food insecurity in the Vancouver Coastal Health Region (where the University of British Columbia resides) being 9.8% specifically (12).

What determines food insecurity?

Household food insecurity is a social determinant of health, which is closely linked with income (another determinant of health) (13). It has been demonstrated that households with low income are more likely to be food insecure, and experience specifically severe food insecurity (13). The finances of household food insecurity have been described as a construct of resources like income, assets, credit and expenditures consisting of shelter, food, other necessities and debt (14). Specifically, the type of income is also a determinant of food insecurity, where in 2014 61% of households with social assistance as a main form of income were food insecure (4). Similarly, 62.2% of food insecure households were receiving mostly income from working (4). Besides income, which is the most influential determinant of food insecurity (4,13), other factors that are associated with food insecurity include: being Indigenous or Black (4,13), renting (4,13), being a woman, lone parent, unattached single person, disabled, lesbian, gay, bisexual and transgender population, and new immigrant or refugee (13).

Why is food insecurity an issue?

Food insecurity negatively impacts an individual’s ability to access affordable healthy food (4,13). Food insecurity has adverse effects on both physical and mental health (13), through pathways of nutritional deficiencies and stress. Examples of illnesses that are associated with food insecurity include: diabetes, heart disease, depression and poor self-rated physical and mental health (13). Additionally, food insecurity impacts health care costs, whereby household food insecurity is associated with a higher likelihood of becoming a high cost user of the healthcare system (13).

What is being done about food insecurity?

In Canada, household food insecurity is a recognized national concern, with both interventions and advocacy undertaken by a variety of stakeholders. Interventions for food insecurity can be considered either upstream or downstream, where upstream interventions focus on systems wide prevention of food insecurity and advocacy (related to income, as it is an income based problem) (figure 3) and downstream interventions mainly assist those who are already food insecure, and essentially domains of food security in the community context as opposed to food insecurity solutions (figure 3). The Hamilton Community Food Security Stakeholder Committee summarizes the continuum of food security interventions, which can be described as short term relief, capacity and empowerment and systemic shift for sustainability (Figure 4) (15).



Figure 3. Select examples of upstream and downstream interventions and advocacy groups



Figure 4. Food Security Continuum (15)

Food Insecurity in the University Context

Students within the university population are a unique demographic for examining prevalence, determinants of and interventions for food insecurity. Recently, more attention, including research, has been focused on this population potentially due to the rising reported usage of campus food banks (16).

The prevalence of food insecurity amongst the University student population is currently not measured nationally in Canada. However, although not extensive, some research has been conducted at some Canadian institutions, including a multi-site measure conducted by the non-profit organization Meal Exchange (17). The prevalence of food insecurity in Canadian Universities from the work of Meal Exchange is approximately 40% (18), which is four times as high of than in the general Canadian population (approximately 10%) as presented above (10).

Demographics of university students are heterogeneous in nature, for example year of study (undergraduate vs graduate), living situation (at home with family vs on campus), and income (student loans, working, unemployed). However, in general, University students face many factors that contribute to a risk of food insecurity, which are unique to this population. Examples of these contributing factors include high rates of unemployment, rising cost of tuition and textbooks,

inadequate student assistance, poor availability of summer jobs and high population prevalence of unattached individuals and renters, which are associated with higher likelihood of being food insecure (13). Despite high rates of unemployment compared to the general Canadian population, more and more students are working during the school year (19) to cover essentials like food, housing and tuition, which has seen an increase of 238% since 1991 (20). Additionally, students that are international, graduate, Indigenous or have children are more likely to be food insecure (18).

Other factors may contribute to specifically a concern with the ability to utilize food, which is a domain of food security, is University student housing, which may have limited food storage and cooking facilities, including inadequate utensils and ingredients (13). Attention has also been given regarding student abilities to budget and cooking skills, however, it is well established that for most students who are financially independent, forms of income such as student loans and minimum wage employment are often not enough to cover basic needs and tuition (20).

Food insecurity (especially over many years) can contribute to a higher risk of poor physical and mental health (anxiety, depression, other mental health disorders) in University students (21), because of stress and poor diet quality, just as with the general Canadian population. Being food insecure is also a concern in the University population because it can negatively impact academics over many years (21) and social wellbeing (18).

Although the outcomes of food insecurity are similar to the general population, the circumstances surrounding them differ in the University student population. University is well known as a stressful experience for students, with academic pressures to succeed and, for some, new challenges living away from home and managing personal finances. For those with financial stability, food insecurity due to economic reasons would be non-existent. For those with inadequate finances (including insufficient student loans), they may have additional stressors affording necessities like food and housing (and school supplies), contributing to risk of anxiety and depression, which are already high in University students for various social and academic reasons (22). Additionally, some students may attempt to alleviate financial pressures by taking on a part-time job, which can also contribute to further stress managing time to dedicate to schoolwork (23).

University institutions have implemented various interventions to combat food insecurity, in addition to the strategies individual students may employ. Universities may have campus food banks, food skills programs, community gardens, subsidized restaurants/cafeterias and meal card programs which all can be considered downstream interventions that are essentially food security interventions (as described above), meant to help those who are already food insecure. Universities (specifically students unions) also partake in advocacy efforts to reduce the cost of studying and living (example from UBC below), which is a financial based intervention that would have an impact on food insecurity. Students themselves have adapted to a state of food insecurity by buying less expensive food (21), borrowing food from friends or family (21), using credit cards (accumulating debt) and for the most severe food insecure visiting food banks.

#### University of British Columbia Context

The University of British Columbia (Point Grey Campus) is situated in Vancouver, where the cost of living is very high. Rental properties are in high demand, with 1% vacancy rate in 2018 and the highest monthly rental cost in Canada for a two bedroom unit, at \$1649 (5.5% increase from 2017) (24).

Additionally, the cost of healthy eating has been rising, where in 2015 and 2017, respectively, it cost a single male or female 19-30 years old \$234-302 and \$246-316 per month to eat healthy (25,26). The monthly cost for a single student for food and rent alone (not including other expenses like tuition, books, utilities etc) is approximately \$1,125. In British Columbia for the 2018/19 academic year, the maximum weekly combined loan and grant funding for a full-time student without dependents with financial need is \$320 (4 weeks per month \$1,280), which is close to covering the basic expenses of food and rent, however not much else. It is important to note that students are not guaranteed to receive the maximum funding (27).

Within the context of the University of British Columbia, various initiatives are in place to mitigate food (in)security. In this section, this work will be summarized.

#### *University of British Columbia AMS Food Bank*

The UBC campus food bank was opened in 2005 and is operated by the Alma Matter Society (AMS). The food bank provides emergency food items for students in need, and additionally provides referrals to budgeting skills (UBC student services) and connections to resources like free food skills workshops, kitchen equipment and recipes. Students can access the food bank up to six times per term, as the service is intended for emergencies and not supplementing existing food purchases. The food bank is financed by sponsors and donations from students and staff, however, is not a registered charity which limits large contributions due to the inability to issue a tax receipt. Most recently, the UBC President's Office announced an annual contribution of \$10,000 per year for five years to the program (28). Additionally, various campus initiatives have facilitated support of the Food Bank. Examples include Food for Fines, where students can donate food items to the food bank to reduce library fines (29) and holiday initiatives to add \$1 to campus restaurant food bills that will go directly to the food bank.

The food bank saw approximately 982 clients in 2017-2018 (30), which has been steadily increasing since the opening in 2005, likely due to increased awareness of the service and high cost of living in Vancouver (28). With this information on access, approximately 1.8% of the student population are accessing the food bank, which is likely a substantial underestimate of those who are food insecure at UBC (28).

In general, the clientele at the food bank is quite different to that of the Greater Vancouver Food Bank, as the campus food bank supports very temporary usage from students who, in time, will likely make an income adequate to be food secure.

#### *Food Services*

UBC Food Services provides Meal Plans for student and staff purchase that offer cost savings at over 30 UBC locations (31). Students can save up to 12% on food and non-alcoholic beverages at UBC run services (31). Additionally, UBC Food Services offers food skill workshops, online nutrition information via blogs and other forms of media, and Registered Dietitian counselling services free of charge for students living in residence exclusively (32). UBC Food Services is also proceeding with the development of other strategies to help address food Insecurity, including a "Swipe Out Hunger" program and a low cost food cafe with meals for five dollars or less.

Subsidized meals are offered at volunteer run restaurants on campus, including Sprouts/Seedlings (33) and Agora Café (34). The restaurants are not for profit and provide affordable meals for students and

staff. For example, at Sprouts, the seasonal stew, bean burger and curry bowl all cost \$4.00 per serving (35).

#### *UBC Farm and Community Gardens*

The UBC farm provides students and staff with the opportunity to volunteer on the farm and receive produce in return for participation (36). Additionally, the farm has a weekly farmers market, where staff and students have a 10% discount on items, to encourage purchasing local produce (37). UBC also has community gardens, including Roots on the Roof, which has a goal of increasing participant food literacy (38). Ability to participate is limited, however, due to program capacity. The Roots on the Roof program, for example, has the capacity for 6 members.

#### *UBC Student Services*

UBC Student Services has Enrollment Services Advisors available to assist students with applying for student loans, budgeting and finances (39). Additionally, the UBC Bursary Program provides funding for students who do not have their full cost of living covered through government assistance (40). Students must apply for this additional funding as it is not guaranteed, and international students do not qualify.

#### *SEEDS Program*

The UBC SEEDS program, which connects students with UBC faculty, staff or community partners to complete work that contributes towards UBC sustainability goals, has completed work in campus food security (41). Past SEEDs projects have included work that supports the AMS Food Bank Strategy (30) Increasing Food Skills of students in residence (42), and investigating sociodemographic predictors of food insecurity among UBC students (43). There are several SEEDS projects that support food security upcoming in 2019, including research to understand student perception of food quality and affordability, mapping the UBC food security interventions, UBC community garden needs assessment, and focus groups with international students to determine a resource for UBC Student Services staff to better support needs.

#### *Advocacy and Awareness*

Recently, awareness has grown over the concern of campus food insecurity at UBC, including the release of feature articles from the UBC newspaper, the *Ubyyssey* (28). Additionally, the profile has been raised with the recent funding announcement towards the food bank from the UBC President's office (28).

The AMS as an interest group completes advocacy work on behalf of students to improve affordability, which has a direct impact on food insecurity. The AMS advocates on matters related to tuition increases and funding for graduate studies with UBC and advocates on a provincial level to the BC government.

#### *University of British Columbia Okanagan*

The University of British Columbia Okanagan (UBCO) campus has two main food assistance programs to aid food insecure students: the UBCO Food Exchange and Food Hampers. The UBCO Food Exchange is hosted by the Student Experience Office and supported by student volunteers. The Food Exchange is a low barrier food access program, where a shelf stocked with food items and toiletries that are available anonymously to students free of charge. Students may fill out a food request form to receive a food hamper for additional short-term relief. In addition to the two programs, there are also a number of

student lead initiatives to promote food security, including “the Karma Bowl” where students cook for their peers a hearty soup with locally donated produce.

Similar to the UBC Vancouver campus, UBCO also has available emergency financial aid to students through Enrollment Services.

*Monitoring of Food Insecurity at UBC*

Most recently at UBC, a variety of tools and methods have been used to measure food insecurity.

Although not a validated tool or question to assess food insecurity, the 2018 AMS Academic Experience Survey, undergraduate and graduate students were asked if in the past year they were concerned about having sufficient food (figure 5) (44). Graduate and undergraduate student groups experienced concern at some frequency throughout the year of 37-42%, which is similar to food insecurity estimates at institutions across Canada conducted by Meal Exchange (45).

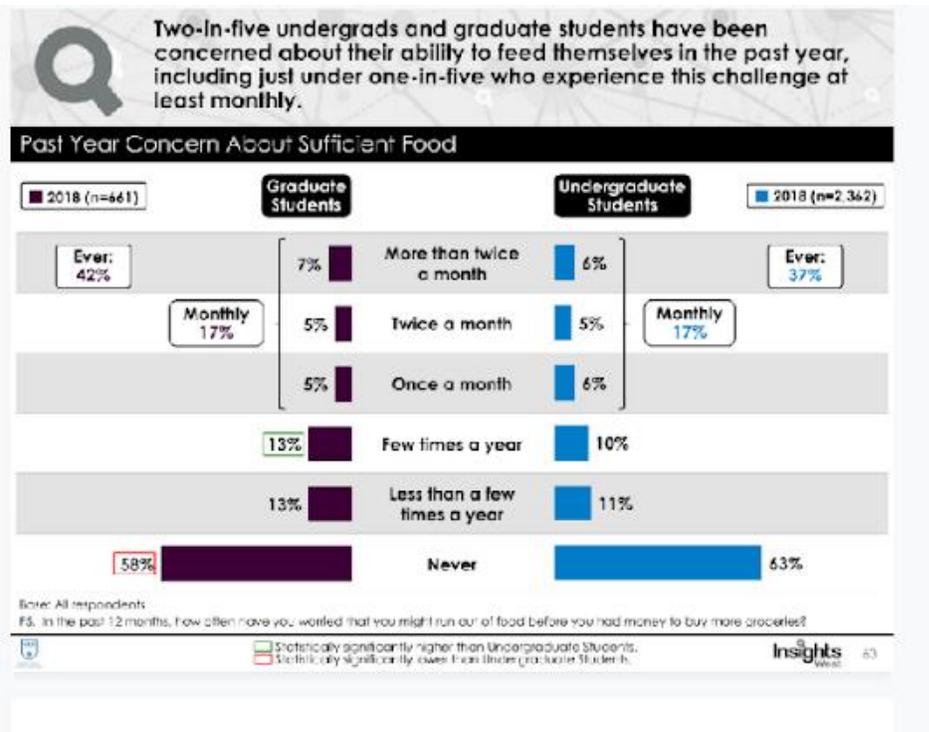


Figure 5. UBC AMS Academic Experience Survey- 2018 (44)

The Graduate Student Society (GSS) conducted a survey in 2018 to assess student perceptions on finances and funding, which indicated 56% of respondents experience financial stress related to a lack of funding for studies (46). It can be hypothesized that this financial stress likely would translate to stress affording food in this population.

As part of a UBC SEEDS project in 2016, Land and Food Systems undergraduate students were surveyed using the 9-item Household Food Insecurity Access Scale (43). From this measure, 45% of participants were deemed food insecure (43). The tool used in this study will be discussed further in the literature review (below).

At UBCO, one question from the Canadian HFSSM was used to estimate food insecurity as part of the VOICE 4 (2016-18) research project. In 2017, the question used was “in the past 12 months, have you worried that food would run out before you got money to buy more food?” From this measure, 41.9% of participants were classified as food insecure.

The UBC Undergraduate Experience Survey is an institutional survey on the student experience. The survey collects information on a variety of indicators, including those related to health and wellbeing. Beginning January 2019, the survey will include questions of food insecurity, specifically using the 6-item HFSSM (shortened version from full version presented above). To date, no survey has collected information from UBC students, staff or faculty on food insecurity with a validated tool (for general Canadian population).

Currently under development, the Canadian Campus Wellbeing Survey (CCWS) will provide population-level health and wellbeing data for and across Canadian post-secondary institutions. The CCWS will include a validated food insecurity measure (for general Canadian population).

## University Food Insecurity Measurement: Literature Review

### Methods

A systematic approach was utilized for this review. Both peer reviewed literature and grey literature was included in the literature search, utilizing Medline and Google Scholar. Determined exclusion criteria included: food banks, qualitative research (due to no measure of food insecurity), colleges (specifically two year), countries that were not comparable to Canada (in terms of development).

Inclusion criteria included quantitative methods to measures of food insecurity in universities, within countries comparable to Canada (development). Measurement of food insecurity in all members of the university community were included (contractors, faculty, staff, graduate and undergraduate students).

Medline was searched with terms including: Food insecurity\* AND Universit\*, College, student, campus Search terms were similar for Google Scholar.

Medline was searched first, followed by a search in google scholar. Sources found in Google Scholar were cross referenced with the Medline publications, to avoid duplication.

### Results

#### *Included literature*

From the peer reviewed literature search, 50 publications were found with the removal of duplicates. After review of abstracts for relevance, 15 full publications were included for review. Eighteen additional documents or peer reviewed publications were included from the grey literature after cross-referencing results from that of the Ovid Medline search and relevant inclusion criteria. Citations from a recent systematic review (21) were also cross-referenced, and an additional seven documents were included in this review. A total of 40 documents were identified as part of this literature review. All the included studies were cross-sectional.

A summary of literature review results can be found in Appendix B and C.

### *Survey populations*

All surveys reviewed were conducted within Universities in Canada, the United States or Australia. Most studies were conducted in American universities (n=29) (47–75), with fewer in Canadian setting (n=8) (20,43,76–81) and even fewer in Australia (n=3) (82–84). Studies varied in population examined. The majority of studies explicitly included both undergraduate and graduate students and few were conducted in specific populations, such as freshman students (first year), exclusion of freshman students or a specific faculty. Two studies included the entire University community (undergraduates, graduates, faculty, staff) (72,78). One study examined FI across more than one university institution (45). The study sample sizes ranged from 43-9705 individuals. The majority (37/40) included 200 or more participants.

### *Survey design and administration*

Nearly all studies measured FI with the USDA Household Food Security Module or the HFSSM in Canada and they are described in table 2. The exception to this would be five studies (43,48,68,78,82), which used the Hager et al. 2010 two item screener (49), Hager two item screener and the USDA Household Food Security Module, USDA Community Food Security Assessment Toolkit and single-item question from Australian National Nutrition Survey, Household Food Insecurity Access Scale, and self-reported measures, respectively. All forms of the USDA tool were represented in studies reviewed, with four using the full 18-item questionnaire (48,66,75,83), 15 the 10-item adult form (50,52,56–65,73,74,84) and 10 using the 6-item short form (47,49,51,53–55,69–72). Of the six studies using the Canadian HFSSM (20,45,76,77,79,80), four used the 10-item survey (no children) (20,76,77,80) and two adapted the 10-item survey to make a customized six-item survey (45,79).

**Table 2. Summary of Main tools (8,9)**

<b>Tool</b>	<b># Questions</b>	<b>Classification (# affirmative)</b>	<b>Food Insecure</b>
Canadian HFSSM Adult (no children)	10	Food Secure (0-1) Food Insecure Moderate (2-5) Food Insecure Severe (≥6)	Moderate + Severe
Canadian HFSSM Household (if children)	18	Food Secure (0-1) Food Insecure Moderate (2-4) Food Insecure Severe (≥5)	Moderate + Severe
USDA Household/Adult (no children)	10	High Food Security (0) Marginal Food Security (1-2) Low Food Security (3-5) Very Low Food Security (6-10)	Low + Very Low
USDA Household (children)	18	High Food Security (0) Marginal Food Security (1-2) Low Food Security (3-7) Very Low Food Security (8-18)	Low + Very Low
USDA Short Form	6	High or Marginal Food Security (0-1) Low Food Security (2-4) Very Low Food Security (5-6)	Low + Very Low

Although most studies used a form of the USDA tool, some differences were found in terms of adaptation of the questionnaire and administration. Some studies, for example Frank, 2018, described minor adaptations to survey question wording or preambles for the purpose of clarifying if the participant was completing the survey from the perspective of an individual or household (20), which will be described further in the discussion section of this document. Period of recall asked of participants differed among studies, of those using derivatives of the USDA tool, four studies (47–49,69) adapting the tool to the past 30 days and three studies under one year (9 months, 1 semester, 3 months) (50–52), with the remaining majority of studies maintaining the original instructions of the USDA tool of reflecting on the past 12 months.

In addition to a standard FI measure tool, most studies collected additional demographic information and included other specific questions of interest based on the research objectives. Examples of additional questions include context specific to food insecurity like food bank use, self-reported mental health, grade point average, finances, meal plan, and living arrangements, which were used to determine potential associated factors of FI or provide more context to population FI.

Most surveys were electronic, administered online without the assistance of an interviewer. Additionally, convenience sampling was common, with very few studies utilizing probability sampling techniques.

### *Analysis methods*

FI analysis methods and categories of FI differ based on which survey tool was used and, in most studies, followed analysis instructions set out by tool (as described in the introduction of this paper and in table 2). However, there were some exceptions, where some studies did not follow standardized methods of scoring of validated tool used. One example of this includes two Canadian studies used an adapted form of the HFSSM (six questions) and adapted scoring: 2-4 affirmative moderate FI as opposed to 2-5, and 5-6 severe as opposed to greater or equal to 5 (45,79). Another example is Blundell who used standard analysis and one from PROOF- food secure if 0 affirmative (not 0-1) (76).

Depending on the objectives of the research, methods for analysis differed. However, most were consistent using descriptive statistics and bi-variate analysis (chi-squared test, t-test, ANOVA) to determine prevalence of FI and associated variables with FI. About half (twenty-two) of all studies (20,43,48,49,52–59,61,64,66,69,73,74,76,79,83,84) provided analysis using regression/modeling methods, which controlled for potential confounders in the relationship of the variable to FI.

### *Prevalence FI and associated outcome measures*

Overall, regardless of survey tool used, the prevalence of FI (low and very low, or moderate and severe) ranged from 13 to 59 percent. Of the two studies including university staff, Eubanks et al did not report prevalence of staff separate from students and Booth and Anderson reported an academic staff prevalence of 39% and 48% for faculty members (72,78).

In general, as not a focus of this review, the statistically significant variables associated with FI reported can be categorized by: demographics, health, and behaviors. See appendix C for more details.

### *Recommendations*

Recommendations discussed in the literature can be categorized by “future research”, “intervention” and “policy”. Examples of each type of recommendation can be found in appendix C. Of note, this was not an extensive review of recommendations.

### *Study Limitations*

Study limitations cited were consistent across the literature reviewed. Main limitations listed included: study design (cross-sectional) prohibits identifying correlations (only associations), non-randomized sampling methods (not representative of population), limited generalizability of results to other populations (University specific), bias associated with self-reported information (recall, social desirability), non-validated tool for University population, and low survey response rates.

## Discussion

After reviewing 40 publications measuring food insecurity in the University population, it was found that the majority (35/40) utilized versions of the USDA tool (including Canadian version, HFSSM) to measure prevalence of food insecurity. Studies also added additional questions to the core tool, depending on the study goals. Aspects of survey administration, such as number of questions (version of USDA tool), period of recall, and population included varied from study to study, with some studies adapting the original instructions/aspects of the USDA/HFSSM tool. Two studies included the entire University community (students, staff, faculty) in assessment, however the quality of food insecurity measure was poor for one study and staff/faculty results not stratified for one study. Food insecurity prevalence ranged from 13-59 percent. Food insecurity recommendations in the literature included interventions for community food security (short term relief, capacity building and empowerment, sustainable food systems) and food insecurity interventions that are income based (advocacy and policy change). Overall, a key limitation discussed by studies included the fact that the USDA/HFSSM tool is not validated in the university population specifically and would be a valuable future step in research.

Limited studies used tools other than the USDA measure, and have been found to be a weaker measure of household food insecurity or not an appropriate measure (food security measure instead). Additionally, none of the tools are validated for use in the University population. Other tools present in the literature review included the Hager 2-item screener (85), the USDA Community Food Security Assessment Toolkit (86), a single-item question from Australian National Nutrition Survey (87), and the Household Food Insecurity Access Scale (88). Briefly, the Hager 2-item screener was assessed to be sensitive, specific and valid as a screener in low income families with children for food insecurity (85). The screener identifies those households that are at risk of food insecurity (69) but does not assess true presence of food insecurity or the extent of insecurity. The USDA Community Food Security Assessment Toolkit contains a variety of tools (including the USDA HFSSM), to assess food security on a community level as opposed to individual households. The toolkit as a whole assists in assessing food accessibility, availability, affordability, and food production resources, with the HFSSM measuring only financial access (86). The toolkit is valuable for community planners, government and non-profit organizations (86), as it assesses community food security, as opposed to household food insecurity, which are different measures and overall purposes. The single Australian National Survey question asks specifically “In the last 12 months, were there any times that you ran out of food and couldn’t afford to buy any

more?” and has been described as underestimating food insecurity prevalence (73) and additionally cannot classify level of food insecurity as other tools do. The Household Food Insecurity Access Scale is a set of nine questions focusing on household food security, specifically the access domain (89). The questions are similar to the USDA tool, however, use the term “resources” to describe access as opposed to “money” in the USDA tool, which indicates physical access (ex. transportation as a resource) could be included in this measure. The scale has been described as being able to be used to measure household food insecurity as well (89), however as indicated, it measures more than just financial access to food, which is not consistent with the definition for food insecurity, thus would argue only measures food security domains.

It is important to note that no tool for measuring food insecurity has been validated in the University population, including on an individual basis (as opposed to considering household only), which was a key limitation discussed in studies reviewed. There would be value in validating a survey in such population, as it is unique compared to the general population of Canada. For example, students live in diverse households with a variety of food or meal sharing dynamics. The dynamics may include roommates or family members, or neither, depending on the living situation. These dynamics exist in the general population, however, tend to be more concentrated in University student demographics. Additionally, the interpretation of questions in the HFSSM may differ in the University population. One question that has been flagged for interpretation differences in other populations is the affordability of a “balanced meals”(90), which could also differ in the University population.

Despite the limitations discussed for the USDA derived survey, with the current body of literature, the USDA/HFSSM tool will allow for comparability to other studies in the literature, and national measures such as the CCHS. The tool and accompanying procedures provide a reliable and valid measure of food insecurity in the general population (86) and is recognized as the best measure available (91). Most studies (except for five) used these tools, which speaks to the benefits of using a population wide validated tool for food insecurity measurement.

The 18-item USDA tool (including the Canadian HFSSM) have short forms, which have been shown to have high sensitivity, specificity and minimal bias compared to the long form in assessing food insecurity prevalence (92), however if an option, the long form is still recommended as additional questions provide more opportunity to capture those who are food insecure (93). Additionally, the survey is customizable, and can be used in combination with other specific desired questions to understand domains of food security. It is important to note, however, that additional questions (such as food utilization) would not contribute to the assessment of food insecurity prevalence as they are different measures.

The papers reviewed used a variety of methods for survey administration. The USDA survey can be customizable to the desires of the surveyor (94). In addition to length already discussed, the period of recall can vary, for example reflecting upon the past 30 days or past 12 months. There may be a variety of reasons for selecting a specific time period, such as a whole year provides a more comprehensive measure of duration of food insecurity, considering all seasons (including the end of a second term, where food insecurity risk may be highest). However, with longer period of recall, the likelihood of recall bias would increase, which may lead to a less accurate measure. Not all studies included all types of students, such as graduate students, which are at high risk of food insecurity (18). Some studies did not include first year students, because the standard period of recall is 12 months. For this population, in

the past 12 months they likely were living in a different situation, such as at home with parents, compared to their current University experience where they may live alone, in residence or with roommates. To address this concern, some surveys adapted the recall period to a shorter duration or asked students to only consider time attending University. In some of the papers reviewed, such as the paper by Frank, the standardized survey questions were adapted to be more appropriate for the university population, including defining the term “household”. Some studies did not include questions to assess if children in the household were food insecure, which would be optional and dependent on the desires of the surveyor. Additionally, as indicated above, additional questions to assess dimensions of food security (ex. utilization and status over time), demographics, and other outcome variables can be included in a customized survey, however this is dependent on the goals of the survey.

Only two studies reviewed included University staff in the food insecurity prevalence assessment. Unfortunately, the study conducted by Eubanks et al. did not report a separate prevalence for staff (72). The study conducted by Booth and Anderson reported a separate and very high prevalence for academic staff and faculty members (78), however the authors did not specify what tool was used to measure food insecurity prevalence, which complicates the interpretation and discussion in this report. The authors cite “food deserts” with a single food services provision contracted company and “time crunches” as impacting staff food insecurity. Despite these concerns, it is questionable if the measurement in this report aligns more with food service satisfaction and food security measures compared to food insecurity. This highlights an area for opportunity, as University communities, such as UBC, focus on the health and well-being of both students and staff. Measuring food insecurity in this population would provide institutions with a better understanding of the current prevalence of staff food insecurity, which could also be compared to other nation and provincial wide measures, such as the CCHS.

The food insecurity prevalence found in this review (range 37-56%) was similar to that of another review conducted by Bruening et al., which found an average of 35% food insecure within peer reviewed literature and 42% in grey literature (95). A review by Lee et al., only reported a range of food insecurity prevalence, which was 9-89.6%, however studies included and at the high range of prevalence were conducted within food banks, which represents a study sample that is highly likely to be food insecure and thus inflates the estimate (21). In addition to measuring prevalence of food insecurity, controlling for confounding factors, such as primary income source or parental status (76), through regression statistical methods, provides a more accurate representation of the relationship between a given factor (ex. GPA) and the outcome of food insecurity.

Briefly, recommendations for future actions vary, with future research, interventions (both upstream and downstream, including food banks, gardens, and income supports) and policy being made. Current evidence from food insecurity research states that food insecurity due to financial inaccessibility is an income-based problem, that is best suited to income-based solutions at a systemic level (96). However, much efforts have been focused on emergency food provisions (food banks) as opposed to addressing the root cause of food insecurity- financial accessibility (96). Additionally, community-based food programs, such as gardens and community kitchens have also been describe as positive social and skill building experiences, however, have limited impact on food insecurity experiences (96). Examples of income based solutions discussed in the Dietitians of Canada position statement on food insecurity and consistent with some studies included in this review include tax exemptions, income protection from precarious employment and low wages, social assistance, subsidized childcare and subsidized,

affordable and stable housing, which is very applicable in the Vancouver setting for UBC students (96). Additional considerations specific to the university student population include the cost of tuition and textbooks.

## Limitations

A key limitation of the review is that only one reviewer participated in the literature search, data extraction and analysis. Inclusion of additional reviewers could reduce potential bias, including confirmation bias.

## Recommendations

The current review contributes to a greater understanding of food insecurity measurement in the University population and provides a context-specific review of existing programming within the UBC setting. From this review, it is recommended that UBC Wellbeing:

- Continue to support the regular inclusion, analysis and dissemination of results from a food insecurity module in campus community surveys (ex. the UES Survey, CCWS, other), for the purpose of monitoring prevalence and, most importantly, the use of information for programming and advocacy efforts (income-based solutions to food insecurity to higher levels of government).
- Utilize the Canadian HFSSM survey tool to measure food insecurity, for the purpose of comparability with other work (national measures in CCHS and other universities). Additionally, context specific needs of the survey should be determined (ex. number of questions, reflection time, population).
- Support the validation of the HFSSM survey tool in the University population, as it is only validated for use in the general Canadian population.
- If possible, include University staff and faculty as part of the food insecurity measure, as prevalence data is limited in this population. Both the *UBC Wellbeing Strategic Framework* and the *Action Framework for a Nutritionally Sound Campus* goal encompass the entire community, including staff, and thus should be included in measurement.
- Explore the assessment of community food security at UBC. The assessment could contribute to context specific evidence to inform already existing campus food programming that can be categorized as short-term relief and capacity building and empowerment and sustainability interventions.
- Support food (in)security literacy on campus, and the use of appropriate terminology for food related interventions, to inform University policy and programming.

Overall, the study and measurement of campus food insecurity is complex; only recently has work focused on the University population. As an institution, committing to the evidence-informed measurement of campus food insecurity is a positive step towards understanding the true burden experienced in this specific context at UBC and towards achieving goal four of the Action Framework for a Nutritionally Sound Campus, that no community member experiences severe food insecurity.

## References

1. FN\_Action\_Framework\_2017.pdf [Internet]. [cited 2019 Jan 18]. Available from: [http://wellbeing.sites.olt.ubc.ca/files/2016/10/FN\\_Action\\_Framework\\_2017.pdf](http://wellbeing.sites.olt.ubc.ca/files/2016/10/FN_Action_Framework_2017.pdf)
2. dpicampaigns. About the Sustainable Development Goals [Internet]. United Nations Sustainable Development. [cited 2019 Jan 3]. Available from: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
3. al936e00.pdf [Internet]. [cited 2018 Nov 26]. Available from: <http://www.fao.org/docrep/013/al936e/al936e00.pdf>
4. Household Food Insecurity in Canada – PROOF [Internet]. [cited 2019 Jan 18]. Available from: <https://proof.utoronto.ca/food-insecurity/>
5. cfs-position-paper.pdf [Internet]. [cited 2019 Jan 18]. Available from: <https://www.dietitians.ca/Downloads/Public/cfs-position-paper.aspx>
6. Canada H, Canada H. The Household Food Security Survey Module (HFSSM) [Internet]. aem. 2010 [cited 2018 Oct 2]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/household-food-insecurity-canada-overview/household-food-security-survey-module-hfssm-health-nutrition-surveys-health-canada.html>
7. USDA ERS - Survey Tools [Internet]. [cited 2019 Jan 3]. Available from: <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools/>
8. Canada H, Canada H. Determining Food Security Status [Internet]. gcnws. 2010 [cited 2019 Feb 22]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/household-food-insecurity-canada-overview/determining-food-security-status-food-nutrition-surveillance-health-canada.html#as>
9. Guide to Measuring Household Food Security (Revised 2000) | Food and Nutrition Service [Internet]. [cited 2019 Feb 22]. Available from: <https://www.fns.usda.gov/guide-measuring-household-food-security-revised-2000>
10. PROOF – Research to identify policy options to reduce food insecurity [Internet]. [cited 2018 Dec 19]. Available from: <https://proof.utoronto.ca/>
11. Latest household food insecurity data now available – PROOF [Internet]. [cited 2018 Dec 19]. Available from: <https://proof.utoronto.ca/new-data-available/>
12. Priority health equity indicators for British Columbia: Household food insecurity indicator report – PROOF [Internet]. [cited 2019 Jan 18]. Available from: <https://proof.utoronto.ca/resources/proof-annual-reports/priority-health-equity-indicators-for-british-columbia-household-food-insecurity-indicator-report/>

13. HFI-Background-DC-FINAL.pdf [Internet]. [cited 2018 Dec 19]. Available from: <https://www.dietitians.ca/Downloads/Public/HFI-Background-DC-FINAL.aspx>
14. Sriram U, Tarasuk V. Changes in household food insecurity rates in Canadian metropolitan areas from 2007 to 2012. *Can J Public Health Rev Can Sante Publique*. 2015 Apr 29;106(5):e322-327.
15. food security continuum hamilton - Google Search [Internet]. [cited 2019 Jan 18]. Available from: [https://www.google.com/search?q=food+security+continuum+hamilton&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj4o7zjgjfAhWCIDQIHeF5DwwQ\\_AUIDygC&biw=1280&bih=610#imgsrc=ndkdQzPoR8b1tM](https://www.google.com/search?q=food+security+continuum+hamilton&source=lnms&tbm=isch&sa=X&ved=0ahUKEwj4o7zjgjfAhWCIDQIHeF5DwwQ_AUIDygC&biw=1280&bih=610#imgsrc=ndkdQzPoR8b1tM):
16. May 04 DB· CN· P, May 4 2018 5:30 AM AT | Last Updated:, 2018. Empty bellies and bare shelves: university food banks struggle to meet demand | CBC News [Internet]. CBC. 2018 [cited 2019 Jan 18]. Available from: <https://www.cbc.ca/news/canada/nova-scotia/university-food-banks-education-school-hunger-1.4644781>
17. Meal Exchange Canada [Internet]. [cited 2019 Jan 18]. Available from: <https://www.mealexchange.com/>
18. Hungry for Knowledge [Internet]. Meal Exchange Canada. [cited 2019 Jan 18]. Available from: <https://www.mealexchange.com/what-we-do/hungryforknowledgereport/>
19. Neill C. Rising student employment: the role of tuition fees. *Educ Econ*. 2015 Jan 2;23(1):101–21.
20. Frank L. “Hungry for an Education”: Prevalence and Outcomes of Food Insecurity Among Students at a Primarily Undergraduate University in Rural Nova Scotia. *Can J High Educ*. 2018 Aug 31;48(2):109–29.
21. Lee SD, Hanbazaza M, Ball GDC, Farmer A, Maximova K, Willows ND. Food insecurity among postsecondary students in developed countries: A narrative review. *Br Food J* [Internet]. 2018 Aug 7 [cited 2018 Oct 2]; Available from: <https://www.emeraldinsight.com/doi/10.1108/BFJ-08-2017-0450>
22. Glauser W. Postsecondary campuses responding to record anxiety and depression levels. *Can Med Assoc J*. 2017 Dec 4;189(48):E1501–2.
23. Snelgar RJ. Stress and the Part-Time Student: Work Factors Associated with Failure Rate. *South Afr J Psychol*. 1990 Mar;20(1):42–6.
24. B.C. has some of the highest rents, lowest vacancy rates in Canada: CMHC rental market survey | Globalnews.ca [Internet]. 2018 [cited 2019 Jan 2]. Available from: <https://globalnews.ca/news/4706695/bc-highest-rents-lowest-vacancy-rates-cmhc-survey/>
25. 2015 Food Costing in BC - FINAL.pdf [Internet]. [cited 2019 Jan 2]. Available from: <http://www.bccdc.ca/pop-public-health/Documents/2015%20Food%20Costing%20in%20BC%20-%20FINAL.pdf>

26. Food Costing in BC 2017: Assessing the affordability of healthy eating [Internet]. BC Food Security Gateway. [cited 2019 Feb 22]. Available from: <https://bcfoodsecuritygateway.ca/resources/food-costing-in-bc-2017-assessing-the-affordability-of-healthy-eating/>
27. Apply | StudentAidBC [Internet]. [cited 2019 Feb 22]. Available from: <https://studentaidbc.ca/apply/eligibility#maximum>
28. McCabe S. The hunger gap: Surface [Internet]. The Ubyyssey. [cited 2019 Jan 2]. Available from: <https://www.ubyssey.ca/features/hunger-food-insecurity/>
29. Food for Fines 2018 runs from October 22 until November 5 [Internet]. About UBC Library. 2018 [cited 2019 Jan 2]. Available from: <https://about.library.ubc.ca/2018/10/15/food-for-fines-2018-runs-from-october-22-until-november-5/>
30. LFS\_450\_AMSFoodBankStrategy\_FinalReport.pdf [Internet]. [cited 2018 Oct 2]. Available from: [https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFS\\_450\\_AMSFoodBankStrategy\\_FinalReport.pdf](https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFS_450_AMSFoodBankStrategy_FinalReport.pdf)
31. Meal Plans | UBC Food Services [Internet]. [cited 2019 Jan 2]. Available from: <https://www.food.ubc.ca/meal-plans/>
32. Nutrition | UBC Food Services [Internet]. [cited 2019 Jan 2]. Available from: <https://www.food.ubc.ca/nutrition/>
33. UBC Sprouts [Internet]. UBC Sprouts. [cited 2019 Jan 2]. Available from: <http://www.ubcsprouts.ca/>
34. AGORA CAFÉ – Monday – Friday 9:30am to 3:00pm | Sept – April, excluding holidays [Internet]. [cited 2019 Jan 2]. Available from: <https://blogs.ubc.ca/agora/>
35. Menu [Internet]. UBC Sprouts. [cited 2019 Jan 2]. Available from: <http://www.ubcsprouts.ca/menu/>
36. Volunteering | Centre for Sustainable Food Systems at UBC Farm [Internet]. [cited 2019 Jan 18]. Available from: <https://ubcfarm.ubc.ca/get-involved/volunteer-program/>
37. UBC Farm Markets | Centre for Sustainable Food Systems at UBC Farm [Internet]. [cited 2019 Jan 18]. Available from: <http://ubcfarm.ubc.ca/food-production/farm-markets/>
38. We are – Roots on the Roof! – Fully student cultivated club and community, for the campus and beyond [Internet]. [cited 2019 Jan 2]. Available from: <http://blogs.ubc.ca/rootsontheroof/>
39. Enrolment Services Advisors [Internet]. Student Services. 2016 [cited 2019 Jan 2]. Available from: <https://students.ubc.ca/about-student-services/enrolment-services-advisors>
40. UBC Bursary Program [Internet]. Student Services. 2016 [cited 2019 Jan 2]. Available from: <https://students.ubc.ca/enrolment/finances/awards-scholarships-bursaries/ubc-bursary-program>

41. About SEEDS | sustain.ubc.ca [Internet]. [cited 2019 Jan 2]. Available from: <https://sustain.ubc.ca/courses-degrees/alternative-credit-options/seeds-sustainability-program/about-seeds>
42. Cvoric S, Fan J, Gibbard M, Lentz B, Moore K, Nguyen L. UBC Food Services : Increasing Food Skills in Residence. 2018 Apr 9 [cited 2019 Jan 2]; Available from: <https://open.library.ubc.ca/cIRcle/collections/undergraduateresearch/18861/items/1.0374130>
43. Rideout C and James C. Sociodemographic Predictors of University Students' Food Insecurity: Insights From a Large University in Canada [Internet]. 2017 [cited 2018 Oct 2]. Available from: [https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFSFS\\_0.pdf](https://sustain.ubc.ca/sites/sustain.ubc.ca/files/seedslibrary/LFSFS_0.pdf)
44. AES Report 2018.pdf [Internet]. Dropbox. [cited 2018 Nov 28]. Available from: <https://www.dropbox.com/s/a8vu7budsmef74s/AES%20Report%202018.pdf?dl=0>
45. Silverthorn D. HUNGRY FOR KNOWLEDGE: [Internet]. 2016. Available from: [http://cpcml.ca/publications2016/161027-Hungry\\_for\\_Knowledge.pdf](http://cpcml.ca/publications2016/161027-Hungry_for_Knowledge.pdf)
46. 2018\_GSS\_funding.pdf [Internet]. [cited 2019 Jan 2]. Available from: [https://ubyssey.storage.googleapis.com/media/files/2018/11/2018\\_GSS\\_funding.pdf](https://ubyssey.storage.googleapis.com/media/files/2018/11/2018_GSS_funding.pdf)
47. Maguire J, O'Neill M, Aberson C. California State University Food and Housing Security Survey: Emerging Patterns from the Humboldt State University Data. :12.
48. Bruening M, Brennhofner S, van Woerden I, Todd M, Laska M. Factors Related to the High Rates of Food Insecurity among Diverse, Urban College Freshmen. *J Acad Nutr Diet*. 2016 Sep;116(9):1450–7.
49. Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *Int J Behav Nutr Phys Act* [Internet]. 2018 Dec [cited 2018 Oct 24];15(1). Available from: <https://ijbnpa.biomedcentral.com/articles/10.1186/s12966-018-0647-7>
50. King JA. Food Insecurity Among College Students - Exploring the Predictors of Food Assistance Resource Use [Internet]. Kent State University; 2017 [cited 2018 Oct 22]. Available from: [https://etd.ohiolink.edu/pg\\_10?0::NO:10:P10\\_ACCESSION\\_NUM:kent1492466215893925](https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ACCESSION_NUM:kent1492466215893925)
51. Calvez K, Miller C, Thomas L, Vazquez D, Walenta J. The University as a Site of Food Insecurity: Evaluating the Foodscape of Texas A&M University's Main Campus. 2016;15.
52. Morris LM, Smith S, Davis J, Null DB. The Prevalence of Food Security and Insecurity Among Illinois University Students. *J Nutr Educ Behav*. 2016 Jun;48(6):376-382.e1.
53. Martinez SM, Frongillo EA, Leung C, Ritchie L. No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *J Health Psychol*. 2018 Jun 25;135910531878302.

54. Mirabitur E, Peterson KE, Rathz C, Matlen S, Kasper N. Predictors of college-student food security and fruit and vegetable intake differ by housing type. *J Am Coll Health J ACH*. 2016 Oct;64(7):555–64.
55. Patton-López MM, López-Cevallos DF, Cancel-Tirado DI, Vazquez L. Prevalence and Correlates of Food Insecurity Among Students Attending a Midsize Rural University in Oregon. *J Nutr Educ Behav*. 2014 May;46(3):209–14.
56. Pia Chaparro M, Zaghoul SS, Holck P, Dobbs J. Food insecurity prevalence among college students at the University of Hawai'i at Mānoa. *Public Health Nutr*. 2009 Nov;12(11):2097.
57. El Zein A, Mathews A, House L, Shelnut K, El Zein A, Mathews AE, et al. Why Are Hungry College Students Not Seeking Help? Predictors of and Barriers to Using an On-Campus Food Pantry. *Nutrients*. 2018 Aug 25;10(9):1163.
58. Hagedorn R, Olfert M, Hagedorn RL, Olfert MD. Food Insecurity and Behavioral Characteristics for Academic Success in Young Adults Attending an Appalachian University. *Nutrients*. 2018 Mar 16;10(3):361.
59. McArthur LH, Ball L, Danek AC, Holbert D. A High Prevalence of Food Insecurity Among University Students in Appalachia Reflects a Need for Educational Interventions and Policy Advocacy. *J Nutr Educ Behav*. 2018 Jun;50(6):564–72.
60. McArthur LH, Fasczewski KS, Wartinger E, Miller J. Freshmen at a University in Appalachia Experience a Higher Rate of Campus than Family Food Insecurity. *J Community Health*. 2018 Oct;43(5):969–76.
61. Wattick R, Hagedorn R, Olfert M, Wattick RA, Hagedorn RL, Olfert MD. Relationship between Diet and Mental Health in a Young Adult Appalachian College Population. *Nutrients*. 2018 Jul 25;10(8):957.
62. Espinoza A. ASSESSING DIFFERENCES IN FOOD SECURITY STATUS AMONG COLLEGE STUDENTS ENROLLED AT A PUBLIC CALIFORNIA STATE UNIVERSITY CAMPUS. :108.
63. Chappelle N. FOOD INSECURITY AT HUMBOLDT STATE UNIVERSITY. :87.
64. Gaines A, Robb CA, Knol LL, Sickler S. Examining the role of financial factors, resources and skills in predicting food security status among college students. *Int J Consum Stud*. 2014 Jul 1;38(4):374–84.
65. Gorman AM. Food Insecurity Prevalence among College Students at Kent State University [Internet]. Kent State University; 2014 [cited 2018 Oct 22]. Available from: [https://etd.ohiolink.edu/pg\\_10?0::NO:10:P10\\_ACCESSION\\_NUM:kent1396903865](https://etd.ohiolink.edu/pg_10?0::NO:10:P10_ACCESSION_NUM:kent1396903865)
66. Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student Hunger on Campus: Food Insecurity Among College Students and Implications for Academic Institutions. *Am J Health Promot*. 2018 Feb 1;32(2):349–54.

67. Silva MR, Kleinert WL, Sheppard AV, Cantrell KA, Freeman-Coppadge DJ, Tsoy E, et al. The Relationship Between Food Security, Housing Stability, and School Performance Among College Students in an Urban University. *J Coll Stud Retent Res Theory Pract*. 2017 Nov;19(3):284–99.
68. Darling KE, Fahrenkamp AJ, Wilson SM, D’Auria AL, Sato AF. Physical and mental health outcomes associated with prior food insecurity among young adults. *J Health Psychol*. 2017 Apr;22(5):572–81.
69. Kashuba KE. The Prevalence, Correlates, and Academic Consequences of Food Insecurity among University of Oregon Students. 2017 [cited 2018 Dec 30]; Available from: <https://scholarsbank.uoregon.edu/xmlui/handle/1794/22865>
70. MacDonald A. Food Insecurity and Educational Attainment at the University of Arkansas. *Sch Soc Work Undergrad Honors Theses* [Internet]. 2016 May 1; Available from: <https://scholarworks.uark.edu/scwkuht/3>
71. Biediger-Friedman L, Sanchez B, He M, Guan J, Yin Z. Food Purchasing Behaviors and Food Insecurity among College Students at The University of Texas at San Antonio. *J Food Secur*. 2016 Jun 21;4(3):52–7.
72. Eubanks MM. The Prevalence of Food Insecurity within the University of Mississippi Community and Knowledge of and Opinions About the University of Mississippi Food Bank [Internet] [undergraduate]. University of Mississippi; 2017 [cited 2018 Dec 30]. Available from: <http://thesis.honors.olemiss.edu/845/>
73. Danek AC. Food Insecurity and Related Correlates Among Students Attending Appalachian State University.
74. Knol LL, Robb CA, McKinley EM, Wood M. Food Insecurity, Self-rated Health, and Obesity among College Students. *Am J Health Educ*. 2017 Jul 4;48(4):248–55.
75. Miles R, McBeath B, Brockett S, Sorenson P. Prevalence and Predictors of Social Work Student Food Insecurity. *J Soc Work Educ*. 2017 Oct 2;53(4):651–63.
76. Blundell L, Mathews M, Bowley C, Roebathan B. Determining Student Food Insecurity at Memorial University of Newfoundland. *Can J Diet Pract Res*. 2018 Oct 3;1–8.
77. Reynolds E, Johnson C, Jamieson JA, Mawhinney H. Prevalence and Correlates of Food Insecurity among Students Attending a Small, Rural Canadian University. *Can J Diet Pract Res*. 2018 Sep;79(3):125–8.
78. Booth AL, Anderson M, Anderson M. Anybody Could be at Risk: Food (In)Security within the University of Northern British Columbia. :58.
79. Entz M, Slater J, Desmarais AA. Student food insecurity at the University of Manitoba. *Can Food Stud Rev Can Études Sur Aliment*. 2017 May 26;4(1):139–59.

80. OLAUSON-THESIS-2017.pdf [Internet]. [cited 2018 Dec 30]. Available from: <https://harvest.usask.ca/bitstream/handle/10388/7850/OLAUSON-THESIS-2017.pdf?sequence=1&isAllowed=y>
81. Silverthorn D. HUNGRY FOR KNOWLEDGE: :49.
82. Hughes R, Serebryanikova I, Donaldson K, Leveritt M. Student food insecurity: The skeleton in the university closet. *Nutr Diet*. 2011 Mar 1;68(1):27–32.
83. Gallegos D, Ramsey R, Ong KW. Food insecurity: is it an issue among tertiary students? *High Educ*. 2014;67(5):497–510.
84. Micevski DA, Thornton LE, Brockington S. Food insecurity among university students in Victoria: A pilot study. *Nutr Diet*. 2014 Dec 1;71(4):258–64.
85. Hager ER, Quigg AM, Black MM, Coleman SM, Heeren T, Rose-Jacobs R, et al. Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*. 2010;126(1):e26-32.
86. Cohen B, Andrews M, Kantor L. *Community Food Security Assessment Toolkit*. :166.
87. New South Wales, Department of Health, NSW Centre for Public Health Nutrition. *Food security options paper: a planning framework and menu of options for policy and practice interventions*. Sydney, N.S.W.: NSW Centre for Public Health Nutrition; 2003.
88. Coates J, Swindale A, Bilinsky P. *Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide: Version 3: (576842013-001)* [Internet]. American Psychological Association; 2007 [cited 2019 Jan 3]. Available from: <http://doi.apa.org/get-pe-doi.cfm?doi=10.1037/e576842013-001>
89. Jones AD, Ngure FM, Pelto G, Young SL. What are we assessing when we measure food security? A compendium and review of current metrics. *Adv Nutr Bethesda Md*. 2013 Sep 1;4(5):481–505.
90. Gulliford MC, Mahabir D, Rocke B. Reliability and validity of a short form household food security scale in a Caribbean community. *BMC Public Health*. 2004 Jun 16;4:22.
91. Tarasuk V. A critical examination of community-based responses to household food insecurity in Canada. *Health Educ Behav Off Publ Soc Public Health Educ*. 2001 Aug;28(4):487–99.
92. Blumberg SJ, Bialostosky K, Hamilton WL, Briefel RR. *Household Food Security Scale*. 1999;89(8):4.
93. *Webinars – PROOF* [Internet]. [cited 2019 Jan 18]. Available from: <https://proof.utoronto.ca/resources/webinar/>
94. Goldrick-Rab S, Richardson J, Kinsley P. *Guide to Assessing Basic Needs Insecurity in Higher Education*. :33.
95. Bruening M, Argo K, Payne-Sturges D, Laska MN. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses. *J Acad Nutr Diet*. 2017 Nov;117(11):1767–91.

96. Vanderkooy P. Dietitians of Canada. 2016;14.
97. Canada H, Canada H. Canadian Community Health Survey, Cycle 2.2, Nutrition (2004): Income-Related Household Food Security in Canada [Internet]. aem. 2007 [cited 2018 Oct 2]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/canadian-community-health-survey-cycle-2-2-nutrition-2004-income-related-household-food-security-canada-health-canada-2007.html#appa>

## Appendix A: CCHS Household Food Security Survey Module (HFSSM) (97)

The following questions are about the food situation for your household in the past 12 months.

Q1.[20](#) Which of the following statements best describes the food eaten in your household in the past 12 months, that is since [current month] of last year?

1. You and other household members always had enough of the kinds of foods you wanted to eat.
2. You and other household members had enough to eat, but not always the kinds of food you wanted.
3. Sometimes you and other household members did not have enough to eat.
4. Often you and other household members didn't have enough to eat.

Don't know / refuse to answer (Go to end of module)

### The HFSSM begins here:

Now I'm going to read you several statements that may be used to describe the food situation for a household. Please tell me if the statement was often true, sometimes true, or never true for you and other household members in the past 12 months.

Q2. The first statement is: you and other household members worried that food would run out before you got money to buy more. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q3. The food that you and other household members bought just didn't last, and there wasn't any money to get more. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q4. You and other household members couldn't afford to eat balanced meals. In the past 12 months was that often true, sometimes true, or never true?

1. Often true
2. Sometimes true

3. Never true

Don't know / refuse to answer

IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q5 AND Q6; OTHERWISE, SKIP TO FIRST LEVEL SCREEN

Now I'm going to read a few statements that may describe the food situation for households with children.

Q5. You or other adults in your household relied on only a few kinds of low-cost food to feed the child(ren) because you were running out of money to buy food. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

Q6. You or other adults in your household couldn't feed the child(ren) a balanced meal, because you couldn't afford it. Was that often true, sometimes true, or never true in the past 12 months?

1. Often true
2. Sometimes true
3. Never true

Don't know / refuse to answer

**FIRST LEVEL SCREEN (screener for Stage 2):** If AFFIRMATIVE RESPONSE to ANY ONE of Q2-Q6 (i.e., "often true" or "sometimes true") OR response [3] or [4] to Q1, then continue to STAGE 2; otherwise, skip to end.

**STAGE 2:** Questions 7-11 - ask households passing the First Level Screen

IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q7; OTHERWISE SKIP TO Q8

Q7. The child(ren) were not eating enough because you and other adult members of the household just couldn't afford enough food. Was that often, sometimes or never true in the past 12 months?

1. Often true
2. Sometimes true

3. Never true

Don't know / refuse to answer

The following few questions are about the food situation in the past 12 months for you or any other adults in your household.

Q8. In the past 12 months, since last [current month] did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

1. Yes
2. No (Go to Q9)

Don't know / refuse to answer

Q8b. How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

Don't know / refuse to answer

Q9. In the past 12 months, did you (personally) ever eat less than you felt you should because there wasn't enough money to buy food?

1. Yes
2. No

Don't know / refuse to answer

Q10. In the past 12 months, were you (personally) ever hungry but didn't eat because you couldn't afford enough food?

1. Yes
2. No

Don't know / refuse to answer

Q11. In the past 12 months, did you (personally) lose weight because you didn't have enough money for food?

1. Yes
2. No

Don't know / refuse to answer

**SECOND LEVEL SCREEN (screener for Stage 3):** If AFFIRMATIVE RESPONSE to ANY ONE of Q7-Q11, then continue to STAGE 3; otherwise, skip to end.

**STAGE 3:** Questions 12-16 - ask households passing the Second Level Screen

Q12. In the past 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?

1. Yes
2. No (IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q13; OTHERWISE SKIP TO END)

Don't know / refuse to answer

Q12b. How often did this happen?

1. Almost every month
2. Some months but not every month
3. Only 1 or 2 months

Don't know / refuse to answer

IF CHILDREN UNDER 18 IN HOUSEHOLD, ASK Q13-16; OTHERWISE SKIP TO END

Now, a few questions on the food experiences for children in your household.

Q13. In the past 12 months, did you or other adults in your household ever cut the size of any of the children's meals because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q14. In the past 12 months, did any of the children ever skip meals because there wasn't enough money for food?

1. Yes
2. No

Don't know / refuse to answer

Q14b. How often did this happen?

1. Almost every month
2. Some months but not every month

3. Only 1 or 2 months

Don't know / refuse to answer

Q15. In the past 12 months, were any of the children ever hungry but you just couldn't afford more food?

1. Yes

2. No

Don't know / refuse to answer

Q16. In the past 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food?

1. Yes

2. No

Don't know / refuse to answer

**End of module**

20 Question Q1 is not used directly in determining household food security status.

## Appendix B: Literature Review Results Table

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Blundell et al., 2018, Newfoundland	University	971	HFSSM	10	Online, recruitment-emails, posters, social media.	12 months	Logistic regression; Chi-sq test	39.9%	Cross-sectional, non-random sample, self-reported, 9.4% response rate. Measures household FI, not individual. Doesn't consider social acceptability of how food obtained, interpretation of "balanced meals", adapt for cultural differences.
Bruening et al., 2018, Arizona, USA	University freshman living in residence	1138	USDA 6-item FI Short Form	6	Part of another survey, online 4 times per year.	Past month, 4 times per year	Structural equation models- chi-sq test	28- 36%	Limited generalizability, self-reported, limited to prospective examination FI and health/behavior outcomes. No examination of causes of FI.
Bruening et al., 2016, Southwestern USA	University freshman living in residence	209	US HFSSM + validated 2 item screening instrument (Hager et al.)	18 + 2 screener	Online, recruitment-resident hall floor meetings	Past month, and same question 3-month period	Mixed Logistic regression; Chi-sq test, t-test	32-37%	Convenience sample, no temporality, non-generalizable findings, self-reported (recall bias, social desirability bias), misinterpretation questions, not validated for college students

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Chaparro et al., 2009, Hawaii, USA	University (non-freshman)	441	USDA AFSSM	10	In person; surveyed classrooms (contacted instructors for approval), questions assessed for readability, relevance with sample of 9	12 months	Descriptive stats; chi-sq test; t-test; linear-by-linear association analysis; Logistic regression	21%	Selection bias, generalizability, challenge assessing income/spending
Darling et al., 2017, Ohio, USA	University (freshman)	98	Hager et al. 2010 2 item screener	2	interview administered questionnaire	The past (no restrictions)	Descriptive stats; t-test	28%	FS not a current measure (history)
El Zein et al., 2018, Florida, USA	University	899	USDA AFSSM	10	Online, via email campus wide (grad and undergrad)	12 months	Chi-sq; logistic regression	32%	Cross-sectional, non-generalizable findings, convenience sample, self-reported data (social desirability bias)

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Hagedorn et al., 2018, Appalachia, USA	University (undergrad and grad)	692	USDA AFSS	10	Professors emailed with link to survey	12 months	Logistic regression; chi-sq test; descriptive stat	37%	limited generalizability from non-probability sample, not establish causation, <u>self reported</u> measures,
Martinez et al., 2018, California, USA	University	9705	USDA 6-item FI Short Form	6	Online- part of NCHA and independent survey	12 months	Structural equation modeling; descriptive stats; chi-sq test; t-test; Confirmatory Factor analysis	40%	Cross-sectional design, no cause/effect/directionality, more females than males, low response rate, FS status past 12months which could <u>been</u> before attended the University
McArthur et al., 2018, Appalachia, USA	University Freshman	456	USDA AFSSM	10	online	12 months	T-test; chi-sq	Living with family FI 7%, on campus FI 22%	limited generalizability,

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Mirabitur et al., 2016, Midwest, USA	University (within housing with and without food provisions)	514	USDA 6-item FI Short Form Modified to focus on individual, not household	6	Online, emailed random sample	12 months	data weighted; chi-sq test; ordered logistic regression; linear regression	54%	Small sample minority groups, needed to group together ethnicities
Morris et al., 2016, Illinois, USA	University (undergrad)	1882	"HFSSM" incorrectly identified, really is the Adult FSSM	10	Online, emailed	9 months	Descriptive stats; chi-sq test; t-test; linear-by-linear association analysis; Logistic regression	35%	Self-reported, limited generalizability
Patton-Lopez et al., 2014, Oregon, USA	University	354	USDA HFSSM Short Form	6	Online, emailed all students	12 months	Descriptive statistics; chi-sq; logistic regression	59%	Cross sectional, self-reported, non-probability sample, low response rate (sampling error and non-response bias), no measurement of child food insecurity and doesn't capture most severe adult food insecurity

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Payne-Sturges et al., 2018, Midatlantic, USA	University (undergrad, of three faculties)	237	USDA HFSSM	18	Online, during class time	12 months	Descriptive stat; chi-sq; test; logistic regression	FI: 15%, 16% at risk FI	Cross-sectional (no causation), selection bias, HFSSM not validated in college population,
Reynolds et al., 2018, Atlantic Province, Canada	University	218	HFSSM (Canada), wording adapted for individual, not household	10	Online, emailed	12 months	Descriptive statistics; chi-sq	37%	Self-reported, low response rate, non-probability sampling (selection bias)
Wattick et al., 2018, Appalachia, USA	University (undergrad and grad)	1956	USDA AFSS	10	Online, university listserv emailed link	12 months	Logistic regression; chi-sq; descriptive stat	37%	self-reported indicators, not generalizable, didn't collect major information (could have contributed to stress level)
Silverthorn, 2016, Canada	University (5 campus's)	4013	HFSSM (select questions)	6	Online- social media, university promotion	12 months	Descriptive	39%	did not use full HFSSM, response bias (over reported FI)
Espinoza, 2013, California, USA	University (grad and undergrad)	597	USDA Adult FSSM	10	Paper survey, selected courses	12 months	chi-sq; descriptive stat	33%	Timing end of fall semester (could have had drop outs not participating), self-reported

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Calvez et al., 2016, Texas, USA	University (undergrad)	263	USDA HFSSM (short form)	6	Online- social media, listservs, class announcement	Current semester	Descriptive	48%	Small sample size
Chappelle, 2015, California, USA	University	231	USDA AFSSM	10	Online- all enrolled students	12 months	chi-sq; t-test; descriptive stat	35%	Very low response rate (technical difficulties, skew data to people who live on campus respond),
Maguire et al., 2016, California, USA	University (grad and undergrad)	1554	USDA HFSSM (short form)	6	Online	30 days	Descriptive	53%	
Gaines et al., 2014, Southeastern USA	University (undergrad, no freshman)	557	USDA AFSSM	10	Paper, selected courses, mix of sampling frame and convenience	12 months	Descriptive; chi-sq; ANOVA; prohibit regression analysis (financial analysis)	14%	Cross sectional, selection bias, not generalizable

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Gallegos et al., 2013, Australia	University (undergrad)	810	USDA FSSM	18	Online, to all students in Business and Health Faculty, university home page link, posters	12 months	Descriptive; chi-sq; logistic regression	25%	Low response rate, not representative sample, cross sectional design, self-reported data,
Hughes et al., 2011, Australia	University (grad and undergrad)	399	USDA Community Food Security Assessment Toolkit (adapted) and single-item question from Australian National Nutrition Survey	Unsure	Paper survey	unsure	Descriptive; chi-sq	Single measure FI 12.7%, USDA 46.5% FI without hunger, 25.3% FI with hunger	Cross sectional, no causation determined
Rideout et al., 2017, British Columbia, Canada	University (undergrad one faculty)	138	Household Food Insecurity Access Scale	9	Unsure	30 days	Chi-sq; t-test; stepwise multiple binary logistic regression	45%	Not indicated

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
King, 2017, Ohio, USA	University (undergrad and grad)	4473	USDA AFSSM	10	Online, university wide email	3 months	Descriptive; Chi-sq; multinomial regression	36%	Cross-sectional- no causation or generalizability, self-reported data, skip patterns survey, not validated for college population 3month recall, misinterpretation questions,
Frank, 2018, Nova Scotia, Canada	University (undergrad)	1030	CCHS HFSSM-Adult	10	Online, university wide	12 months	Descriptive; Chi-sq; logistic regression	38%	Cross-sectional no causation, self-reporting, non-probability sample (although whole population sampled), 12 month recall of tool- could have captured spring/summer off campus, tool measures FI due to financial reasons- other reasons possible (with access and use of food- ex. limited stores, lack transportation, payment times lump sum vs spread out)
McArthur, 2017, Apalacia, USA	University (2nd year undergrad to grad)	1093	USDA HFSSM-Adult	10	Online, emails to all students	12 months	Correlation; chi-sq; regression	46.2%	limited generalizability, non prob sample, self-reporting,
Micevski et al., 2014, Australia	University	124	USDA HFSSM-Adult	?	Paper survey (on campus recruitment, info flyers, posters etc)	12 months	Chi sq; multinomial regression	48%	No clear section

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Olason, 2016, Saskatchewan, Canada	University	1359	CCHS HFSSM-Adult	10	Online, email simple random sample	12 months	Descriptive; chi-sq.	39.5%	No causality, non-representative of campus (self-selection bias),
Silva et al., 2017, Massachusetts, USA	University (grad and undergrad)	390	USDA HFSSM (not explicitly stated, likely adapted)	4?	Paper survey-random classes selected	12 months	Not described in methods	25%	*poor description of methods, including tool and statistics used
MacDonald, 2016, Arkansas, USA	University (grad and undergrad)	473	USDA HFSSM (short form)	6	Online, convenience sample	12 months	Descriptivly; chi-sq.	40%	Convenience sample, not representative, small sample size, <u>self reported</u> .
Gorman, 2014, Ohio, USA	University (grad and undergrad)	298	USDA AFSSM	10	Online, convenience sample	12 months	Descriptive; chi-sq.	49.7%	Small sample size, convenience sample
Entz et al., 2017, Manitoba, Canada	University (grad and undergrad)	548	HFSSM (select) (Meal exchange) Silverthorn 2016 questions + 2 questions students rate own FI	6	"Census style sampling" through email	unsure	Descriptive; chi-sq; regression	35%	Small sample size, other confounders not accounted for

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Biediger-Friedman et al., 2016, Texas, USA	University (grad and undergrad)	258	USDA AFSSM (short form)	6	Online, convenience sample	12 months?	Descriptive; t-test; ANOVA	31%	Cross sectional data, convenience, small sample size,
Donek, 2017, North Carolina, USA	University (undergrad and grad, no freshman)	1093	USDA AFSSM	10	Online, randomized sample	12 months	Descriptive; chi-sq; regression	46.2%	Non-generalizable, cross-sectional, self-reported data, low response rate (sampling error and non-response bias), <u>non-probability</u> sampling
Eubanks, 2017, Mississippi, USA	University (faculty, staff, grad and undergrad)	356	USDA AFSSM (short form)	6	Online, 1/3 campus	12 months	Descriptive; chi-sq.	42%	Did not differentiate between staff and faculty responses, or age
Kashuba, 2017, Oregon, USA	University (grad and undergrad)	1236	USDA AFSSM (short form)	6 (combined two questions into 1-cutting meals and frequency)	Online, non-probability sample	30 days	Descriptive; logistic regression	52%	Response bias, cross-sectional (no casual), no income/expenditure info collected, selection and measurement bias (non-random sampling, non-response bias, voluntary response bias, measurement bias- USDA tool in university population

Author, year, location	Population	Sample size	Tool	Number of Questions	Methods Administer	Recall period	Statistics	Prevalence Food Insecurity	Limitations
Kong et al., 2017, Alabama, USA	University students off campus	351	USDA AFSSM	10	Online, non-probability sample	12 months	Descriptive; logistic regression; chi-sq.	38%	food security scale only 4 dimensions of FS, cross sectional
Miles et al., 2017, Pacific Northwest, USA	University (Social work students)	496	USDA HFSSM (? Children included)	15? (includes children)	Online, non-probability sample	12 months	Descriptive; chi-sq.	43%	non prob sample, single faculty, measurement bias from tool, cross sectional (no causation), social desirability bias
Booth and Anderson, 2016, British Columbia, Canada	University Community (including staff)	400	Question: "How food insecure do you think you are right now"	1?	Online Survey	Current	Descriptive	39% FI students, 39% academic staff, 48% faculty members.	None listed

## Appendix C: Literature Review Results Table - Associated factors and recommendations

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Blundell et al., 2018, Newfoundland	University	971	Logistic regression; Chi-sq test	Out of Province and International students more likely to be FI compared to provincial students (controlled). High risk FI- international, with children, government income as primary income	Dietitians and stakeholders work together, implement strategies to reduce FI, especially in <u>at risk</u> population. strategies- affordable childcare and housing, increased availability financial support. Research needed to develop and validate individual food security- most vulnerable don't live in traditional households
Bruening et al., 2018, Arizona, USA	University freshman living in residence	1138	Structural equation models- chi-sq test	FI related <u>to</u> : poorer eating patterns, physical activity behaviors, mental health.	Multifaceted intervention. Systematically screen for FI in Universities. More research <u>prevent</u> and address FI on and before university
Bruening et al., 2016, Southwestern USA	University freshman living in residence	209	Mixed Logistic regression; Chi-sq test, t-test	FI higher odds depression, lower odds eating breakfast, consuming home cooked meals, perceiving off campus eating habits as healthy, receiving food from parents.	For interventions, consider students with limited resources. More research needed understand scope and prevalence FI

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Chaparro et al., 2009, Hawaii, USA	University (non-freshman)	441	Descriptive stats; chi-sq test; t-test; linear-by-linear association analysis; Logistic regression	Higher risk FI- living on campus and off-campus with roommates, Hawaiians/Pacific Islanders/Filipinos/mixed	Increase food availability and accessibility through on-campus food banks, student gardens. Future studies should assess prevalence in colleges nationwide, investigate connection to performance
Darling et al., 2017, Ohio, USA	University (freshman)	98	Descriptive stats; t-test	FI history- higher BMI, depressive symptoms, stress, disordered eating scores	Interventions that target decreasing negative mental health outcomes and risk for overweight for those with history FI, research prospective longitudinal design, more comprehensive measure of FI, psychoeducation food buying and preparation skills on budget
El Zein et al., 2018, Florida, USA	University	899	Chi-sq; logistic regression	Increased likelihood accessing food pantry: being food insecure, international status, student loan/need based federal funding	Reduce social stigma with food pantry/interventions

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Hagedorn et al., 2018, Appalachia, USA	University (undergrad and grad)	692	Logistic regression; chi-sq test; descriptive stat	Higher scores for money expenditure and coping strategies significantly higher odds being FI. Odds of higher academic performance score inversely related to FI. Significant predictors of FI: money expenditure, coping strategies, health, school year remained.	Provide for basic needs- would promote success of students. Targeted interventions to promote academic success. Behavioral differences for coping strategies, money expenditure, academic performance of FI individuals can be used to identify and target at risk students to promote well-being.
Martinez et al., 2018, California, USA	University	9705	Structural equation modeling; descriptive stats; chi-sq test; t-test; Confirmatory Factor analysis	FI related to lower GPA directly and indirectly through poor mental health	Interventions and policy to provide students with basic needs for academic and future success, Institutions devise strategies to ID students at risk and assist those who would benefit from campus services and federal/state/local programs
McArthur et al., 2018, Appalachia, USA	University Freshman	456	T-test; chi-sq	FS significantly higher on self-rated academic progress, perceived health status and healthy eating habits	Campus and community interventions to increase food access (ex. More part time jobs, affordable meal plans)

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Mirabitur et al., 2016, Midwest, USA	University (within housing with and without food provisions)	514	data weighted; chi-sq test; ordered logistic regression; linear regression	Within housing without food provisions, marginal and low FS lower Fruit and vegetable intake, undergraduate more likely to have lower FI compared to PhD/graduate professionals	Garden/farm access, affordable food outlets, reduce cost campus meal plan (on campus for off campus students), health center/counseling screen for FI and refer to resources
Morris et al., 2016, Illinois, USA	University (undergrad)	1882	Descriptive stats; chi-sq test; t-test; linear-by-linear association analysis; Logistic regression	Significant relationship between FS and race, GPA, loan use, living location	Campus food banks/pantries, counselors/nutrition educators provide info re: eligibility Supplemental Nutrition Assistance Program (federal benefit), erase stigma for food assistance
Patton-Lopez et al., 2014, Oregon, USA	University	354	Descriptive statistics; chi-sq; logistic regression	Factors associated with FI: fair/poor health, being employed, income <15,000 per year. Good academic performance inversely associated with FI	Expand research on different campus settings and strengthen support systems to increase access nutritious foods and improve economic stability

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Payne-Sturges et al., 2018, Midatlantic, USA	University (undergrad, of three faculties)	237	Descriptive stat; chi-sq test; logistic regression	Higher odds FI/at risk FI: African American, other race/ethnicity, multiple forms financial aid, and experiencing housing problems. FS- less likely report depression symptoms than at risk/FI.	Universities that measure FS better positioned advocate for policy changes regarding affordability and financial assistance.
Reynolds et al., 2018, Atlantic Province, Canada	University	218	Descriptive statistics; chi-sq	Students in higher years study, living off campus higher rates FI	Advocate increased funding for students, reducing/halting education costs for students, improve access to healthy, affordable food
Wattick et al., 2018, Appalachia, USA	University (undergrad and grad)	1956	Logistic regression; chi-sq; descriptive stat	Association of anxiety and depression and FS status	Research a better validated tool for mental health and diet quality
Silverthorn, 2016, Canada	University (5 campus's)	4013	Descriptive		Policy recommendations- national survey FS and housing, guaranteed annual income (investigate), TRC calls to action, local programs/policies for affordable housing
Espinoza, 2013, California, USA	University (grad and undergrad)	597	chi-sq; descriptive stat	No difference FS based on GPA, race/ethnicity. Difference based on living arrangement, income level, credit card debt, health status, food coping strategies	Research further, identify factors increase risk FI, reduce prev. ID why few use emergency food services

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Calvez et al., 2016, Texas, USA	University (undergrad)	263	Descriptive	42% meal plan users low or very low FS rate3s non-meal plan users 50%	
Chappelle, 2015, California, USA	University	231	chi-sq; t-test; descriptive stat	Poor health and wellness outcomes significantly assoc. with FI	Reject "impoverished student experience" that is normalized, long term solutions needed- food assistance program, health and wellness education, work with policy makers
Maguire et al., 2016, California, USA	University (grad and undergrad)	1554	Descriptive	Freshman more likely to be high/marginal FS, graduate students more likely high/marginal FS	State and Federal policies need to be redesigned to be more inclusive for college students - ex. Easier to be eligible for public social service programs
Gaines et al., 2014, Southeastern USA	University (undergrad, no freshman)	557	Descriptive; chi-sq; ANOVA; prohibit regression analysis (financial analysis)	FS status signif. Assoc. with food resource adequacy (receiving financial aid, on food assistance, financially independent). Familial financial support, alternative financing (eg credit cards) negatively assoc with FI. Higher score on measure of resource adequacy (not cooking self-efficacy) less likely food insecure	Further research FI variety student populations

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Gallegos et al., 2013, Australia	University (undergrad)	810	Descriptive; chi-sq; logistic regression	Associated with FI: low income, reliance on government support, renting. FI households- x2 as likely report fair or poor health, x3's likely to have deferred studies due to financial difficulties. 80% studies compromised	Strategies to alleviate FI could improve retention rates and educational outcomes. Improve access, availability, affordability of food on campus. Develop innovative strategies that promote dignity.
Hughes et al., 2011, Australia	University (grad and undergrad)	399	Descriptive; chi-sq	FI significantly associated with renting, boarding or sharing accommodation, low incomes or receiving government assistance. FI more likely rate health lower than those FS.	Further research broader determinants of FI and responses- including social support
Rideout et al., 2017, British Columbia, Canada	University (undergrad one faculty)	138	Chi-sq; t-test; stepwise multiple binary logistic regression	Each year education associated with 39% decrease FI risk, parent as primary food purchaser associated with 80% decrease risk, having moved to Vancouver within 3 years associated with 279% increase in FI risk. 6 FI students used emergency food programs.	Ensure FI students connected with appropriate resources, public support (ex. Guaranteed Income Supplement), more research across Canada

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
King, 2017, Ohio, USA	University (undergrad and grad)	4473	Descriptive; Chi-sq; multinomial regression	Association with FS status: ethnicity/race, marital status, class standing (undergrad vs grad), residence, employment status, financial aid and previous/current use of federal assistance (ex. NSLP, SNAP) signif. relationship with FS Status.	Validate tool with University population (language to avoid misinterpretation), inclusion FS question on funding application, institutions work with student's awareness benefits, barriers to access, contracts with food vendors to include provisions to address student FI (ex. portion annual profit for resources), modify current SNAP guidelines etc
Frank, 2018, Nova Scotia, Canada	University (undergrad)	1030	Descriptive; Chi-sq; logistic regression	FI associated with living arrangements, source of funds for schooling, meal plan and year of study. Poor overall health, poor mental health, high stress, poor academic performance signif. higher for FI students	re-evaluate funding policies for post-secondary education to ensure affordability of costs of basic needs and educational costs
McArthur, 2017, Apalacia, USA	University (2nd year undergrad to grad)	1093	Correlation; chi-sq; regression	Predictor variables: higher money expenditure, lower GPA, male, receiving financial aid, fair/poor self-rated health, never cooking for self or others	FI student interventions teach budgeting skills, how purchase and prepare healthy foods, policies increase access food resource assistance
Micevskij et al., 2014, Australia	University	124	Chi sq; multinomial regression	Lower odds FI students living with family, higher odds if receiving government support	Increase food availability, accessibility (ex. Food bank) (not a solution), further work to determine causal intervention

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
Olsson, 2016, Saskatchewan, Canada	University	1359	Descriptive chi-sq.	Increased odds FI students who are parents, international students, rely on gov student loans as primary source income	Need to understand barriers to FS better-engage other universities to undergo similar work
Silva et al., 2017, Massachusetts, USA	University (grad and undergrad)	390	Not described in methods	Homelessness and severe FI greater risk no completing University	Identify students with difficulties to intervene and increase retention and student health and wellbeing. Study results can inform policy and practices.
MacDonald, 2016, Arkansas, USA	University (grad and undergrad)	473	Descriptive; chi-sq.	Negative correlation FI and educational attainment	More awareness FI issues and services
Gorman, 2014, Ohio, USA	University (grad and undergrad)	298	Descriptive; chi-sq.	Signif relationship between living arrangement, location, level of FI. Higher FI living off campus. No relationship between FI and class standing (ex. First year vs graduate student)	Increase food availability and accessibility.
Entz et al., 2017, Manitoba, Canada	University (grad and undergrad)	548	Descriptive; chi-sq; regression	Indigenous students 5-10 times more likely report FI than non-Indigenous students. Severe FI 5x's more likely on student/bank loans, FI signif more likely poor to fair mental and physical health.	Institutions/government need to consider implications of tuition increases and funding for universities on FI
Biediger-Friedman et	University (grad and undergrad)	258	Descriptive; t-test; ANOVA	purchasing patterns consistent across levels of FS	Explore other influencers of food purchasing (upper level environmental),

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
al., 2016, Texas, USA					
Danek, 2017, North Carolina, USA	University (undergrad and grad, no freshman)	1093	Descriptive; chi-sq; regression	Predictive of FI: female, higher money expenditure and coping strategy scores, lower GPA, receiving financial aid, students who did not own a car, perceived fair/poor health status, lower frequency cooking for self or others. Reported coping strategies as well.	"Immediate need for food resource assistance"- on campus and community based
Eubanks, 2017, Mississippi, USA	University (faculty, staff, grad and undergrad)	356	Descriptive; chi-sq.	Awareness of food bank and food consumption q's (meal plan, budget, food cultural beliefs)	Future research on financial aid status and FI. Relationship btwn food banks in area and FS.
Kashuba, 2017, Oregon, USA	University (grad and undergrad)	1236	Descriptive; logistic regression	Higher risk FI- Hispanic/Latino, international, LGBTQ, first-generation college student), black/African American, FI signif assoc lower GPA.	Add FS questions to more general student survey to reduce response bias and have longitudinal data to understand FI and help ID causal relationship if exists
Knol et al., 2017, Alabama, USA	University students off campus	351	Descriptive; logistic	FI not associated with obesity, FI signif higher rates fair/poor health compared to FS	Educators should be cognizant of financial conditions may place students at risk for FI, need interventions to address FI on campus

Author, year, location	Population	Sample size	Statistics	Other associated factors	Recommendations
			regression; chi- sq.		
Miles et al., 2017, Pacific Northwest, USA	University (Social work students)	496	Descriptive; chi- sq.	Students in BSW program, students of color, females, first gen college students more likely FI	Administrators should strongly support students challenged to meet basic needs- additional beyond financial aid packages from university. Etc etc understand and address FI
Booth and Anderson, 2016, British Columbia, Canada	University Community (including staff)	400	Descriptive	No data	Not described