# Graduate Student Food Insecurity on Campus: A Hidden Hurdle

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## Abstract

Food insecurity is characterized by an uncertainty or inability to acquire sufficient amounts of food needed to meet the dietary requirements of household members, due to a lack of financial resources within the household (Polsy & Garriguet, 2022). Post-secondary students are a particularly vulnerable population, with a disproportionate number reporting having experienced food insecurity during their studies (El-Zein et al., 2019). Such tendencies are concerning as correlations between food insecurity and various adverse outcomes influencing the health and well-being of post-secondary students have consistently been documented in the literature. However, very little is known regarding the specific experiences of graduate students. To this end, this thesis seeks to bridge the gaps in our understanding through a three-phase approach. Phase one of this thesis assessed changes in neighborhood food environment quality pre- and post-pandemic using data from 39 supermarkets located in Ottawa. The findings suggest that food affordability and food quality have decreased post-pandemic with disparities persisting between high and low socioeconomic status neighborhoods in Ottawa. Phase two consisted of a survey of 363 anglophone graduate students attending the University of Ottawa revealing that 48% were food secure, 13.5% of graduate students were marginally food insecure, 19.5% were moderately food insecure, and 18.7% were severely food insecure. Furthermore, food insecure students were more likely to report a negative influence on their academic performance, course load, in-class participation, attendance, and sense of belongingness to graduate studies community. Finally, phase three made use of semi-structured interview with 14 food insecure graduate students which revealed four key themes namely 1) Graduate students understood food insecurity as a lack of proximity, affordability, quality, and time; 2) Food insecure students experienced adverse physical and mental health outcomes, lower socialization, and academic outcomes; 3) Institutional factors hindered help-seeking behaviours; and 4) Food insecure advocated for holistic programs on campus to mitigate food insecurity. Together, the findings of the thesis provide insights into the experience of food insecurity amongst graduate students which may be used to adapt policies and approaches used by universities in better supporting students.

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# Table of Contents

## List of Figures

## List of Tables

# Chapter One - Introduction

This article-based thesis contains five chapters. Chapter one beings with a brief explanation of my personal motivations and explores the ways in which I experience food as a prominent factor of my cultural identity, before outlining the literature review which informed the overarching thesis project. Specifically, I delve into the outcomes of food insecurity as it relates to the physical and mental health, as well as academic success, of post-secondary students. I then present the theoretical and conceptual frameworks guiding this thesis' inquiry process and which establishes the research questions that will subsequently be investigated. Finally, chapter one concludes by presenting the subsequent chapters of this thesis.

## Personal motivation to conduct this research

As I write this portion of the introductory chapter, I sit on the terrace of the house my father built, looking out to the land that partially feeds my family in Tunisia. So, it is only fitting to open this chapter by first touching on my family history. I am a second-generation immigrant to Canada. My family, as well as my husband, are originally from a small town in Tunisia called Ras El Jebel (Head of the mountain). The Karouis, my father's side of the family, represent multiple generations of farmers with land being transferred from parents to children. My paternal grandfather and grandmother (may they rest in peace) inherited their land from their parents, and my six uncles, aunt, and father, in turn, inherited the land from their parents and so on. Today, the portion of land written to my father is not only the land upon which our family home is built but is also home to our pomegranate trees, orange trees, walnut trees, apple trees, and perhaps most importantly, olive trees used to make the most delicious olive oil which we produce and preserve using traditional methods and use as the first ingredient for all meals we prepare. As the Tunisian folk song goes:

يا زيتونة خضراء فوق التلة
شامخة وراسخة في أرضنا الأصيلة
من زيتك نعيش ونفرح ونتهنى
ومن ظلك نحتمي في شمسنا الجميلة

Oh green olive tree on the hill,

Standing tall and rooted in our ancient land.

From your oil, we live, rejoice, and find comfort,

And from your shade, we shelter under our beautiful sun.

**Figure 1**. Pictures of olive and pomegranate trees from my family's farm in Ras Jebel, Tunisia.

**Figure 2**. Traditional Tunisian olive oil pottery

While the food from our farm is not enough for commercial sale, one of my uncles, Youssef, and his two sons, Ahmed and Houssein, are the family's most prominent farmers. Their livelihood depends on the land's produce. Every summer, I witness their dedication to farming as they work long hours under challenging conditions and climates to provide fresh produce to sell at local markets.

**Figure 3**. Picture of my cousin's daily harvest from summer 2023.

My family's history, Tunisian culture and heritage, as well as my summers living on the farm in Ras Jbel, have emphasized the importance of fresh and nutritious food in my eyes, which has partially fueled my interest and passion for food and nutrition. However, in recent years, as we continue to experience the impacts of climate change, I have witnessed a detrimental change in the day-to-day lives of my family members in Tunisia. With abnormally hot summers and a significant decrease in rainfall, sustaining small farming businesses such as my uncle's is becoming harder and harder. Indeed, this is not unique to my family's farm. In fact, recent

studies demonstrate a clear link between climate change and negative impacts on agricultural yields across African countries such as Ethiopia, explained by a decrease in annual rainfall as well as the late-onset and early cessation of rainy seasons (Mekonen et al., 2021). With smaller yields from local farms, comes an increased difficulty in accessing healthful food items as availability of food is limited and thus pricing of food increases. In addition, with the ongoing wars, access to food becomes increasingly difficult (Fiandrino et al., 2023). In point of fact, we are seeing a decrease in both availability and affordability of food in Tunisia as imported goods are negatively influenced by the global crisis (Le Monde, 2023), which could increase the prevalence of food insecurity in the country. From this is born my passion and advocacy for what Adams (2021) coins the right to food for all.

**The Right to Food – A promise for a food secure world.**

At its core, the right to food posits that guaranteed access to safe, sufficient, and nutritious food should be a universal humanitarian right (Adams, 2021). Over the course of the past few decades, many international organizations such as the World Food Program, the Food and Agriculture Organization, amongst others have continuously advocated for this right to all. Indeed, as of 1989, the United Nations Centre for Human Rights (1989) declared that food security is a fundamental human right and essential to one's material well-being. Following, in 1996, members of the United Nations committed to the *World Food Summit Plan of Action* at the Rome Declaration on World Food Security with the goal of building a food secure world (The Rome Declaration on World Food Security, 1996). Since then, various United Nations agencies have continued to draft resolutions aimed at resolving the food insecurity crisis worldwide (Adam, 2021). Yet, over two decades later, food insecurity still presents an important and persistent public health challenge in North America, disproportionally impacting children, youth, and young adults (Men et al., 2021). Within this context, food insecurity is assessed at the household level (Blanchet et al., 2020). According to Statistics Canada (Polsy & Garriguet, 2022), food insecurity is characterized by a lack of financial resources within a household, causing an uncertainty or inability to acquire sufficient amounts of food needed to meet the dietary requirements of household members. While food insecurity rates are lower in Western countries, there are still 12% of Canadian households experiencing marginal to severe food insecurity, impacting approximately one million underaged Canadian children (Tarasuk et al., 2017).

Within Western countries, a variety of socioeconomic factors put households at an increased risk of experiencing food insecurity. For instance, in North America, lone-parent households (Tarasuk et al., 2017), being racialized as Black (Dhunna & Tarasuk, 2021), identifying as First Nation, Metis, or Inuit (St-Germain et al., 2019), unemployment (Petralias et al., 2016), and low education levels (Hussain et al., 2021) are associated with a higher risk of experiencing food insecurity. Another socioeconomic status variable often mentioned in the literature surrounding food insecurity concerns the built environment(s) within which individuals engage, whether it be their neighbourhoods or place of work. Specifically, it is the quality, quantity, and accessibility to food within such environments which holds an influence on the risk of developing food insecurity. For example, Lamicchane et al. (2012) demonstrate that individuals living within lower quality food environments with more difficult access to healthful foods typically reside in neighbourhoods with lower socioeconomic status and are 25 to 46% less likely to follow a healthy diet that meets their nutritional needs. Additionally, following the COVID-19 pandemic and the rise of food prices, the rate of food insecurity in North America is only increasing as the ability to purchase food items decreases (Hutchinson & Tarasuk, 2021; Hussain & Tarasuk, 2021). This presents a public health concern as the experience of food insecurity in North America is associated with an increased prevalence of chronic physical and mental health concerns (Jessiman-Perreault & McIntyre, 2017), to which post-secondary students are particularly vulnerable.

**Food insecurity in higher education.**

Post-secondary student food insecurity within North American university and college campuses are high, with the rates of food insecurity far exceeding national averages (El Zein et al., 2019). Within North America, food insecurity is most typically experienced by already marginalized student populations. For instance, Black, Indigenous, Latinx, and other students of colour are reported to experience food insecurity at higher rates than their white counterparts (Townley et al., 2020; Baker-Smith et al., 2020). Additionally, non-traditional students such as mature, single parents, or low socioeconomic status students are also experiencing higher risks of food insecurity throughout their time in higher education (Martinez et al., 2021). Furthermore, the experience of food insecurity persists despite students holding part-time jobs and/or scholarships (Martinez et al., 2021). This is problematic as, according to Shipley and Christopher (2018):

> "At the heart of this matter dwells the paradox: marginalized students attempting to improve their quality of life yet facing obstacles tethering them into a cycle of poverty, The [higher] educational system they turn to as an avenue to break out of this cycle remains the same system retaining them in the cycle." (p.311)

As such, the experience and high prevalence of student food insecurity within university and college campuses undermines the socioeconomic goals of these institutions (El Zein et al., 2019). In this way, student food insecurity presents a critical social justice concern in academia, which requires intentional action and research (Shipley & Christopher, 2018).

The study of student food insecurity in a higher education context is a relatively new area of inquiry, with the first study appearing in 2009 conducted at the University of Hawaii at Manoa demonstrating that over 1/5$^{th}$ of students did not have access to sufficient food to maintain an active and healthy lifestyle (Chapparo et al., 2009). Over the past decade, studies on post-secondary student food insecurity have primarily been conducted in the United States (US), showing that students experience food insecurity at higher rates than the general population (Bruening et al., 2017; Nikolaus et al., 2019; Service ER, 2021). Similarly, in Canada food insecurity rates amongst post-secondary students have been documented and range between 25.7% to 38.1% (Olauson et al., 2018; Entza et al., 2017; Frank, 2018; Silverthorn, 2016). In contrast, the Canadian national average remains around 12% (Tarasuk et al., 2017). In light of these findings, it is evident that food insecurity remains a significant challenge within North American campuses. Beyond the concerns relating to the prevalence of food insecurity on campus, one should also consider the hurdles which food insecurity may present in the academic achievement of food insecure students within higher education. Of the studies conducted to date, many highlight the relationship between food insecurity and lower academic achievement through variables such as adverse physical and mental health outcomes (Crutchfield et al., 2020; Keenan et al., 2021; Martinez et al., 2021). For example, food insecure students report experiencing fatigue, an inability to focus, and sluggishness which impacts their abilities to achieve their academic goals (Crutchfield, 2020; Farahbakhsh et al., 2017). Furthermore, within Canada, food insecure students are more likely to receive lower grade point averages than their food secure counterparts (Frank et al., 2018). In this way, it is crucial to investigate the role food insecurity may play on Canadian campuses.

### *The role of the university in supporting food insecure students*

Despite the hurdles experienced by food insecure students, they remain committed to the completion of their degrees (Beam, 2020). Yet, the degree completion rate of food insecure students remains closely related to the support they receive from the university community in sustaining their basic needs (Crutchfield & Maguire, 2018; Goldrick-Rab, 2018). In hopes of facilitating success, universities have recently put in place a multitude of programs, the most prominent of which remains charity-based initiatives such as on-campus emergency food pantries (Nazmi et al., 2019). In recent years, North American campuses have seen a growth in campus food pantries due to changing student demographics and an increase in school-related fees such as tuition or meal plans (Daugherty et al., 2019). According to Cady (2014), on-campus food pantries have long been relied upon as a first response for student food insecurity as they are thought to supplement student diets and relieve student food insecurity adequately. However, such a belief does not necessarily hold true. Firstly, students often view food pantries as a last resort due to the social stigmatization and normalization of student food insecurity in higher education (Sabi et al., 2019; Daugherty et al., 2019), whereby accessing emergency on-campus food pantries may be interpreted as personal failure (El Zein et al., 2019) and thus avoid its use. For example, a study at the University of Saskatchewan showed that less than 1% of food insecure students indicated visiting the on-campus food pantry (Olauson et al., 2018). Secondly, accessing food pantries presents a logistical issue for food insecure students as hours of operation tend to conflict with class time thus making students choose between visiting the food pantry or attending their courses (Smith-Carrier et al., 2017). Finally, the food found at on-campus food pantries are often packaged, non-perishable items which do not address the lack of fresh produce often lacking in food insecure diets (Martinez et al., 2021; Hagedorn et al., 2019). In this way, food pantries are only meant to address episodic hunger (Mook et al., 2020) and are not intended to support chronic student food insecurity on their own (Hagedorn-Hatfield et al., 2022). To this end, some North American universities have implemented additional initiatives to address student food insecurity on campus, such as mandatory meal plans.

On-campus meal plans are put in place by universities with the belief that they provide the necessary nutrition for students to function in an academic environment and alleviate the stress associated with purchasing one's own food (Diaz & Gaylor, 2020) all while representing a substantial profit for universities (Mathewson, 2017). However, similarly to food pantries, meal

plans do not work towards alleviating student food insecurity and remain significantly correlated to the experience of food insecurity (El Zein et al., 2019; Hickey et al., 2019). This is in part explained by the cost of meal plans, which pushes students with limited financial resources to opt for lower-priced plans offering fewer meals a week (Frank, 2018). With little ability to purchase foods outside of campus, students adapt their eating behaviours to conform to their meal plans (e.g., consistently skipping meals) and experience food insecurity (Shipley & Christopher, 2018). As such, researchers have been advocating for more holistic food programs that leverage established practices within the university, such as food recovery models (Dubick et al., 2016). For example, in the US, the Swipe Out Hunger program allows students to donate their unused meal plan account balances to food insecure students (Swipe Out Hunger, 2019). Alternatively, some campuses in the US have implemented the Matching Excess and Need for Stability (MEANS) program, which makes use of a mobile application encouraging dining halls, restaurants, and other food facilities to post when they have excess food available for pick-up at a reduced price or for free (Beam, 2020; MEANS, 2022). On the other hand, some researchers advocate for programs that facilitate food access, such as campus gardens and/or farmer's markets (Sharpe et al., 2018; Stluka et al., 2019). Such programs are intended to supplement fresh fruit and vegetables typically lacking in food insecure diets and may not be readily available at food pantries (Manry et al., 2017; Osiecki et al., 2022). However, such interventions, when used in isolation, cannot fully address student food insecurity on campus (Merjia et al., 2020), and the success of these programs is dependent on the campus community, starting with faculty and staff awareness (Crutchfield & Maguire, 2018).

Staff and faculty hold a positional power within universities and colleges (Stebleton et al., 2020). In this way, they have the potential to play a major role in assisting food insecure students and should be made aware of the effects which food insecurity holds on students within their classrooms (Broton & Cady, 2020). For instance, food insecure students express the need for professors to acknowledge that lack of engagement/attention during class may be due to a lack of food rather than disinterest in the subject matter (Beam, 2020; Diaz & Gaylor, 2020). Furthermore, researchers advocate for the involvement of academic staff in reducing food insecurity on campus. Such involvement is crucial when considering that many food insecure students report that faculty and staff are often unaware of the issue of campus food insecurity and are thus insensitive toward their experience (Martinez et al., 2021). To address this concern,

Duran & Nuñes (2021) state that professors should be educated on the resources available on campus for their students and include these resources in their course syllabi. Through such training, staff and faculty members' understanding of student food insecurity is increased, and the stigma surrounding the topic may be alleviated (Khosla et al., 2020). In this way, addressing student food insecurity on campuses requires a coordinated effort between the institution, faculty, and staff members. Yet, as higher education institutions experience cuts in their budgets, many in North America have moved towards a neoliberal corporate model of management wherein profit is prioritized, education becomes a marketable commodity, and students are thought of as consumers of educational products rather than integral members of the university community (Morgan, 2022; Gasser, 2024). Unsurprisingly then, students start to experience a sense of alienation from the university community (Wong, 2022) and perceive a sense of carelessness from the university vis à vis the hurdles they may experience such as those brought forth by food insecurity (Sallee et al., 2024). As such, efforts to address student food insecurity must also seek to resist neoliberal ideologies within campuses and push for solutions which address the inequities students still experience within its walls.

***Food insecure graduate students: An understudied population.***

Within the field of food insecurity in higher education, most studies have focused on the experiences of undergraduate students. As a result, graduate students present a noticeable gap in our understanding of food insecurity on university campuses (Coffino et al., 2020). However, some studies have been conducted on the graduate student population specifically. For example, Hill et al. (2021) find food insecurity rates amongst the graduate student body to be approximately 21% as compared to 34% amongst the undergraduate population. Another study conducted by Lankford et al. (2022) highlights more concerning food insecurity rates amongst graduate students wherein 34.5% experienced high food insecurity and 35.8% experience very high food insecurity. Further studies investigating risk factors in the experience of graduate student food insecurity show that the effects of food insecurity are more strongly observed in racialized and minority students (Boncyk et al., 2021) and highly prominent amongst international students (Amoyaw et al., 2022). However, further investigation on the experiences of graduate students is warranted as they often receive lower financial support from family members, higher restrictions on working hours, and are usually older adults as compared to undergraduate students (Hiller et al., 2021; Coffino et al., 2020) and thus generalizing the

findings from the undergraduate population to the graduate population may lead to flawed conclusions.

## Theoretical Framework – Post-Positivism

This thesis aims to establish the prevalence of graduate student food insecurity within the University of Ottawa and provide insights into their perceptions of the issue of student food insecurity in hopes of improving current practices and programs put in place in Canadian institutions. To do so, a post-positivist theoretical framework following Karl Popper's Critical Rationalism was adopted (Popper, 1963) in order to test whether current beliefs, practices, and policies are shown to withstand the process of falsification wherein theories are put through empirical testing by the researcher(s) and/or decision-makers.

### *Post-Positivism*

Following the popularization of positivist knowledge, such as Freud's and Adler's theories of psychotherapy, Karl Popper took notice that these concepts built on self-justifying beliefs, which were defended and viewed as true for all, were, in fact, logically flawed (Maxwell, 2017, p.12; Hicks, 2018). That is, these theories and derived hypotheses did not lend themselves to being falsified and thus, according to Popper, could not be incorporated into his conceptualization of scientific knowledge but would rather remain pseudoscience and thus meaningless (Miller, 2017, p.52; Popper, 1963, pp. 344-345, 378). Moreover, Popper (1963, pp. 305-309) regarded positivists' ontological positioning that truth is objective, external, and attainable through measurements as impossible. Thus, its associated static claims about the reality of the social world must remain open to the possibility of being disproven. That is, continuing to argue for the validity of theory through confirmative empirical evidence will always remain logically fallible no matter how many times the theory is shown to be true. To counter the positivist logical and philosophical downfalls, Popper put forth the critical rationalist approach in his work *Conjectures and Refutations* (1963), which he viewed as the best-suited methodology for scientific inquiry and the study of human behaviour.

To summarize, critical rationalism rejects verification and instead advocates for the use of falsification to approach a given research problem objectively and without hypothecation of the study's results. That is, researchers advance empirical falsifiable conjectures or guesses, accept them as provisional and tentative theories of Truth, and then subject those conjectures to a

multitude of testing through various approaches with the goal of finding errors within the theory and proving it to be false (Rod, 2015; Alger, 2019). Using this critical rationalist approach, Popper sought to guide knowledge growth using a system akin to natural selection. To this end, Popper (1963) made use of tentative theories, which he put through cycles of testability in such a way that $T_2$, being an evolution of $T_1$, contained less erroneous guesses of the truth while also not losing any degree of truthfulness (p.314). This evolving and iterative understanding of knowledge growth was later also expressed in the following way:

> P1 → TT → EE → P2, where P1 is the initial problem state, TT is a tentative solution or theory, EE is the error elimination process applied to the theory, and P2 represents the new problem state generated by the process (Popper, 1972, p.121, as cited in Gladish, 2019, p.388).

Thus, this approach would bring our collective knowledge a degree of verisimilitude, which is the closest understanding of Truth given our current context (Popper, 1963, pp.313-316). In other words, whether the conjectures are refuted or shown to not yet be false, the critical rationalist approach argues that our understanding of the truth and knowledge will still be transforming and evolving towards the objective, static, and external Truth.

### *Critiques of Post-positivism*

While post-positivism is a valid paradigm in social sciences and educational research, it has not been immune to criticism in the literature. Firstly, post-positivism is criticized for its apparent futility of formulating hypotheses regarding the true nature of knowledge. This criticism brings some to question whether post-positivism is worthwhile, given that only a probable understanding of the Truth rather than the truth in and of itself can be uncovered. According to Ager (2019), such criticism results from a misinterpretation of the post-positivist falsification criteria. That is, falsification's purpose is not, as some assume, to prove all our theories false but rather to test whether the theories can withstand criticism. A second critique of post-positivism comes from the belief that post-positivist makes use of inductive reasoning when choosing which theory to implement in practice and thus do not adequately address the downfalls of positivism (Ormerod, 2014). Here, Maxwell (2017) states that the choice of one theory or hypothesis over another is not based on induction, that is, on previous experiences, but rather on the understanding that because a theory has withstood the test of falsification and has been

corroborated, it is the rational position to give this theory more credence than one which has not yet been tested or one which cannot be subjected to falsification. Finally, post-positivism is critiqued for reducing complex social phenomena into observable and measurable constructs (Young & Ryan, 2020). However, as previously stated, post-positivism lends itself to the use of mixed-methods methodologies whereby sequential mixed-methods case study research can be used to gather data from multiple sources and obtain a more holistic representation of the social phenomena being studied (Wahyuni, 2012; Romm, 2020; Tanlaka et al., 2019).

Post-positivism is also frequently critiqued by those endorsing an interobjective approach to research. Such epistemological perspectives criticize the objective and reductionist aspect of post-positivism and instead advocate for a relationship approach to inquiry whereby uncertainty is acknowledged, and the world is viewed as dynamic and based on interactions between oneself, others, and the surroundings (Letts, 1998). In this way, interobjectivists emphasize "networks of relations that emerge between actors, objects, and their environment" and are rooted in a social-ecological system (Davis, 2021). That is, knowledge is reframed away from seeking out objective external truths in favour for an approach which is more pragmatic in nature and focuses on the plurality of worldviews and the coherences of one's theories with the environment which surrounds them (McMurtry, 2024). In other words, rather than seeking out one objective truth, the plurality of truth is embraced which values the various perspectives individuals may bring to a given area of interest. As such, for advocates of such epistemologies, the ontological and objective truth sought out by post-positivists is seen as an unproductive endeavor which should be put aside in favour of an approach which allows researchers to adopt various perspectives, methods, and processes to posit a form of knowledge which is adapted to one's environment and open to evolution over time (McMurtry & McMurtry, 2016). That is, the goal of knowledge becomes the elaboration of pragmatic ways of understanding and interacting with surrounding environments rather than an objective understanding of the one external Truth (McMurtry & McMurtry, 2016). Nonetheless, post-positivists retain that scientific inquiry should remain critical and open to falsification. That is, by emphasizing pragmatism, relativism, and subjective idealism, one runs the risk of fabricating an understanding of truth which over-emphasizes situatedness and does not lend itself to continuous criticism (Paranje, 1993). To illustrate, one could quickly recognize its downfalls when considering the issue of addressing graduate student food insecurity. One could implement a given food program that acknowledges the complexity

of food insecure graduate students. Hypothetically, one could consider the ways in which food insecure graduate students interact with and are in turn influenced by their surrounding environment (e.g. local farms, seasonal selection of foods, cultural diversity, etc.). The elaborated program could in theory appear to be coherent with the environment in question such as within the university community context. In other words, on the surface the program could appear to be successfully interacting with the targeted population. Take for instance a campus food bank which regularly distributes meals to students who visit the establishment. That said, regardless of the program, for post-positivists it is vital that continuous falsification be used in a way which ensures that it is continuously addressing and adequately meeting the needs of food insecure graduate students, by putting our held knowledge or conjecture of truth to the test. That is, for post-positivists, failure to continuously challenge our conjectures of the truth puts us at risk of wrongly accepting pseudoscience as truth (Popper, 1963). To come back to the example, one should seek to pinpoint downfalls in their proposed program to ensure its appropriateness. For instance, one could seek to determine whether the students visiting the campus food bank are representative of the food insecure population and explore the after-effects accessing a campus food bank may have on the nutritional needs and sociopsychological health of those students. Indeed, it could be found that the food bank is only serving severely food insecure students and providing food items which are low in nutritional quality and that the action of accessing a food bank places a heavy psychological burden on students. That is, even though on the surface the program may seem adapted and coherent with the environment, without continuous re-evaluation and attempts to falsify the effectiveness of the program one cannot ascertain whether it is truly addressing the needs of food insecure students. In this way, through one's biases, we could run the risk of dismissing the gaps in our current programs aimed at mitigating food insecurity on campus and wrongly accepting the program as "good enough" for the problem at hand.

Additionally, post-positivists acknowledge the role of the situatedness, or the sociohistorical context, in the inquiry process. However, as opposed to interobjectivists, who view situatedness as a means towards knowledge development through coherence (McMurtry & McMurtry, 2016), post-positivists view situatedness in such a way that our current understanding of a phenomenon is rooted within our current context. That is, theories or conjectures of the truth should be continuously re-examined as the context of the research changes. A second critique of post-positivism by interobjectivists relates to the issue of researcher objectivity. Indeed,

according to interobjectivists, the post-positivist attempts at maintaining objectivity in the research process are futile as the researchers are in constant interaction with their research process and thus external objectivity is impossible (Davis, 2021). However, post-positivists acknowledge that, as human beings, researchers are biased by their own culture, past experiences, and world views, which can impact their interpretation of knowledge (Young & Ryan, 2020). However, this subjectivity and value-laden element is only with regards to the researcher(s) as a human being rather than about the objective true Truth. Again, the idea being that theories or conjectures of truth should continuously be put through falsification to avoid the risk of accepting untrue or partially true version of knowledge.

***Post-positivism applied to the study of student food insecurity.***

Within the context of the present project, the study arises from three commonly held societal beliefs. Firstly, that everyone within a university/college campus has easy access to food (Beam, 2020). Secondly, the study rises against the bootstrap myth whereby it is believed that individuals looking to achieve a degree have the means to do so via their personal autonomy, thus blaming food insecurity on personal limitations and failure (Lardier et al., 2017). Finally, the study arises from the societal normalization of student food insecurity wherein it is viewed as a "right-of-passage" towards a degree in higher education (Crutchfield et al., 2020). Taking such a stance is essential as reinforcing such societal beliefs can influence students' identities and removing the onus of responsibility in supporting students from higher education institutions (Crutchfield et al., 2020). In this way, questioning and potentially disproving currently held beliefs and practices within higher education institutions may unveil concerning trends, mobilizing governments and institutional leaders to reevaluate their approach toward student food insecurity in higher education. The Popperian addresses the present study's research questions in the following ways, bearing in mind that the questions address common societal norms.

- Question 1, "In what ways has the food environments in Ottawa, Ontario, been impacted by the pandemic?" arises from the societal assumption that everyone within a university/college campus has easy access to food (Beam, 2020). In this way, the commonly held assumption was tested. Should the food environment be empirically shown to have worsened, the assumption that all students have easy access or similar

access to food as before the pandemic would be refuted. If refuted, then it may be indicative of the need to elaborate new strategies to address worsening disparities in food environments as compared to strategies used prior to the pandemic.

- Question 2, "What is the prevalence of graduate student food insecurity within Ottawa, and how does it relate to their academic experience?" arises from the societal assumption that individuals looking to achieve a degree have the means to do so via their own personal autonomy (Lardier et al., 2017). That is, degrees are achievable through continuous hard work and dedication to one's education, regardless of the personal circumstances experienced by students. This assumption was tested by establishing the proportion of food insecure students within Ottawa's colleges and universities. Should the incidence of student food insecurity be shown to be prominent, it would imply that students are facing hurdles that outweigh their own personal autonomy and/or goals and undermine their own academic achievement.
- Question 3, "In what ways do food insecure graduate students perceive the intervention strategies used in higher education?" arises from the normalization of student food insecurity within higher education (Crutchfield et al., 2020). Again, should the data show that students do not perceive their experiences as "normal," it would indicate a need for problematization of food insecurity within higher education and the proposal of new intervention strategies and/or policies to support the learning and development of university/college students within Ottawa.

Within the context of the present study, a post-positivist framework was used as a way to test current approaches and understanding of food insecurity in a graduate student population. The project's ultimate goal is to elaborate recommendations and solutions for decision-makers in addressing graduate student food insecurity on campuses in a way that incorporates these students' voices. With that being said, the complex nature of the phenomenon of food insecurity must also be acknowledged. That is, being a health-related behaviour, the experience of food insecurity is considered a population health concern. When studying the prevention of public health issues, it is important to consider and acknowledge the multidimensional aspect of the concern. That is, health-related behaviours do not arise in isolation but are also influenced by an individual's surroundings. In this way, food insecurity was conceptualized using Evans and

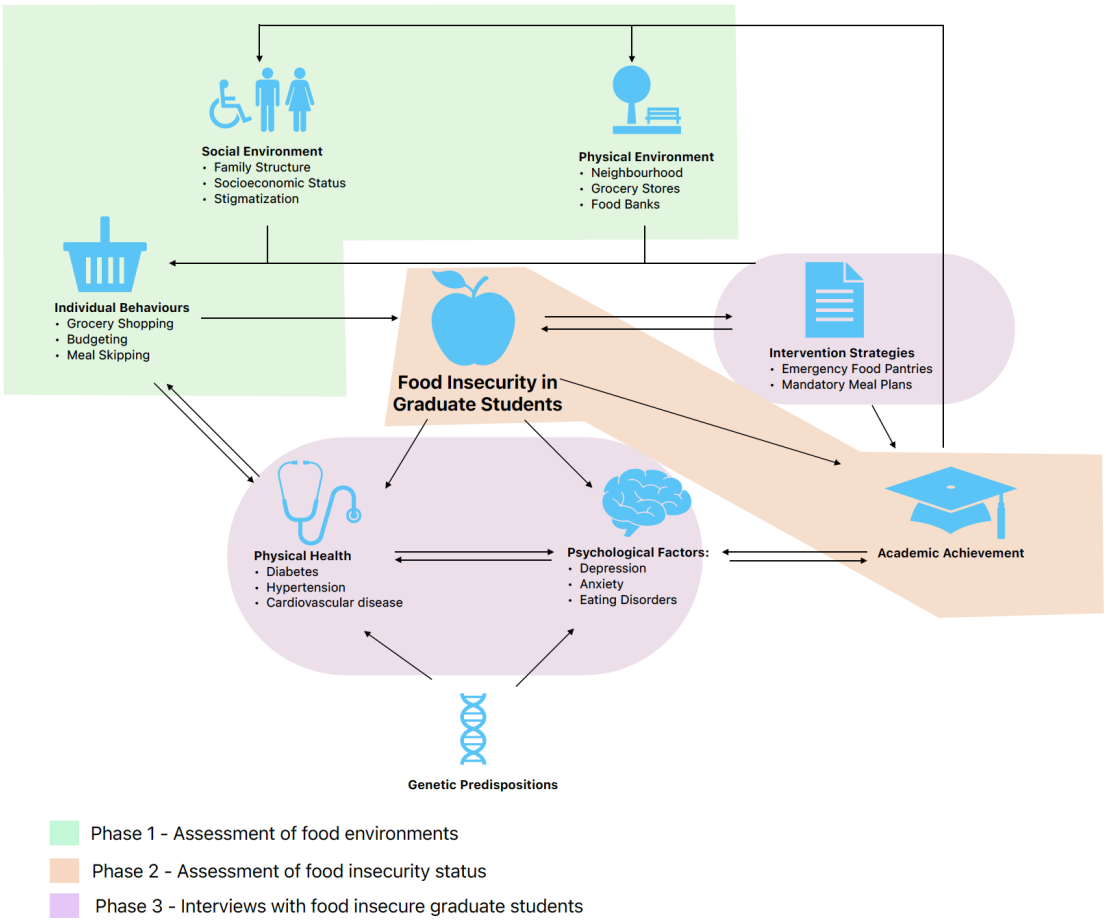
Stoddart's (1990) health field model, which is also based on a post-positivist perspective (Weissman, 1996).

**Conceptual Framework: Modified Health Field Model for Food Insecurity**

As advanced by Evans and Stoddart (1990), the general field model of health takes a step back from viewing health as a lack of diseases and instead advances health as a total state of physical, psychological, and social well-being. To this end, the model seeks to provide a flexible analytical framework representing the relationship between health determinants around a given health-related issue (Evan & Stoddart, 1990). Overall, the model focuses on population health through a multidisciplinary perspective, including the psychological, sociological, biomedical, economic, and educational aspects of health-related behaviours and emphasizes the importance of statistical methodologies (Weissman, 1996). Specifically, the model includes the social environment within which a population resides, including family structure, social networks, socioeconomic status, and work status (Weissman, 1996). In this way, the model seeks to help researchers elaborate evolving and better-adapted solutions to a given issue, which acknowledges the multi-faceted and complex reality of population health. The model also incorporates the physical environment in which a population is located (e.g. neighbourhood characteristics) and the genetic predispositions of individuals. Combined, these factors shape individuals' behaviours, which in turn influence health (Evans & Stoddart, 1990).

When applied to the current study, the field model of health was used to holistically capture the factors influencing the experience of graduate student food insecurity. However, as our collective knowledge of health and determinants of health is ever evolving, the original model was modified to account for more current understandings of the interrelationships between factors when applied to the study of food insecurity (see Figure 4).

**Figure 4**. Modified health field model – A framework for the study of food insecurity.




The original model put forth by Evans and Stoddart (1990) incorporates a factor entitled "Prosperity." For the context of the study, prosperity was replaced by "Academic Achievement." Similarly, the original model denotes "Health Care" to identify preventative measures to address the population's health concerns. For the purposes of this study, "Health Care" was replaced by "Intervention Strategies" to more aptly capture the interventions put in place by the university community to alleviate the experience of food insecurity in graduate students. Finally, as outlined in the literature on food insecurity, the relationship between key factors was modified to represent our most updated knowledge of food insecurity. For instance, the relationship between physical health and psychological well-being was modified to be bi-directional as opposed to uni-directional. As highlighted in the literature review, it is now recognized that psychological conditions such as eating disorders and anxiety can have important consequences on the physical health of individuals, such as disrupted sleep patterns and increased cardiovascular risk (NEDA, 2022).

Additionally, the current literature suggests that food insecurity is related to students' academic achievement. To this end, a relationship between food insecurity and academic achievement was added to the model. Finally, while genetic endowment is present in the model put forth by Evans and Stoddart (1990) and linked to individual behaviour, our current understanding of food insecurity would place genetic predisposition as a link to physical and mental health. That is, specific individuals may be at increased risk of developing diseases linked to food insecurity as a result of their genetic makeup (Mendy et al., 2018; Lackland, 2015). While out of scope for the current study, genetic endowment was replaced by genetic predisposition and linked to physical and psychological health in an effort to acknowledge its role in the issue of food insecurity. Nonetheless, the modified health field model presents a useful framework highlighting the various players in the issue of graduate student food insecurity and was used to guide the study's investigation by incorporating the social, economic, geographical, and academic dimensions of food insecurity.

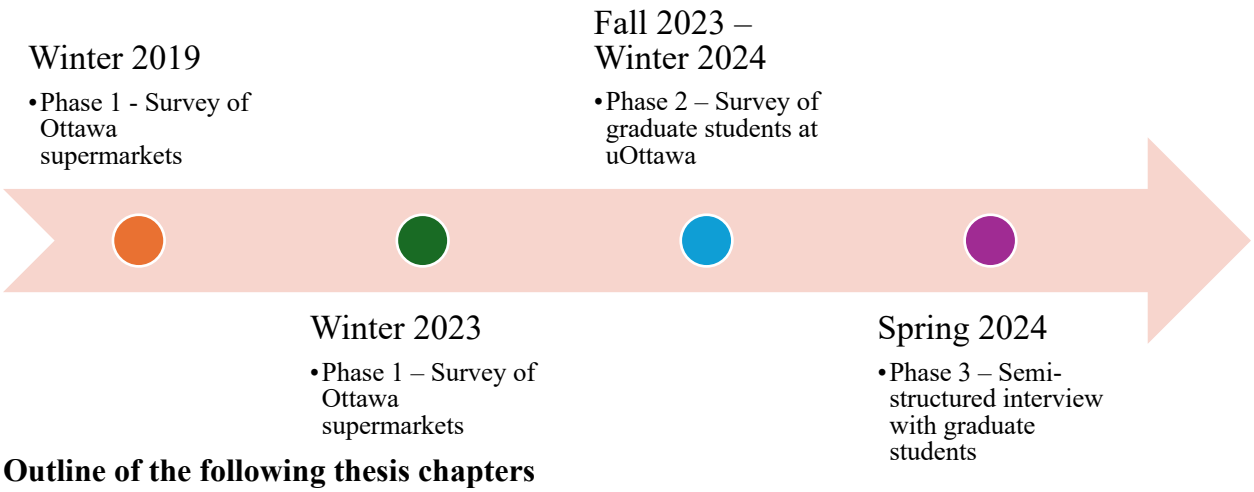
**Study Design**

According to Curry et al. (2013), conducting research on health-related services and behaviours requires an investigation approach which combines both qualitative and quantitative data. As such, the thesis made use of a cross-sectional mixed method, sequential, explanatory design (Fetters et al., 2013). Such an approach allows researchers to first collect and analyze quantitative data to obtain a general idea or understanding of a given phenomenon, followed by a qualitative phase, which enables researchers to explore the phenomenon further to obtain richer and more nuanced information (Ivankova et al., 2006). To do so, a case study approach was used. Briefly, case studies are an empirical inquiry framework which allows researchers to deepen their understanding of a given phenomenon by answering the "why" and "how" questions surrounding a given topic (Yin, 2014). In using case studies, the investigator bounds the research in time and proceeds to collect detailed information using multiple data collection tools (Creswell, 2014). Specifically, explanatory case studies using a cross-sectional sequential explanatory mixed-methods design allow the research team to address the multi-faceted nature of a problem by relating the findings from one inquiry phase to another (Thomas, 2011). That is, rather than each data point being interpreted in isolation, the data from all phases of the case are interpreted in an interrelated manner (Thomas, 2011). As such, the current research project was conducted in three phases and are presented in the following three chapters.

## Project Outline

As outlined in Figure 5, the three phases of inquiry for the thesis project took place from the Winter of 2019 to the Spring of 2024 semesters. Phase one consisted of the assessment of the nutritional quality of supermarkets located in Ottawa and took place in the Winter of 2019 and the Winter of 2023. Phase two took place from Fall 2023 to Winter 2024 and involved the survey of graduate students attending the University of Ottawa regarding their food security status and its influence on their graduate student experience. Finally, phase three consisted of follow-up structured interview with graduate students which took place in the Spring of 2024.

**Figure 5**. Thesis project outline.




## Outline of the following thesis chapters

The following three chapters in the thesis are articles that result from each of the project's phases. Chapter two, entitled "*A comparison of food environments pre and post-pandemic in Ottawa, Ontario, Canada"* documents the findings of phase one of the study. In phase one, an assessment of the quality of food environments within Ottawa's neighbourhoods was conducted in 2019 and subsequently in 2023 through observational data gathering. This chapter aimed to answer the research question, "In what ways has the food environments in Ottawa, Ontario, been impacted by the pandemic?". Chapter three, "*Graduate Student Food Insecurity: A Prominent Concern in Higher Education,*" outlines the findings of phase two of the study. During this phase, a survey assessing food insecurity status was administered to graduate students attending the University of Ottawa through convenience sampling in order to answer the research question "What is the prevalence of graduate student food insecurity within Ottawa, and how does it relate to their academic experience?". Chapter four "*Understanding food insecurity amongst graduate*

*students: Influences, institutional barriers, and recommendations*" results from phase three of the study which consisted of semi-structured interviews with 14 food insecure graduate students attending the University of Ottawa in various programs. Finally, Chapter five, "*Concluding Remarks,"* incorporates the data from all three study phases by integrating them into the study's conceptual framework (see Figure 4). Specifically, the data was tied back to factors which have been suggested as important and in need of further investigation by previous studies. When integrated and combined, the results are thus interpreted to answer the study's overarching goal as it relates to mitigating the experience of food insecurity among graduate students. As case studies acknowledge that a given problem is multi-faceted, the interpretation of the results was done with the understanding that food insecurity is not a straightforward concern. That is when talking about how to address food insecurity, one should consider the various factors influencing food insecurity in graduate students. For instance, if the results of phase two of the study indicated that the food environment in Ottawa has improved (availability and quality of healthful food is increasing and the pricing is decreasing) but the results from phase one demonstrated a high incidence of food insecurity, integrating the findings from both phases would suggest that a variable other than food environment is impacting food insecure students. The underlying reasons could then be uncovered during the interview phase of the study, answering "why" food insecurity is high among graduate students. On the other hand, if the food environment is shown to have deteriorated but the prevalence of food insecurity is low, and interviews showed that students are feeling overall supported by the university community, then the interpretation of the results would be different than if each phase was interpreted in isolation of one another. Thus, chapter 5 provides a more holistic and comprehensive understanding of the topic of study.

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# Chapter Two - A comparison of pre-and post-pandemic supermarket food environments of graduate students in Ottawa, Canada.


## Abstract

Food environments have long been a source of inquiry in studying food insecurity in a community setting. This paper aims to study the food environments in Ottawa, Canada, comparing the ways in which they have changed pre- to post-pandemic to highlight the role food environments may play in the prevalence of food insecurity in the graduate student community. To provide a rationale for the study, 232 graduate students were surveyed to ascertain where they primarily shopped for food and the results highlighted that 84% primarily accessed supermarkets within the Ottawa region. To this end, a total of 39 supermarkets were assessed using the Nutritional Environment Measures Survey of Stores (NEMS-S) survey in the winter of 2019 and again in the winter of 2023. To analyze the data, various statistical methods were used including Wilcoxon signed-rank tests and a Kruskal-Wallis test. Effect size was also calculated using rank-biserial correlation coefficients and epsilon-squared respectively. The results highlight that overall food environment quality has decreased post-pandemic. Further analysis into the dimensions of food environment quality revealed that while availability of food items has not decreased post pandemic, the affordability and quality have significantly decreased. Finally, the study finds that higher socioeconomic status neighbourhoods have overall higher quality food environments than the lowest socioeconomic status neighbourhoods within the Ottawa region. The outcomes of study highlight that food environments may be a variable of interest when considering food insecurity in the graduate student population.


## Introduction

The COVID-19 pandemic has brought forth economic hardships across the world, impacting populations from low-income backgrounds at disproportional rates (Gonçalves, 2022). Unsurprisingly, such economic conditions have put already disadvantaged populations at an increased risk of experiencing poverty, only worsening poverty gaps within our societies (Myers, 2018). Yet, neoliberal policies continue to prevail within Western societies, where there is a continuous deregulation of economic markets, and the privatization of industries coupled with the withdrawal of social support and welfare programs (Harvey, 2005). Following such ethos, disparities, whether economic or social in nature, are attributed to individual shortfall rather than

seen as societal blame, indicating that solely the individual is held responsible for their lack of financial prosperity (Lardier et al., 2017). When neoliberalism prevails in situations of crisis, such as those advanced by the pandemic, populations from disadvantaged backgrounds are put at increased risk of experiencing basic needs insufficiencies such as food insecurity (Merchant et al., 2022). Indeed, the recent increase in food insecurity witnessed worldwide can be partly attributed to economic slowdowns and increased inflation rates caused by the pandemic, which decreased access to food for households from lower socioeconomic status (SES) backgrounds (FAO et al., 2020). Such circumstances were only projected to worsen in the aftermath of the pandemic (OBR, 2020; Wels & Hamarat, 2024).

### *The current understanding of food insecurity*

Briefly, food insecurity is defined as uncertain and/or limited access to safe and adequate amounts of food needed to meet a household's dietary requirements (Adams et al., 2022; Health Canada, 2017). Food insecurity can be further broken down into four dimensions, namely usage, availability, stability, and access to food sources within a given food environment (Coates, 2018; FOA, 2006). The FOA (2021, p.190) further defines each category as outlined in Table 1. As can be deduced, food insecurity is a multi-dimensional and complex issue which comes down to the inability to acquire nutritional and appropriate foods for one's household.

**Table 1**. Four dimensions of food insecurity as described by the FOA (2021).

| **Usage of Food** | **Availability of Food** | **Food Stability** | **Access to Food** |
|---|---|---|---|
| The ability to consume a healthful and balanced diet, whether from a food preparation or physiological aspect. | The potential or actual supply of food, whether the food source is from scavenging, markets, reserves, large or small productions. | A household's ability to retain a stable supply of food regardless of environmental threats to food supply. | A household's capacity to acquire food within their environment. |

Current research demonstrates that food insecurity can have a detrimental influence on individuals through three distinct experiences. Firstly, food insecurity impacts the quality of

diets, decreasing the likelihood of consuming balanced meals (Dachner & Tarasuk, 2018). Secondly, the experience of food insecurity imparts a psychological load as it often contributes to feelings of anxiety due to uncertainty of food supply (Men et al., 2021; Holley & Mason, 2019). Finally, food insecurity also contributes to social isolation via feelings of stigmatization resulting from a lack of basic necessities in societies that are regarded as affluent (Loopstra, 2018). For the past 20 years, food insecurity has impacted approximately 12% of the Canadian population (Health Canada, 2017). However, in 2021, this percentage increased to approximately 16% of the population or 5.8 million Canadians (Canadian Public Health Association, 2023). In 2024, the percentage has further increased to approximately 25.5% (PROOF, 2025). While food insecurity has been extensively studied within the general Canadian population, specific groups such as graduate students remain understudied within the literature.

***Food insecurity amongst graduate students and the influence of food environments.***

The literature specific to graduate students within the field is small, however recent research showcase a high percentage of food insecurity amongst this population. For example, a study conducted in the US outlines that 17% of graduate students and 13% of postdoctoral trainees experience moderate to severe levels of food insecurity (Hammad & Leung, 2024). Similarly, Coffino et al. (2020) find moderate to severe food insecurity rates near 22% amongst graduate students in the US. Within Canada, a report published by the University of Concordia (2023) depicts slightly higher rates of food insecurity with approximately 58% of master's students and 56% of PhD students experiencing moderate to severe food insecurity. In this way, it is evident that food insecurity is prominent amongst the graduate student community. However, as previously discussed, food insecurity is a multi-dimensional issue which is deeply tied to socioeconomic factors such as inflation and the pricing of food (Statistics Canada, 2024; Polsky, 2024). That is, to understand the increased prevalence of food insecurity, one should explore the socioeconomic dimensions which may influence food insecurity such as the food environments within which one resides. To illustrate, a study conducted in Brazil during the pandemic highlights that food insecure households are more likely to perceive the decreased affordability of fresh food items as a barrier in acquiring these foods and thus influencing their dietary choices (Justiniano et al., 2024). Moreover, beyond lack of affordability, the overall food environments within which individuals reside have a strong influence on the likelihood of

experiencing food insecurity through factors such as availability, accessibility, and quality of food items (Bezerra et al., 2024). For example, a study conducted in the US demonstrates that food insecure individuals who perceived their food environment as having low availability and accessibility to healthful foods had a tendency to eat lower quality diets as compared to food secure individuals (Gupta & Freedman, 2020). While research specific to the university setting is scarce, the research conducted to date demonstrates similar findings with regards to the role that food environments may play in the experience of food insecurity. For example, a study exploring university food environments highlights that food environment variables such as affordability, availability, and nutritional quality of food items influenced the diet quality of students (Li et al., 2022). With regards to graduate students specifically, a study conducted by Boncyk et al. (2024) details the ways in which food environment variables such as affordability as well as limited access to fresh produce and high-quality foods were more prominently experienced by food insecure graduate students as compared to food secure graduate students, hindering their likelihood of consuming a balanced diet. Additionally, studies outline the impacts of the pandemic on food environments, detailing worsening food environment qualities post-pandemic both at the university level (Perez et al., 2024) and within the wider community setting (Cardarelli et al., 2024; Dalhousie University et al., 2022). In this way, a study of the food environments within which graduate students engage may provide valuable insights into the role of food environments in their experience of food insecurity. At the very least, the study of food environments allows for the contextualization of the graduate student food insecurity experience.

### *The role of food environments.*

Given the current economic and systemic barriers experienced by disadvantaged populations, it becomes increasingly important to investigate the inequities which make it challenging to adhere to a healthful and nutritious diet (Adams et al., 2022). Indeed, as previously described, the pandemic brought forth further barriers such as increased cost of living which may hinder individual's access to sufficient quantity of healthful foods (Martinez et al., 2024; Woolston, 2022). In this way, investigating the characteristics of food environments for the quality, availability, and affordability of food may provide insights into the challenges faced by individuals within their built environments. Briefly, the concept of food environment refers to the physical, social, economic, cultural, and political landscapes which influence food adequacy and accessibility (Vaillancourt et al., 2024). Indeed, neighbourhoods have a strong capacity to

influence individual behaviours and are considered an important avenue for understanding population health inequities (Chaparro et al., 2022). In fact, neighborhood food environments have been shown to influence public health outcomes such as those associated with food (in)security (Agarwal et al., 2022). Specifically, within the context of the study of food insecurity, neighbourhood food environments play a pivotal role in determining the access individuals have to healthful food items through variables such as availability, affordability, and quality of food items (Choi et al., 2022). In fact, it has been demonstrated that food insecure individuals are more likely than food secure individuals to be influenced by their food environments when making food selections (Slotnick et al., 2022). Additionally, poor food environments have not only been linked to food insecurity in Canada (Perez et al., 2017) but are also considered a risk factor for the development of poor health outcomes such as diabetes and cancer (Fitzpatrick et al., 2016; Kelli et al., 2019; Eskandari et al., 2022; Mo et al., 2022). This association is partly explained by the dynamic relationship between retail environments, individual shopping behaviours, and societal norms (Dombrowski et al., 2022; Herforth et al., 2015). While a relationship seems apparent, the directionality of the association is unclear and presents a limitation to the current research surrounding food environments as well as a gap in our current understanding of the ways in which food environments facilitate or mitigate the experience of food insecurity. That is, while food insecurity is associated to a food environment of lower quality, food environments are also themselves influenced by the rules of supply and demand within the social environment in which they are located. Indeed, as discussed by Houghtaling et al. (2019), store managers decisions regarding the availability and pricing of their store's offerings are in part influenced by their perceptions of consumer demands. That is, should store managers perceive that their clientele is less likely to afford and purchase healthful and fresh produce, they will tend to favour offering unhealthful alternatives to increase sales within their stores. Nevertheless, studying the attributes and characteristics of food environments is important when considering the issue of graduate student food insecurity, especially when considering that food secure and insecure students tend to access food from the same sources, such as regional or national grocery stores located within their neighbourhoods (Richards et al., 2022).

Research conducted to date has debated which attributes of food environments are most influential with regard to food insecurity. More specifically, researchers are investigating not

only exogenous factors such as the availability or pricing of food but also intrinsic dimensions, such as the personal ability to obtain healthful food items through factors such as accessibility, affordability, and convenience (Wang et al., 2019; Turner et al., 2020). Unsurprisingly, the primary factor often highlighted by research is the role affordability plays on food (in)security status. More specifically, the affordability of fresh produce and healthful food items is considered the driving factor for food insecurity (Eskandari et al., 2022). In fact, within Ontario, a family of four earning two minimum wages would need to spend approximately 48% of their monthly income to obtain nutritious and healthful food for their household (Parker et al., 2019), leaving only 52% for other necessary expenses such as housing. Additionally, many graduate students within Canada anecdotally report receiving stipends of 17,500 CAD to 21,000 CAD a year, which falls below minimum wage income and remains true even for those receiving prestigious government-funded scholarships (Connolly, 2022). When looking at the reality of graduate students, this has caused many to be faced with the dilemma of choosing between spending their income on housing or on healthful nutrition (Richards et al., 2022).

A second factor which researchers have theorized may influence food insecurity status is the density of grocery stores within a given environment. However, empirical work done in the US and Canada demonstrates this association is found only within rural areas (Baxter et al., 2023). In urban settings, there is no association between grocery store density and food insecurity (Perez et al., 2017; Agarwal et al., 2022; Chaparro et al., 2022). Rather, it is the selection of products available within retailers that is associated with food insecurity prevalence. Specifically, it appears that healthful food consumption may be influenced by the percentage of shelf space dedicated to healthful versus unhealthful food within a supermarket, the pricing of healthful versus unhealthful foods, and the positioning of healthful versus unhealthful foods around the store (Vogel & Riernas, 2022). Moreover, when talking about pricing, food insecure individuals tend to report lower quality, availability, and higher pricing of healthful food items such as fresh produce within their neighborhood grocery stores as compared to food secure individuals (Minaker et al., 2016). As such, when considering the influence of food environments, it appears that the focus should be placed on dimensions of accessibility, affordability, and quality of healthful food items.

## Theoretical Framework: Social Determinants of Health Framework

The current study made use of the social determinants of health framework (Healthy People, 2030) to enable a nuanced understanding of the various factors which influence the experience of food insecurity among graduate students. The Social Determinants of Health Framework considers "the conditions in the environments where people are born, live, learn, work, play, worship, and age that affects a wide range of health, functioning, and quality-of-life outcomes and risks" (Healthy People 2030). In so doing, the framework focuses on five factors which should be considered when looking at health inequities within a population, namely economic stability, social/community context, education, health care access, and neighbourhood/built environments (Healthy People 2030; Yearby, 2020). Specifically, economic stability considers aspects such as income, socioeconomic status, and cost of living. Social/community context refers to factors such as workplace safety and community connectedness. Education encompasses factors such as high school graduation rates and enrollment in higher education. Health care access refers not only to the access to primary health care services but also to health literacy of individuals. Finally, neighbourhood /built environments consider aspects such as access to safe housing and healthful foods (Hamilton, 2023). In this way, the Social Determinants of Health Framework facilitates the exploration of the communitarian and structural characteristics which influence an individual's behaviour and their overall health.

## Methodology

The study adopted a quantitative approach, consisting of a comparison of food environment quality in Ottawa, Ontario, Canada, from pre-pandemic (data collected in 2019) and post-pandemic (data collected in 2023) days using a pre-post statistical design. The purpose of this phase was to assess the changes in the food environments of Ottawa to provide context into the understanding of food insecurity prevalence amongst graduate students attending the University of Ottawa. The research question addressed was "In what ways has the food environments in Ottawa, Ontario, been impacted by the pandemic?" In order to ensure the data collected on food environments reflected the food environments of graduate students at the University of Ottawa, the target population was surveyed and asked the following open-ended question "Where do you most commonly access food?" (see Appendix C). A total of 367

graduate students were administered the survey and 232 graduate students provided a response to the open-ended question, giving a response rate of 63%. The data was then coded into three categories, namely 1) Supermarkets within the Ottawa region such as Walmart, Loblaws, FreshCo, etc.; 2) Other which includes meal delivery services, pharmacies, food banks, parents, farmers markets etc.; and 3) Outside the Ottawa region which includes supermarkets or services which are outside of the Ottawa area such as those located in the Gatineau, Quebec region for example Super C, Provigo, IGA, etc. Following, descriptive statistics were conducted to illustrate the percentage of students accessing supermarkets within the Ottawa area as their primary sources of food. The results of the analysis revealed that approximately 84% of the surveyed graduate students attending the University of Ottawa accessed food primarily from supermarkets in the Ottawa region and thus an evaluation of the food environments as assessed by supermarkets was deemed appropriate for the purposes of the project. Table 2 provides a summary of the results.

**Table 2**. Percentage of students accessing supermarkets within the Ottawa region as their primary source of food.

| | **Supermarkets within Ottawa** | **Other** | **Outside of Ottawa** |
|---|---|---|---|
| **Frequency** | 83.6% (*n* = 194) | 6.9% (*n* = 16) | 9.5% (*n* = 22) |

The research protocol used to assess the food environment quality of supermarkets within the Ottawa region was observation-based, wherein the researcher objectively assessed a given food environment following a rigorous protocol to collect empirical data, which was then coded and analyzed to ascertain the environment quality (see Appendix A and B). To reduce noise in the data set, the same research protocol was followed during the winter months of 2019 and of 2023, avoiding variations due to seasonal changes in food quality, availability, and affordability.

***Research tool: Nutritional Environment Measures Survey of Stores (NEMS-S).***

For the purposes of this study, the Nutrition Environment Measure Survey of Stores (NEMS-S) was used. The survey is a validated tool with a high degree of inter-rater reliability, which ranges from 0.84 to 1.00, as well as test-retest reliability, which ranges from 0.73 to 1.00 (Glanz et al., 2017). The NEMS-S was used to assess the availability, quality, and affordability

of healthful food items as compared to their associated unhealthful food items within a given supermarket. The food items evaluated by the survey were milk, fresh fruits and vegetables, ground beef, hot dogs, frozen dinners, baked goods, beverages, bread, chips, and cereals. Availability was assessed based on the presence and variety of healthful food items. Quality was evaluated based on the percentage of non-withered fresh produce. Affordability was assessed based on the non-sale price differences between healthful and unhealthful food items within each category.

Some categories of the survey were modified to reflect the most recent research regarding the nutritional value of certain food items (Karoui, 2022). Firstly, Diet Coke © was replaced by carbonated water. This decision was made since a recent study revealed that artificial sweeteners found in diet beverages led to an increase in waist circumference and body mass index (BMI) over time (Fowler et al., 2015). Secondly, the fruit juice category was removed due to higher than recommended values of sugar per serving within both the fruit juice and the 100% juice products, with experts advising for the limitation of the consumption of 100% fruit juice beverages due to its correlation to high BMI (Shefferly et al., 2015; Guasch-Ferré & Hu, 2019). Finally, since all serving units and brands are American on the published survey, they were replaced with Canadian equivalents.

### *Sample Description*

To be included in the sample, supermarkets had to meet the inclusion criteria as described by Health Canada whereby to be considered a supermarket, the establishment must retail a general line of food (e.g. fresh, canned, and frozen goods) as well as a range of non-food household products (e.g. toileteries, non-prescription drugs, etc.) and should be free of any membership requirements (Health Canada, 2024). For the purposes of the current study, SES was determined based on data obtained from the Ottawa Neighbourhood Study (2015). Specifically, SES was determined through the percentage of residents aged 24 to 65 with no high school diploma, unemployment rates, percentage of families who are lone-parent households, average household income, and percentage of residents living in low-income neighbourhoods. Such factors were important to include in the assessment of SES as they constitute determinants of food insecurity. For instance, the risk of food insecurity is higher for individuals with lower educational attainment, limited household income, unemployment, and family status (Smith &

Meade, 2019). Once neighbourhoods' SES was established, the neighbourhoods were subdivided into quintiles according to their SES, wherein quintile 1 represented the highest SES neighbourhoods in Ottawa, and quintile 5 represented the lowest SES neighbourhoods in Ottawa. The stores assessed for the present study were all located in either quintiles 1,2,4 or 5. Quintile 3 was omitted from the study due to small variability in SES between quintiles 2 and 3 as well as 3 and 4. The same 45 supermarkets were visited in the winter of 2023 to gather the post-pandemic data. However, the final sample consisted of 39 supermarkets, as 6 stores had closed between 2019 and 2023. In total, there were 7 supermarkets located in Quintile 1 neighborhoods, 9 in Quintile 2 neighborhoods, 9 in Quintile 4 neighborhoods, and 14 in Quintile 5 neighborhoods.

***Data Scoring***

All data gathered from each supermarket in 2019 and 2023 was converted into a neighborhood food environment value using the same scoring sheet (see Appendix B). Briefly, the sheet breaks down the data into three categories, namely pricing, availability, and quality, which were then combined to determine the overall food environment score for a given supermarket. The overall survey was scored on a range of –9 to 52, broken down into 0 to 28 points for availability, -9 to 18 points for affordability, and 0 to 6 points for food quality. Specifically, affordability was determined by comparing the non-sale price of healthful food items versus the non-sale price of its unhealthful counterpart. That is, if pricing was lowest for the healthful food item, then two points were allocated. If the pricing was the same for both items, then one point was allocated. Finally, if the affordability was highest for the healthful food item, one point was removed from the affordability score.

Regarding quality, the measurement applied only to fresh and non-packaged items such as fruits and vegetables. The percentage of non-withered items was used to determine quality scoring. That is, three points were allocated if 100% of the available produce was deemed non-withered and in acceptable condition for consumption. Two points were allocated if 90% of the available produce was acceptable. One point was allocated if 80% of the available produce was acceptable. If 70% or less of the available produce was deemed acceptable for consumption, no point was allocated to the score.

The last factor scored was availability. The scoring procedure for availability varies from one item to another. For example, when considering fresh produce such as fruits and vegetables,

the items were considered available if at least 50% of the observed produce was deemed to show no signs of rot or withering. The scores allocated then depended on the number of fruits or vegetables available within a given grocery store. That is, if all 10 varieties of fruits or vegetables were available, 3 points were added to the score. If 9 out of 10 varieties were available, 2 points were added. If 8 out of 10 varieties were available, 1 point was added. If 7 or fewer varieties were available, no points were added to the score. For the dairy category, points were allocated based on the availability of skim milk options wherein two points were added if skim milk was available, and an additional point was allocated if over 50% of the available stock was skim or 1% fat milk products. Regarding meat products, two points were added for the availability of lean ground meat (under 10% fat), with an additional point added if 2 to 3 varieties were available and another point added if over 3 varieties were available. When assessing frozen dinners, availability was scored based on the number of varieties displayed in the grocery stores whereby 3 points were added to the score if 3 varieties were available, 2 points were granted if 1 or 2 varieties were available, and no points were added if no healthful options were available. When scoring availability for the bread category, two points were added if the grocery store had whole wheat or whole grain bread on display. An additional point was added if the store carried more than five varieties of whole wheat/grain bread. With regards to beverages, availability was scored by adding one point if healthful alternatives were available. Finally, the availability scores for the remainder of the categories (hot dogs, baked goods, chips, and cereals) were allocated by adding two points if healthful alternatives were provided. The overall NEMS-S score for a given grocery store was determined by tallying the points obtained for each factor. The removal of fruit juice had no impact on the scoring as there is no threshold set to determine a low versus high food environment quality as per the NEMS-S. Rather, the interpretation of the NEM-S is such as the higher the score, the better the environment is considered to be. Additionally, previous studies adapting the NEMS-S to their specific context followed similar procedures (Martinez-Garcia et al., 2020; Liu et al., 2019). Finally, for the purposes of the current study, the NEMS-S was used as a way to compare between neighborhood differences which were all assessed and scored using the same procedure.

Prior to collecting the data, two researchers completed the NEMS-S training offered by the University of Pennsylvania. Following the training, the researchers proceeded to rate three supermarket locations in the winter of 2019 on the same day and at the same time of day. The

interrater reliability was established using Cohen's kappa at $k = 0.904$ which is congruent with previous studies done using the NEMS-S as well as modified versions of the NEMS-S (Glanz et al, 2017; Martinez-Garcia et al., 2020).

***Data Analysis***

The data resulting from the NEMS-S was analyzed as a pre-post statistical analysis. The final sample consisted of 39 supermarkets. The data was first checked for normality using a Shapiro-Wilks test. The results of the Shapiro-Wilks test were significant for portions of the data set indicating that the overall data was not normally distributed. Therefore, non-parametric statistics were selected for the purposes of this study.

A Wilcoxon signed-rank test was run to compare overall NEMS-S scores, affordability, quality, and availability between 2019 and 2023. The Wilcoxon signed-rank test requires paired data, continuous or ordinal data, and does not assume equal variances nor normality in the data set. Therefore, the conditions of the test were satisfied. Additionally, given the modest sample size ($n = 39$), and to follow recommendations for sample sizes under $n = 50$, exact p-values were provided to ensure accuracy. It is also important to note that the Wilcoxon signed-rank test could present a loss of power, increasing the risk of type II error wherein it would be wrongly concluded that there are no differences between the groups of study. Nonetheless, for the characteristics of the data collected, the Wilcoxon signed-rank test remained appropriate. Furthermore, effect size was calculated using the rank-biserial correlation coefficient using the following formula $r = \frac{Z}{\sqrt{n}}$ where $Z$ is the standardized test statistic and $n$ is the total number of observations. The effect size was interpreted in such a way that a value 0.1 or less represented a small effect, a value of 0.3 represented a medium effect, and a value of 0.5 or more represented a large effect (Cohen, 1988). The hypotheses tested were that NEMS-S scores, affordability, quality, and availability would differ pre and post pandemic.

H0: Overall NEMS-S scores do not differ pre and post pandemic
H1: Overall NEMS-S scores differ pre and post pandemic.

H0: Affordability scores do not differ pre and post pandemic
H1: Affordability scores differ pre and post pandemic.

H0: Quality scores do not differ pre and post pandemic
H1: Quality scores differ pre and post pandemic.

H0: Availability scores do not differ pre and post pandemic
H1: Availability scores differ pre and post pandemic.

Finally, the overall 2023 data was analyzed to determine whether a statistically significant difference persisted between lower and higher SES neighbourhoods in Ottawa. To do so, a Kruskal-Wallis test for independence was run for the 2023 overall NEMS-S score data with follow-up pairwise comparisons to determine between which quintiles the differences occurred. Effect size was calculated through $\varepsilon^2$ using the following formula $\varepsilon^2 = \frac{H}{(n^2-1)/(n+1)}$ wherein *H* is the Kruskal-Wallis test statistic, *k* is the number of groups, and *n* is the total number of observations. The effect size was interpreted in such a way that a value of 0.01 was considered small, a value of 0.09 was considered a medium effect, and a value of 0.25 or more was considered a large effect (Sawyer & Ball, 1981; In & Lee, 2024). The hypothesis tested was that food environment quality would differ across neighbourhood quintiles. H0: The neighbourhood quintiles follow the same distribution as it relates to food environment quality. H1: The neighbourhood quintiles do not follow the same distribution as it relates to food environment quality. All statistical analyses were done using a significance level of $\alpha = 0.05$ and through the IBM © SPSS software for Mac version 31.0.0.0 (117).

**Results**

Table 3 provides a summary of the medians broken down by quintiles. A Wilcoxon signed-rank test showed that overall NEMS-S food environment scores pre-pandemic (2019) and post-pandemic (2023) were significantly different ($Z = -2.360$, $p = 0.018$, $r = -0.378$), with a medium effect size. This finding indicates that overall food environment quality as measured by the NEMS-S has worsened in 2023 ($\tilde{x} = 32$) as compared to 2019 ($\tilde{x} = 34$).

With regards to availability of healthful food items, the Wilcoxon signed-rank test showed that availability scores pre and post pandemic were not significantly different ($Z = -1.255$, $p = 0.21$, $r$

= -0.201). This finding indicates that the availability of healthful food items as measured by the NEMS-S has not significantly changed between 2019 ($\tilde{x}$ = 22) and 2023 ($\tilde{x}$ = 23).

When considering the quality of fresh food items, the Wilcoxon signed-rank test showed that quality scores prior to the pandemic and after the pandemic were significantly different ($Z$ = -4.026, $p < 0.001$, $r$ = 0.645), with a large effect size. This finding indicates that the quality of fresh food items as assessed by the NEMS-S has significantly worsened in 2023 ($\tilde{x}$ = 2) as compared to 2019 ($\tilde{x}$ = 5).

Finally, when considering affordability, the Wilcoxon signed-rank test showed that affordability scores before and after the pandemic were significantly different ($Z$ = -2.430, $p$ = 0.015, $r$ = -0.389), with a medium effect size. This indicates that the affordability of food items as measured by the NEMS-S has significantly worsened post-pandemic ($\tilde{x}$ = 6) as compared to prior to the pandemic ($\tilde{x}$ = 7).

**Table 3**. Summary of NEMS-S scores medians per quintile between the year 2019 and 2023.

| | **NEMS-S Score 2019** | **NEMS-S Score 2023** | **Availability Score 2019** | **Availability Score 2023** | **Quality Score 2019** | **Quality Score 2023** | **Affordability Score 2019** | **Affordability Score 2023** |
|---|---|---|---|---|---|---|---|---|
| **Quintile 1** | 39.0 | 39.0 | 23.0 | 24.0 | 6.0 | 6.0 | 9.0 | 8.0 |
| **Quintile 2** | 37.0 | 33.0 | 25.0 | 24.0 | 6.0 | 5.0 | 9.0 | 6.0 |
| **Quintile 4** | 32.0 | 30.0 | 22.0 | 23.0 | 4.0 | 2.0 | 6.0 | 6.0 |
| **Quintile 5** | 32.0 | 26.5 | 20.0 | 21.5 | 4.0 | 0.0 | 7.0 | 5.5 |

The second analysis conducted was specific to the 2023 data and sought to explore whether differences existed between SES neighbourhood quintiles. A Kruskal-Wallis test was performed on the NEMS-S scores of the four quintiles. The differences between the rank totals of 39.0 (Quintile 1), 33.0 (Quintile 2), 30.0 (Quintile 4), and 26.5 (Quintile 5) were significant, $H$ ($df$ = 3, $n$ = 39) = 22.786, $p$<0.001, $\varepsilon^2$ = 0.59. The results indicate that at least one of the four groups differs significantly from the rest with regards to their overall food environment quality

scores. The effect size is large indicating the socioeconomic status quintile of the neighbourhood explains a large amount of the variance in food environment quality. To investigate further, post hoc comparisons were conducted using a Dunn's test with Bonferroni corrections. The results indicate that a significant difference is observed between quintile 5 and quintile 2 ($p = 0.003$), as well as quintile 5 and quintile 1 ($p = 0.000$). All other pairwise comparisons were insignificant with Bonferroni adjustments. The results indicate that there are disparities between the highest SES neighbourhood quintiles (1 and 2) and the lowest SES neighbourhood quintile 5 in Ottawa.

**Discussion**

The study aimed to assess the ways in which overall neighborhood food environments in Ottawa, Canada, have changed from pre-pandemic to post-pandemic times. Such investigation is pertinent as neighborhood food environments are considered as a factor which greatly influences public health outcomes within communities (Agarwal et al., 2022; FAO, 2021) and recent research has revealed a trend in which food environment quality is decreasing following the aftermaths of the pandemic (Dalhousie University et al., 2023; Perez et al., 2024). To this end, the study aimed to assess the three dimensions of food environments, namely food quality, food availability, and food affordability, within 39 supermarkets in the highest and lowest SES neighbourhoods in Ottawa, Ontario using the NEMS-S. While the NEMS-S only bases its assumption on supermarkets, such analysis is warranted as supermarkets are the primary food source within high-income countries such as Canada (Vogel et al., 2023). In addition, graduate students attending the University of Ottawa were surveyed and the results indicated that approximately 84% of graduate students primarily accessed supermarkets within the Ottawa region. Therefore, the exploration of supermarkets within Ottawa was deemed appropriate.

The results indicated that the overall quality of the food environments within Ottawa's supermarkets as measured by the NEMS-S has significantly decreased following the pandemic. While the research investigating food environment pre and post pandemic is scarce, the findings of the study corroborate research exploring food environment before and during the pandemic. For example, Justiniano et al. (2024) highlights that the pandemic has negatively influenced individuals' perception of their food environment quality through variables such as lower affordability and quality of fresh food items. More locally, Lowitt et al. (2024) examine the effects of the pandemic on the overall food systems in Manitoba, Canada showcasing disruption

in food environments partly explained through variables such as decreased affordability of food items available for purchase. The current findings of the study add a unique perspective to the literature by quantifying the differences pre and post pandemic, building on current research in advocating for improved quality of food environments post-pandemic.

The data was further analyzed to explore differences in availability, affordability, and quality of food items which may provide additional insights into the observed differences between overall food environment quality. The findings highlighted that the affordability of healthful food items has significantly decreased post-pandemic compared to pre-pandemic days. As for the quality of healthful foods, the study suggested that the quality of healthful foods has significantly decreased post-pandemic, meaning that fresh produce available for purchase within Ottawa's supermarkets was lower in quality as compared to pre-pandemic days. However, the availability of food items was not found to have significantly changed post pandemic. Interpreting the results together, the findings of the study may indicate that, as compared to pre-pandemic times, healthful food items were equally available for purchase in Ottawa's supermarkets; however, they were more likely to be of lower quality and affordability. Again, these findings are in accordance with research conducted to date primarily as it relates to the affordability of food following the pandemic. For example, in Canada, studies exploring pricing highlight trends in progressively decreasing affordability of food items post pandemic (Dalhousie University et al., 2023; ISED, 2023). Moreover, decreased affordability of food has been associated to changes in food purchasing habits amongst Canadians including decreasing the amount and nutritional quality of purchased foods (Government of Canada, 2023; Taylor et al., 2023). Beyond Canada, studies of food environments also cite decreasing affordability and quality of food as potential barriers in consuming healthy diets (Niles et al., 2020; Barazzoni et al., 2022). As was previously discussed, this influence is not only felt by the general public, but is also present within the university community both with regards to undergraduate and graduate students (Li et al., 2022; Boncyk et al., 2021; Perez et al., 2024). Finally, it has been documented that the continuing decrease in the affordability of food items may facilitate the experience of food insecurity (Fitzpatrick et al., 2016; Choi et al., 2022). Given that graduate students attending the University of Ottawa have been shown to primarily access food within a built environment which is characterized by an overall decrease in affordability and quality of food items, the state of the post pandemic food environments may be setting the stage for increasing

food insecurity rates amongst graduate students. However, further research should be done to explore the prevalence of food insecurity amongst graduate students and investigate the role that food environments may play in their experiences of food insecurity.

Following the comparison of pre and post pandemic data, the post pandemic data was further analyzed to identify potential disparities between SES neighbourhood quintiles. The results highlighted differences in the food environment between neighbourhoods specially between Quintile 1 and Quintile 5 neighbourhoods as well as Quintile 2 and Quintile 5 neighbourhoods, indicating that higher SES neighbourhood quintiles may have easier access to healthful foods through variables of affordability, quality, and availability as compared to the lower SES neighbourhood quintile. These findings are supported by studies mainly conducted in the US whereby differences in food environments and access to healthful foods were observed between neighbourhoods of low and high SES (Larson et al., 2008; Richardson et al., 2014; Hilmers et al., 2012, Havewala, 2021). Applying the Social Determinants of Health Framework (Healthy People 2030), the study's results indicated that two factors may be facilitating the experience of food insecurity within Ottawa notably SES and built environment disparities present between different SES neighborhoods. This finding is cause for concern as food environments which promote unhealthful items have been shown to exacerbate dietary inequities and lead to population health disparities (Vogel & Piearnas, 2022). In this way, in accordance with Dombrowski et al. (2022), public health practices should leverage neighborhood food environments as protective factors to mediate food insecurity. That is, they should encourage and facilitate healthy eating behaviours, especially within disadvantaged areas like low-income neighbourhoods. Unfortunately, as highlighted in this study, food environment quality in Ottawa may be presenting barriers which may disproportionally influence those living in lower SES neighbourhoods. This is however not unique to Ottawa as food insecure individuals continue to face a plethora of systemic barriers which make following healthy eating guidelines such as those proposed by Health Canada (2017) difficult and out-of-reach (Adams et al., 2022). As such, it is necessary to advocate for policy reforms that aim to encourage changes within the food system to make healthful food items more accessible to all (Pollard & Booth, 2019).

## Conclusion

The objective of this research was to explore the ways in which food environment quality of graduate students attending the University of Ottawa have changed pre to post pandemic. The study highlighted that the overall food environment in Ottawa, Canada have decreased post-pandemic. The study also suggested decreased affordability and decreased quality of food items available for purchase within supermarkets in Ottawa. However, no differences were identified with regards to the availability of food items post-pandemic. Finally, the study revealed that higher SES neighbourhoods have an overall better food environment quality as assessed by the NEMS-S compared to the lowest SES neighbourhoods in Ottawa indicating potential disparities in access to healthful foods.

## Limitations

The study presents some key limitations due to the methodology chosen. Firstly, the findings presented in the study are correlational and cannot determine causation. In the same way, the directionality of the relationship cannot be established in that it cannot be determined through the study's findings whether food environment quality is influenced or rather influences socioeconomic status neighbourhoods. Secondly, due to the nature of the data sets, non-parametric statistics were used which present a loss of power and may have increased the risk of type II errors meaning that potential differences may not have been detected. Thirdly, the sample selected omitted supermarkets located within Quintile 3 neighbourhoods due to the scope of the project. Future research should seek to explore food environments within those neighbourhoods to provide additional insight on the quality of food environments within Ottawa. Despite these limitations, the current study provides an overview of the correlation between neighbourhood SES and food environment quality as well changes pre and post pandemic which highlighted inequities which may exist within the community.

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# Chapter Three: Graduate student food insecurity: A prominent concern in higher education


## Abstract

Food insecurity is increasingly present on university and college campuses across North America. While many studies have worked towards highlighting the prevalence of food insecurity amongst undergraduate students, the experience of graduate students remains understudied. The current paper sought to highlight the prevalence of food insecurity amongst graduate students attending a large university in Ottawa, Canada and to understand the ways in which limited access to healthful foods may hold negative effects on the graduate student experience. To do so, a modified version of the household food security survey module (HFSSM) survey was sent out to graduate students ($n$ = 363). Descriptive statistics were carried out highlighting that 48.3% ($n$ = 175) were food secure, 13.5% ($n$ = 49) were marginally food insecure, 19.5% ($n$ = 71) were moderately food insecure, and 18.7% ($n$ = 68) were severely food insecure. Following, various statistical methods, including Chi-Square tests for independence and independent sample Kruskal-Wallis tests were used to analyze the data. Effect size was also calculated using Cramer's V and epsilon-squared respectively. The findings suggest that low food security status was negatively associated to academic achievement, course load, in-class participation, attendance, likelihood of considering dropping out of one's degree, deferring degree completion, and reporting a disconnect from the graduate studies community. Overall, the findings build on the literature done on the undergraduate community and advocates for increased resources for food insecure graduate students.


## Introduction

Colleges and universities provide the space for young adults to explore and form their identities and values (Crutchfield et al., 2020) with the ideology that through the attainment of a university degree, individuals achieve a form of social capital and health (El Zein et al., 2019). In fact, earning a higher education degree is associated with higher personal and professional success as well as increased lifetime earnings (Ma et al., 2021), allowing for mobility within a society which is competitive and global in nature (Weaver et al., 2020). Indeed, Chetty et al. (2015) highlight the link between living within lower-poverty neighbourhoods and attending

university demonstrating the influence education may provide on breaking the intergenerational cycle of poverty and increasing social mobility within North American societies. Historically, students attending higher education were considered to be from economically privileged and elite households (Haskett et al., 2021). However, in recent years, the demographic makeup of university students has substantially changed, including a higher percentage of historically excluded student groups, such as those from households with lower socioeconomic status (Broton et al., 2018). Specifically, universities and colleges are seeing higher numbers of "non-traditional" students, such as students who have dependents and/or are single parents (Daugherty et al., 2019), as well as low-income, racialized and/or mature students (Martinez et al., 2021). With this change in demographics, more and more students face substantial out-of-pocket costs to access a college or university education, resulting in the decreased affordability of higher education (Pfeffer, 2018; Ziol-Guest & Lee, 2016) despite the use of student loans (El Zein et al., 2019). In fact, with the continuous rise in tuition fees (Frank, 2018), research shows that Canadian post-secondary students continue to struggle to afford higher education due to a mismatch of student funding/loans, minimum wage jobs and the cost of basic student needs and tuition (Ferguson, 2004; Neill, 2015). In this way, the costs associated with attaining a higher education have brought about higher rates of student debt and poverty than ever seen before (Olauson et al., 2018). This is problematic as facing such financial burdens pushes students to prioritize their funds towards tuition and housing (Abu et al., 2022; Klobodu et al., 2021) and increases their risks of facing basic need insecurities (Hagedorn-Hatfield et al., 2022) such as food insecurity. Hence, universities are seeing new challenges arise within the student body, which hinder success in higher education (Miller, 2018).

In Canada, food insecurity is characterized by a lack of financial resources within a household causing an uncertainty or inability to acquire sufficient amounts of food needed to meet the dietary requirements of household members (Health Canada, 2017). Additionally, food insecurity can be broken down into low usage, availability, stability, and affordability of food sources within a given environment (Coates, 2018). In this way, food insecure individuals are likely to lack economic and physical resources limiting their diet quality and quantity resulting in the experience of chronic hunger (Tarasuk et al., 2017) through disrupted eating patterns, skipped meals, and reduced food intake (Crutchfield et al., 2020a). The study of student food insecurity in a higher education context is relatively new with the first study done dating back to

2009 (Chapparo et al., 2009). Over the past decade, studies on post-secondary student food insecurity have primarily been conducted in the United States (US), showing that students experience food insecurity at higher rates than the general population, ranging from 10 to 85% of the total student body (Bruening et al., 2017; Nikolaus et al., 2019; Service ER, 2021). Similarly, studies conducted in the Canadian context demonstrate food insecurity rates of 39.5% at the University of Saskatchewan (Olauson et al., 2018), 37.2% at St. Francis Xavier University (Reynolds et al., 2018), 35.3% at the University of Manitoba (Entza et al., 2017), 38.1% in rural Nova Scotia (Frank, 2018), 25.7% at the University of Calgary and 46% at Dalhousie University (Silverthorn, 2016). In light of these findings, it is evident that food insecurity remains a significant challenge within North American campuses.

### *Academic challenges faced by food insecure post-secondary students*

The psychological stress resulting from insufficient funds to purchase food as well as the physiological stress resulting from the lack of food intake often holds negative outcomes on the educational experiences of food insecure students within higher education (Beam, 2020). In fact, studies conducted at both colleges and universities suggest that student food insecurity is correlated to decreased academic performance, reduced course load, and dropping out of classes (Allen & Alleman, 2019; Hickey et al., 2019; Dubick et al., 2016). For instance, El Zein et al. (2019) report that first-year university food insecure students are twice as likely to have a grade point average below a 3.00/4.00 compared to their food secure peers. In Canada, severely food insecure post-secondary students are over five times more likely to receive grades in the C, D, and F range, while moderately food insecure students are twice as likely to report such grades (Frank et al., 2018) compared to their food secure peers. Furthermore, food insecure students are at a greater risk of slow progression, deferring of studies, and/or failing to complete their degrees as a result of their decreased performance (Phillips et al., 2018; Meza et al., 2019).

The association between food insecurity and these academic variables is partly explained by the physiological and psychological outcomes experienced by food insecure students. To provide an example, food insecurity has been associated to nutrient deficiency and decreased micronutrient consumption (e.g., iron deficiency) (Pourmotabbed et al., 2020), which, over time, has been linked to decreased cognitive functions such as focus (Pivina et al., 2019). This difficulty to focus has also frequently been reported in the research literature. For instance,

students often report difficulty concentrating and studying for an exam due to a lack of adequate food intake (Beam, 2020; Crutchfield, 2020; Hanbazaza et al., 2017). Similarly, in Canada, food insecure students report difficulty concentrating in class, an inability to complete assignments, and an inability to study for exams as a result of their diets (Farahbakhsh et al., 2017). In addition to health circumstances hindering academic success, food insecure students experience material hardships, making it increasingly challenging to succeed. For example, students are less able to purchase course textbooks and other school supplies, participate in extracurricular activities, or attend study sessions (Dubick et al., 2016; Mercado, 2017; Mallison, 2021). Moreover, the lack of belongingness resulting from the experience of food insecurity decreases students' perception of control over academic matters, thereby decreasing the likelihood that students will seek help from student support services and/or faculty members (Wood et al., 2016). Furthermore, food insecure students find themselves in need of balancing their basic needs with academics and often opt to take on more paid work in order to earn more money to purchase food which results in less time to study for their courses (Meza et al., 2019; Marin Nin & Keeton, 2020). In this way, food insecure students tend to have lower overall grade point averages and academic success, not necessarily as a reflection of their abilities but rather as an outcome of the invisible and normalized hurdles that their food counterparts do not experience. That is, the experience of food insecurity may be undermining students' potential and investment in higher education, thereby decreasing their potential for social mobility (Broton & Goldrick-Rab, 2018).

### *Potential limitations*

While the research mentioned documents a clear relationship between food insecurity and adverse health and academic outcomes, it is nevertheless important to note that the bulk of these studies make use of correlational study designs by nature of the topic of study which does not lend itself to experimental research designs. While still important to consider, the interpretation of these relationships should be taken with caution as it is possible that other confounding variables may be playing a role in this relationship. For instance, some of the studies mentioned do not provide a description of the characteristics and representativeness of their samples nor do they discuss the limitations of their study's conclusions. That said, the studies remain vital in their contributions to our understanding of food insecurity.

***Food insecure graduate students: An understudied population.***

One of the most notable gaps in the studies conducted on food insecurity relates to its applications to the graduate student population. Many of the studies conducted to date mostly focus on the experiences of undergraduate students with only a few studies including graduate students within their sample. In fact, graduate students are a noticeably understudied population in the field of food insecurity (Coffino et al., 2020). This presents a gap in our current understanding of food insecurity in higher education as graduate students exhibit differing circumstances compared to undergraduate students as they are typically older, partnered, live off-campus, and may have dependents (Hiller et al., 2021). Furthermore, graduate students may experience lower financial support from their families and higher restrictions on the hours permitted to work outside campus (Coffino et al., 2020). Indeed, anecdotally across Canada, many graduate students describe the financial toll of attending graduate school. That is, between low stipends, high tuition, and uncompensated labour within the academic environment, many find themselves in need of taking on low-wage employment opportunities and yet still report facing basic need insecurity (Robert, 2024; Mullin, 2023). To illustrate, on average in Canada graduate stipends for domestic students fall approximately 9 500 CAD below the poverty line and, for international students, it further falls to approximately 16 900 CAD below the poverty line (Owens, 2025). In this way, extrapolating the findings of undergraduate students to the graduate student population may be erroneous and may lead to suboptimal support systems in alleviating their experience of food insecurity.

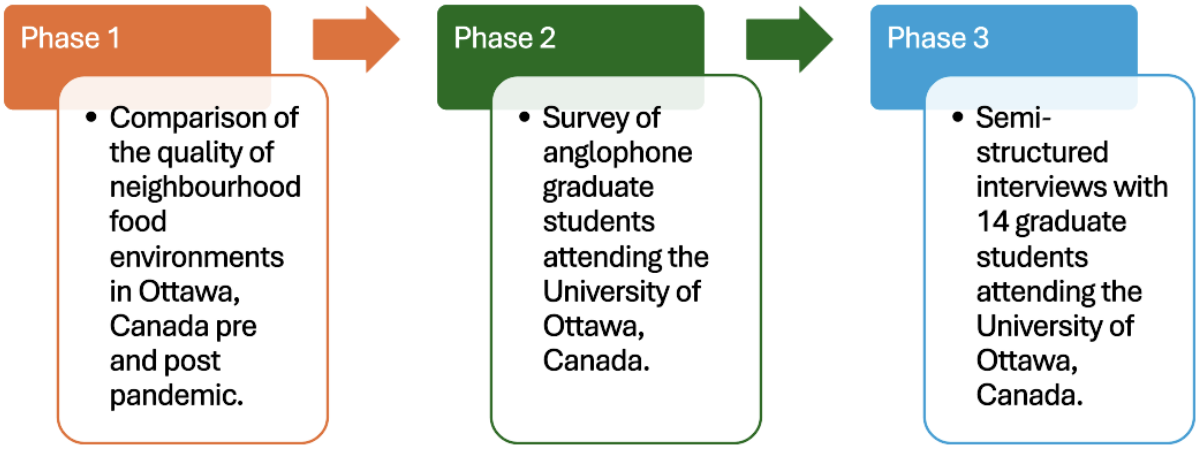
Of the studies conducted with graduate students, most are conducted in the US and the results regarding the severity of food insecurity in the graduate population is mixed. For example, Soldavini et al. (2019) conducted the first study investigating the severity of food insecurity in graduate students and found that graduate students were less likely to experience food insecurity than undergraduate students. These findings were also corroborated by Hill et al. (2021), who observed that 34% of undergraduates experienced food insecurity as opposed to 21% of graduate students. However, a more recent study by Lankford et al. (2022) investigating campus-wide food insecurity rates reveals opposing trends. Specifically, the authors found that of students reporting high food insecurity, 34.5% were graduate students, and of those experiencing very high food insecurity, 35.8% were graduate students, representing the most at-

risk student population (Lankford et al., 2022). As such, the study of food insecurity in graduate students is worthy of additional investigation, particularly within the Canadian context.

## Methodology

The paper results from a sequential-explanatory, mixed methods designed research project which was conducted using a three-pronged approach (see Figure 1). The paper results from phase two of the study. Phase two is quantitative in nature and aimed at answering the research question "What is the prevalence of graduate student food insecurity within Ottawa, Canada and how does food insecurity relate to their academic experiences?"

**Figure 1**. Overall description of the research project




### *Sampling procedure*

Phase two of the project consisted of a survey assessing food insecurity status, which was administered to graduate students attending the University of Ottawa. Convenience sampling was used for this stage. This sampling method was selected as most publications that study the prevalence of food insecurity on campuses have succeeded in employing this technique despite its potential weaknesses (Mallison, 2021). To select the sample size target, the following formula was used $sample\ size = \frac{\frac{z^2 \cdot \hat{p}(1-\hat{p})}{\varepsilon^2}}{1+\frac{z^2 \cdot \hat{p}(1-\hat{p})}{\varepsilon^2 \cdot N}}$ wherein $Z$ is the z-score, $\varepsilon$ is the margin error, $\hat{p}$ is the population proportion, and $N$ is the population size. The population under study in the current paper consisted of anglophone students attending graduate programs at uOttawa. The total population size of anglophone graduate students is N = 6408 (University of Ottawa, 2024),

giving a sample target of 363 graduate students with a confidence level of 95% (that is a z-score of $Z = 1.96$) and a margin of error of $\varepsilon$ =5% and a population proportion $\hat{p} = 0.5$. The target sample size was also consistent with other studies previously conducted on food insecurity in graduate student populations. For instance, Coffino et al. (2020) included 263 graduate students in their sample, while Mallison (2021) included 121 graduate students. Recruitment was done through multiple avenues, including but not limited to advertising the study through graduate student newsletters, graduate student associations events, on-campus posters within graduate student spaces, announcements on graduate course virtual course platforms, as well as in-person recruitment at the beginning of graduate courses and visits to graduate student laboratories and study areas. A total of 372 responses were collected. However, 8 responses were removed due to inappropriate answers or not consenting to participate in the study after reading the consent form, and one was removed as they selected "Prefer not to answer" to all items of the survey. The final sample consisted of 363 anglophone graduate students attending a large Canadian university in Ottawa, Ontario.

***Research tool – Modified Household Food Security Survey Module (HFSSM)***

For the purposes of this study, the modified version of Household Food Security Survey Module (HFSSM) developed by Health Canada (2012) was administered to graduate students via the online platform Survey Monkey ©. The HFSSM is a validated tool which contains 18 questions rated on a Likert scale and designed to assess the degree of food (in)security, that is, whether an individual has experienced food security, marginal food insecurity, moderate food insecurity, or severe food insecurity over the past 12 months (Health Canada, 2022). The tool has also been used previously to assess food insecurity rates amongst the Canadian university community (Concordia University, 2023). Within the context of the current study, Health Canada's definitions were used to define each category. Briefly, marginal food insecurity is defined as worrying about running out of food and/or experiencing limited food selection as a result of low economic resources. Moderate food insecurity is defined as needing to compromise the quality or/and quantity of the food consumed due to low financial resources. Finally, severe food insecurity is characterized by reducing food intake, missing meals, and/or going without food for prolonged periods of time due to low economic resources (Health Canada, 2023). While in the US the categories of severely and moderately food insecure are combined to the overall categorization of food insecure and food secure and marginally food insecure are combined into

the overall categorization of food secure (USDA, 2020), such classification is not advised within the Canadian context. Instead, as Health Canada makes use of a less conservative scale which allows for a continuum of food insecurity severity levels (Health Canada, 2020), experts have advocated for the recognition of marginally food insecure individuals as food insecure as opposed to food secure especially as it relates to trend monitoring and other health-related research (Men & Tarasuk, 2022).

To adapt the survey for the aims of this study, a second portion was added to the original HFSSM. This portion included items to collect demographic information such as year of study, degree type, and the faculty attended by the participant. Additionally, items specific to the experience of graduate students within higher were added with the aim of exploring the ways in which food insecurity may influence the academic experience of graduate students, notably as it relates to the dependent variables of study (See Appendix C). Prior to administering the survey, cognitive interviewing (Ruppert et al., 2013) was used with a pilot group of five graduate students to ensure the study variables were relevant to the graduate student experience and that statements were being well interpreted and understood by graduate student.

***Data Analysis***

The HFSSM survey was first analyzed using descriptive statistics. To do so, each participant's score was converted into one of four categories: food secure, marginal food insecurity, moderate food insecurity, and severe food insecurity. The categorization was done following the Canadian norms whereby the number of affirmative answers were tabulated with 0 affirmative answers equating to food security, 1 affirmative answer equating to marginal food insecurity, 2-5 affirmative answers equating to moderate food insecurity, and 6+ affirmative answers equating to severe food insecurity (Health Canada, 2012). Following, descriptive statistics were carried out depicting the percentage of moderate, marginal and severe food insecure students.

The data from the second portion of the survey, which consisted of Likert-scale statements, was treated as an ordinal data set. The independent variable of the study was food insecurity status, and the dependent variables were academic achievement, course load, dropout of courses, deferral of degree completion, disconnect from the graduate community, attendance to academic events, and skipping class respectively. Prior to analyzing the data, a Shapiro-Wilks

test was conducted and was significant $p < 0.05$ for all variables of study which indicated that the data was not normally distributed. To this end, non-parametric statistics were selected, and the variables were treated as ordinal. First, a Chi-Square test for independence was performed to compare the degree of agreement between food secure and food insecure graduate students. To do so, the data was rendered dichotomous to ensure each subgroup contained sufficient data (minimum expected cell count of 5) to satisfy the requirements of the Chi-Square for independence analysis. The Likert-scale data was dichotomized with responses options ranging from 1 "strongly disagree" to 4 "neither agree nor disagree" combined into the group "disagree" and the responses ranging from 5 "somewhat agree" to 7 "strongly agree" combined into a second group labelled "agree". In addition, moderately food insecure and severely food insecure graduate students were combined into an overall "food insecure" group ($n$=139) and food secure and marginally food insecure graduate students were combined into a "food secure" group ($n$=224). Despite the advocacy efforts in Canada to consider marginally food insecure individuals as food insecure rather than food secure (Men & Tarasuk, 2022), the decision was made to include marginally food insecure graduate students within the food secure category to allow for more accurate comparisons with existing literature which is predominantly out of the US wherein moderate food insecurity is considered food secure. Prior to conducting the test, the conditions for running the analysis were checked. Since the data sample was large ($n$ = 363), the variables of study were categorical, and the expected cell counts of 5 was reached, the conditions for the Chi-Square independence test were satisfied. Additionally, effect size was calculated through Cramer's V $\phi_c$ using the formula $\phi_c = \sqrt{\frac{\chi 2}{n(k-1)}}$ where $\chi 2$ in the Chi-Square statistic, $n$ is the sample size, and $k$ is the smallest value between the number of columns or number of rows. The effect size was interpreted in such a way that a small, medium, and large effect size were determined by the ranges 0.1 to 0.3, 0.3 to 0.5, and 0.5 or more respectively (In & Lee, 2024). For the Chi-Square test for independence, it was hypothesized that food secure and food insecure graduate students would have differing perceptions on the influence of food quality, quantity, and access on the variables of study. H0: There are no differences in how food secure and food insecure graduate students perceive the influence of food quality, quantity, and access on the variables of study. H1: There is a difference in how food secure and food insecure graduate students perceive the influence of food quality, quantity, and access on the variables of study.

Following a significant result of the Chi-Square test for independence, an independent-samples Kruskal-Wallis test was conducted. The Kruskal-Wallis test was included in addition to the Chi-Square analysis for two reasons. Firstly, with the constraints of the data from the study as previously described, the Chi-Square test for independence could only be used to investigate the associations between dichotomous variables, reducing the four food (in)security groups into two classes. This approach aligns with current food security reporting methods from the US and ensures adequate statistical power. While assessing these differences is important and allows to situate the findings more accurately within the literature, doing so also negates the differences that may be observed between each categorization of food insecurity. On the other hand, the independent-samples Kruskal-Wallis test overcomes that limitation and allows for a richer analysis of between group differences which may not be captured through the dichotomization of the groups. Secondly, given the Canadian call to further explore the impacts felt by marginally food insecure individuals (Men & Tarasuk, 2022), the Kruskal-Wallis analysis was selected as it permits the identification of potential differences between the food secure and marginally food insecure groups which may provide further support for the re-classification of marginally food insecure individuals as food insecure within the Canadian context. By structuring the analysis in this way, over-fragmentation of the data was avoided via the Chi-Square analysis thus classifying groups in the conventional food secure / food insecure categorizations, while the Kruskal-Wallis allowed for the further exploration of emerging evidence which encourages a finer distinction in the study of food insecurity.

With regards to the independent-samples Kruskal-Wallis test, the final sample consisted of 363 graduate students. The four groups of study were food secure graduate students ($n$ = 175), marginally food insecure graduate students ($n$ = 49), moderately food insecure graduate students ($n$ = 71), and severely food insecure graduate students ($n$ = 68). The dependent variables of study were academic achievement, course load, dropout of courses, deferral of degree completion, disconnect from the graduate community, attendance to academic events, and skipping class and were individually measure using a 7-point Likert scale. As the sample size of each group contained at least 5 observations, the total sample size was large ($n$ = 363), the dependent variable of study was ordinal, the independent variables of study were ordinal, and the observations were independent of one another, the conditions for the test were met. Additionally,

effect size was calculated using $\varepsilon^2$ following the formula $\varepsilon^2 = \frac{H-k+1}{n-k}$ whereby $H$ is the Kruskal-Wallis test statistic, $k$ is the number of groups, and $n$ is the total number of observations. The interpretation of $\varepsilon^2$ followed the recommendations of Sawyer & Ball (1981) as well as In & Lee (2024) wherein a small, medium and large effect size represented values over 0.01, 0.09, and 0.25 respectively. The hypothesis tested were H0: there are no differences in how food secure, marginally food insecure, moderately food insecure, and severely food insecure graduate students perceive the influence of food quality, quantity, and access on the variables of study and H1: At least one group perceives the influence of food quality, quantity, and access on the variables of study differently than the others. After obtaining a significant result, follow-up pairwise comparisons with Bonferroni adjustments were also conducted to explore between group differences. All tests were performed using the IBM SPSS Statistics for Mac version 31.0.0.0 (117) software with statistical significance set at $p<0.05$.

### *Evidence contributing to construct validity*

The second section of the modified HFSSM survey included 10 items aimed at assessing the overall construct of "academic experience". The items were rated on a Liker-scale and demonstrated strong evidence of construct validity. First, reliability analysis indicated internal consistency with the Cronbach's α calculated at 0.934. This value suggests that the 10 items on the survey are consistently measuring the same underlying construct. Further, an exploratory factor analysis was conducted which also supported the unidimensionality of the scale as only one factor was extracted indicating that all items are contributing meaningfully to the overarching construct of academic experience. Finally, the Kruskal-Wallis tests revealed that academic experience scores decreased significantly as food security worsened, demonstrating that the scale behaves as expected according to the documented literature. Together, these findings provide converging evidence that the scale is both reliable and valid and is working towards effectively capturing the construct of academic experience.

## Results

### *Descriptive statistics*

Before analyzing the data, descriptive statistics were carried out on the sample of 364 graduate students. The breakdown of the sample characteristics is presented in Table 1. The final sample

consisted of 43% self-identifying with the female gender, 24% self-identifying with the male gender, 0.2% as non-binary, and 32.8% preferring not to answer. The study population comprised 54% female, 40% male, 0.04% unknown and 0.003% other gender identity (University of Ottawa, 2023). Additionally, 42.9% of the sample were Master's level students, 20.3% were PhD level students, and 36.8% preferred not to answer. While the number of participants preferring not to answer was large, conversations had with the author indicated that participants preferred not to provide any information which they felt might identify them due to the sensitive nature of the topic. However, this data gap presents a limitation to the study which is later discussed.

Regarding the faculty of study, the sample consisted of participants from all nine faculties offering graduate courses within the university of study. While most graduate students opted out of providing demographic information (approximately 80%), at least 9.1% of the sample are international students, 5.5% are mature students, 10.8% self-identify as LBGTQ2S+, and 0.7% identify as visible minority. Specific information on the population's race, sexual orientation, and age is not publicly available by the institution of study. Nonetheless, the sample was deemed to be a good representation of the study population. Finally, regarding the prevalence of food insecurity within the sample, 48.3% were food secure, 13.5% were marginally food insecure, 19.5% were moderately food insecure, and 18.7% were severely food insecure.

**Table 1.** Descriptive statistics characterizing the sample of studied graduate students attending the University of Ottawa in the 2023-2024 academic year ($n$ = 364).

| ***Category*** | ***Sub-group*** | ***Percentage*** | ***Total N*** |
|---|---|---|---|
| **Gender** | Female | 43% | 156 |
| | Male | 24% | 87 |
| | Non-binary | 0.2% | 1 |
| | Preferred not to answer | 32.8% | 120 |
| **Minority status** | White | 16.6% | 60 |

| | | | |
|---|---|---|---|
| | Visible Minority | 0.7% | 3 |
| | Preferred not to answer | 82.7% | 301 |
| **Sexual orientation** | Heterosexual | 8.3% | 30 |
| | LGBTQ2S+ | 10.8% | 39 |
| | Preferred not to answer | 80.9% | 295 |
| **Level of study** | Masters | 42.9% | 156 |
| | PhD | 20.3% | 74 |
| | Preferred not to answer | 36.8% | 134 |
| **Faculty** | Arts | 3.8% | 14 |
| | Education | 11.8% | 43 |
| | Engineering | 7.7% | 28 |
| | Health Sciences | 8.0% | 29 |
| | Law | 0.8% | 3 |
| | Telfer | 3.3% | 12 |
| | Medicine | 4.4% | 16 |
| | Sciences | 9.1% | 33 |
| | Social Sciences | 4.9% | 18 |
| | Preferred not to answer | 46.2% | 168 |
| **Student status** | International student | 9.1% | 33 |

| | | | |
|---|---|---|---|
| | Mature student | 5.5% | 20 |

### *Non-parametric statistics*

*Chi-Square test of independence analysis*

**Academic Achievement**

With regards to academic achievement, the results indicated that food secure graduate students were less likely to self-report an impact on their nutritional quality/quantity on their academic achievement as compared to food insecure graduate students ($\chi 2$ (1, $N$ = 363) = 141.65, $p$<0.001, $\phi_c$ = 0.62). The effect size was large indicating a high association between food security status and academic achievement.

**Table 2**. Academic Achievement Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 52 | 87 | 139 |
| **Food Secure** | 212 | 12 | 224 |
| **Colum Total** | 99 | 264 | 363 |

**Course Load**

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their course load as compared to their food insecure counterparts ($\chi 2$ (1, $N$ = 363) = 59.85, $p$<0.001, $\phi_c$ = 0.41). The effect size was medium indicating a moderate association between food security status and course load.

**Table 3**. Course Load Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 39 | 100 | 139 |

| | | | |
|---|---|---|---|
| **Food Secure** | 3 | 221 | 224 |
| **Colum Total** | 42 | 321 | 363 |

### Considering dropping out of courses

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on whether they would consider dropping out of courses as compared to their food insecure peers ($\chi 2$ (1, $N = 363$) = 27.44, $p<0.001$, $\phi_c = 0.27$). The effect size was small indicating a weak association between food security status and dropping out of courses.

**Table 4**. Considering Dropping Out of Courses Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 20 | 119 | 139 |
| **Food Secure** | 2 | 222 | 224 |
| **Colum Total** | 22 | 341 | 363 |

### Participation

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their in-class participation as compared to food insecure graduate students ($\chi 2$ (1, $N = 363$) = 65.61, $p<0.001$, $\phi_c = 0.43$). The effect size was medium indicating a moderate association between food security status and participation.

**Table 5**. Participation Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 45 | 94 | 139 |
| **Food Secure** | 5 | 219 | 224 |
| **Colum Total** | 50 | 313 | 363 |

### Deferral of degree completion

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their likelihood of deferring their degree completion ($\chi^2$ (1, $N$ = 362) = 71.86, p < 0.001, $\phi_c$ = 0.44). The effect size was medium indicating a moderate association between food security status and considering deferring one's degree of study.

**Table 6**. Deferral of Degree Completion Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 43 | 95 | 138 |
| **Food Secure** | 2 | 222 | 224 |
| **Colum Total** | 45 | 317 | 362 |

### Feelings of disconnect

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their feeling of disconnection from the graduate student community ($\chi^2$(1, $N$ = 363) = 79.19, p < 0.001, $\phi_c$ = 0.47). The effect size was medium indicating a moderate association between food security status and feeling disconnected from the graduate student community.

**Table 7**. Feelings of Disconnect Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 53 | 86 | 139 |
| **Food Secure** | 6 | 218 | 224 |
| **Colum Total** | 59 | 304 | 363 |

### Missing out on academic events

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their likelihood of opting out of attending academic events

hosted by the university ($\chi^2(1, N = 363) = 80.38$, $p < 0.001$, $\phi_c = 0.47$). The effect size was medium indicating a moderate association between food security status and missing academic events.

**Table 8**. Missing Out on Academic Events Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 49 | 90 | 139 |
| **Food Secure** | 3 | 221 | 224 |
| **Colum Total** | 52 | 311 | 363 |

### Considering dropping out of the degree of study

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their likelihood of considering dropping out of their degree of study ($\chi^2(1, N = 363) = 27.44$, $p < 0.001$, $\phi_c = 0.27$). The effect size was small indicating a weak association between food security status and considering dropping out of the degree of study.

**Table 9**. Considering Dropping out of Degree of Study Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 24 | 114 | 138 |
| **Food Secure** | 1 | 222 | 222 |
| **Colum Total** | 25 | 336 | 361 |

### Skipping class

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their likelihood of skipping class ($\chi^2$ $(1, N = 362) = 39.87$,

$p < 0.001$, $\phi_c = 0.33$). The effect size was medium indicating a moderate association between food security status and skipping class.

**Table 10**. Skipping Class Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 27 | 112 | 139 |
| **Food Secure** | 2 | 221 | 223 |
| **Colum Total** | 29 | 333 | 362 |

**Doing better in the degree of study**

The results indicated that food secure graduate students were less likely to self-report an impact of their nutritional quality/quantity on their perception that they would be doing better in their degrees of study if they had better access to food ($\chi^2(1, N = 361) = 142.75$, $p < 0.001$, $\phi_c = 0.63$). The effect size was large indicating a strong association between food security status and the variable of study.

**Table 11**. Doing better in the degree of study Chi-Square Results

| | **Agree** | **Disagree** | **Row Total** |
|---|---|---|---|
| **Food Insecure** | 113 | 25 | 138 |
| **Food Secure** | 40 | 183 | 223 |
| **Colum Total** | 153 | 208 | 361 |

*Kruskal-Wallis test*

Table 12 outlines the median responses received per food security status group. Table 13 provides an overview of the results of the independent-samples Kruskal-Wallis test which compared the differences between the four groups of study. Based on the results of the test, the findings highlighted that the groups (food secure, marginally food insecure, moderately food

insecure, and severely food insecure) differed significantly in their perceived influence of food insecurity as it related to their academic achievement, course load, consideration of dropping out of courses, participation in courses, differing their degree completion, feeling disconnected from the graduate studies community, skipping academic events, quitting degrees, skipping class and doing better in the degree overall.

**Table 12.** Degree of agreement across each food insecurity group (1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = neither agree nor disagree; 5 = somewhat agree; 6 = agree; 7 = strongly agree).

| ***Statement*** | ***Food Security Status*** | ***Median*** |
|---|---|---|
| **"I feel that my experiences with food quality/ quantity/ access have negatively impacted my academic achievement."** | Food Secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 2 |
| | Moderately food insecure *(n=71)* | 4 |
| | Severely food insecure *(n=68)* | 5 |
| **I feel that my experiences with food quality/quantity/access have led me to reduce my course load.** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=68)* | 3 |
| | Food secure *(n=174)* | 1 |

| | | |
|---|---|---|
| **I feel that my experiences with food quality/quantity/access have caused me to drop out of courses.** | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=67)* | 2 |
| **I feel that my experiences with food quality/quantity/access have led me to decrease my participation in courses.** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=68)* | 3.5 |
| **I feel that my experiences with food quality/quantity/access have pushed me to consider differing the completion of my degree.** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=67)* | 3.5 |
| **I feel that my experiences with food quality/quantity/access have led me to be disconnected from the graduate student community.** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |

| | | |
|---|---|---|
| | Severely food insecure *(n=68)* | 4 |
| **I feel that my experiences with food quality/quantity/access have led me to miss out on academic events held by my faculty (e.g. conferences, presentations, etc.).** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=68)* | 4 |
| **I feel that my experiences with food quality/quantity/access have pushed me to consider quitting my degree.** | Food secure *(n=175)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 1.5 |
| | Severely food insecure *(n=68)* | 2 |
| **I feel that my experiences with food quality/quantity/access have caused me to skip-classes.** | Food secure *(n=174)* | 1 |
| | Marginally food insecure *(n=49)* | 1 |
| | Moderately food insecure *(n=71)* | 2 |
| | Severely food insecure *(n=68)* | 2 |
| | Food secure *(n=174)* | 1 |

| | | |
|---|---|---|
| **I feel that if I had better access to healthy foods, I would be doing better in my degree.** | Marginally food insecure *(n=49)* | 4 |
| | Moderately food insecure *(n=71)* | 4 |
| | Severely food insecure *(n=67)* | 5 |

**Table 13.** Summary of the hypothesis testing using an independent-sample Kruskal-Wallis nonparametric test.

| | **Total N** | **Test Statistic (H)** | **Degrees of freedom** | **P value** | **Effect size ($\varepsilon^2$)** |
|---|---|---|---|---|---|
| **Academic Achievement** | 363 | 234.42 | 3 | $p < 0.001$ | 0.64 |
| **Course load** | 363 | 184.58 | 3 | $p < 0.001$ | 0.50 |
| **Course Drop-Out** | 361 | 139.12 | 3 | $p < 0.001$ | 0.38 |
| **Course Participation** | 363 | 189.95 | 3 | $p < 0.001$ | 0.51 |
| **Degree deferral** | 362 | 162.66 | 3 | $p < 0.001$ | 0.44 |
| **Sense of disconnect** | 363 | 196.45 | 3 | $p < 0.001$ | 0.53 |
| **Attendance to academic events** | 363 | 203.33 | 3 | $p < 0.001$ | 0.55 |
| **Considering quitting the degree of study** | 363 | 125.70 | 3 | $p < 0.001$ | 0.34 |
| **Skipping class** | 362 | 153.57 | 3 | $p < 0.001$ | 0.42 |
| **Doing better if given better access/quality/quantity of food** | 361 | 199.98 | 3 | $p < 0.001$ | 0.55 |

*Follow-up pairwise comparisons*

Following the significant Kruskal-Wallis test, pairwise comparisons with Bonferroni corrections were conducted. Table 14 provides a summary of the results.

### Academic Achievement

When exploring graduate students' self-reported influence of food access/quality/quantity on academic achievement, the results revealed a significant difference between food secure and marginally food insecure, food secure and severely food insecure, food secure and moderately food insecure, marginally food insecure and severely food insecure, as well as marginally food insecure and moderately food insecure graduate students. No significant difference in reported academic achievement was observed between severely and moderately food insecure groups.

### Course Load

Pair-wise comparisons exploring graduate students' self-reported influence of food access/quality/quantity on course load suggested a significant difference between food secure and marginally food insecure, food secure and severely food insecure, food secure and moderately food insecure, marginally food insecure and severely food insecure, as well as marginally food insecure and moderately food insecure graduate students. No significant difference was observed between the severely and moderate food insecure groups.

### Considering dropping out of courses

With regard to considering dropping out of courses, the results indicated a significant difference between food secure and severely food insecure graduate students, food secure and moderately food insecure graduate students, marginally food insecure and severely food insecure graduate students, as well as between marginally and moderately food insecure graduate students. No significant differences were seen between food secure and marginally food insecure graduate students nor between moderately and severely food insecure graduate students.

### Participation in Courses

As it relates to self-reported participation in class, a significant difference was observed between food secure and marginally food insecure, food secure and severely food insecure, food secure and moderately food insecure, marginally food insecure and severely food insecure, as well as marginally food insecure and moderately food insecure graduate students. No significant difference was observed between the severely and moderately food insecure groups.

### Consideration of degree deferral

When looking at the differences in graduate students' consideration of deferring their degrees, the results highlighted a significant difference between food secure and severely food insecure, food secure and moderately food insecure, moderately food insecure and marginally food insecure, moderately food insecure and severely food insecure as well as marginally food insecure and moderately food insecure graduate students. No significant difference was observed between the food secure and marginally food insecure groups.

### Sense of disconnect from the graduate studies community

As it relates to graduate students' sense of disconnect from the graduate studies community, a significant difference was observed between all groups. Specifically, a significant difference was observed between food secure and marginally food insecure groups, food secure and moderately food insecure groups, food secure and severely food insecure groups, marginally food insecure and moderately food insecure groups, marginally food insecure and severely food insecure groups, as well as moderately food insecure and severely food insecure groups.

### Self-reported attendance at academic events

Similarly, a significant difference was observed between all groups when exploring self-reported attendance at academic events such as conferences and faculty events. Specifically, a significant difference was observed between food secure and marginally food insecure groups, food secure and moderately food insecure groups, food secure and severely food insecure groups, marginally food insecure and moderately food insecure groups, marginally food insecure and severely food insecure groups, as well as moderately food insecure and severely food insecure groups.

### Considerations of quitting the degree of study

When looking at the relationship between food insecurity and self-reported consideration of quitting the degree of study, a significant difference was observed between food secure and severely food insecure, food secure and moderately food insecure, moderately food insecure and marginally food insecure, moderately food insecure and severely food insecure as well as marginally food insecure and moderately food insecure graduate students. No significant difference was observed between the food secure and marginally food insecure groups.

**Self-reported tendency to skip class.**

With regards to the self-reported tendency to skip class, a significant difference was observed between food secure and severely food insecure groups, food secure and moderately food insecure groups, marginally food insecure and severely food insecure groups, as well as marginally food insecure and moderately food insecure groups. No significant differences were observed between the food secure and marginally food insecure groups nor the moderately food insecure and severely food insecure groups.

**Doing better in the degree overall.**

Finally, graduate students were asked whether they felt that if access/quality/quantity of food were improved, they'd be doing better in their degrees overall. The results indicated significant differences between food secure and marginally food insecure groups, food secure and severely food insecure groups, food secure and moderately food insecure groups, as well as marginally food insecure and moderately food insecure groups. No differences were observed between moderately and severely food insecure groups.

**Table 14**. Summary of pairwise comparisons.

| | **Severe vs Moderate** | **Severe vs Marginal** | **Severe vs Secure** | **Moderate vs Marginal** | **Moderate vs Secure** | **Marginal vs Secure** |
|---|---|---|---|---|---|---|
| **Academic Achievement** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |
| **Course load** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |
| **Considering dropping out of courses** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p > 0.05$ |
| **Participating in courses** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |
| **Consideration of degree deferral** | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p > 0.05$ |
| **Sense of disconnect** | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |
| **Attendance at academic events** | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Considering quitting the degree of study** | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p > 0.05$ |
| **Tendence to skip class** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p > 0.05$ |
| **Doing better overall** | $p > 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ | $p < 0.05$ |

**Discussion**

Graduate students are a notably understudied population within the field of food insecurity (Mallison, 2021) and the prevalence of food insecurity as well as its impacts on graduate students are not well understood nor documented (Bruening et al., 2017). To this end, this study aimed to assess the relationship between food insecurity and the graduate student academic experience at a large university in Ottawa, Canada. The results indicated a prevalence of 48.3% food secure, 13.5% marginally food insecure, 19.5% moderately food insecure, and 18.7% severely food insecure according to the HFSSM measure developed by Health Canada (2017). The current findings also suggested a strong presence of food insecurity amongst the graduate student population, with approximately 38.2% of surveyed graduate students reporting a moderate to severe degree of food insecurity, which is slightly higher but still in accordance with previous reports of graduate student food insecurity in the literature. For example, Mallison (2021) reported a lower prevalence of food insecurity with 23% graduate students experiencing food insecurity in their study. That said, more recent research conducted in Canada suggests higher rates of graduate student food insecurity with approximately 17.5% being marginally food insecure, 32.5% moderately food insecure, and 25.9% severely food insecure (Concordia University, 2023). In this way, the findings from the present study are within range of previous investigation on graduate student food insecurity prevalence and demonstrate the continued need for improved support. This is especially important given that even prior to the pandemic and its' associated economic instability, graduate students who worked 40 hours a week were still faced with the need to forgo their basic needs to continue their education (Goldrick-Rab, 2016). That is, with the affordability of living decreasing in the years following the pandemic, it is not surprising to see higher prevalences of food insecurity amongst already vulnerable populations such as graduate students.

The study's second objective was to explore the relationship between food insecurity and graduate students' academic experience and success. Previous studies have advocated for incorporating metrics beyond grade point averages when evaluating food insecurity's impact on academic success, such as on-time graduate rates and retention (El Zein et al., 2019). For instance, researchers have suggested that food insecurity status may influence students' academic achievement (Osiecki et al., 2022; Hickey et al., 2019; Payne-Sturges et al., 2018), course load (Duran & Nuñez, 2021), participation (Diaz & Gaylor, 2020; Hanbazaza et al., 2017), dropping courses (Duran & Nuñez, 2021; Dubick et al., 2016; Mercado, 2017; Shipley & Christopher, 2018), degree deferral (Gallegos et al., 2014), connection to the graduate community (Allen & Alleman, 2019; Frank, 2018), participation in academic events such as conferences (Broton & Goldrick-Rab, 2016; Martinez et al., 2021), consideration of quitting the degree (or retention) (El Zein et al., 2019; Phillips et al., 2018), skipping class (Meza et al., 2019) and thus such variables should be explored in the research conducted on food insecurity within university campuses. However, important to note is that these studies were conducted primarily with the undergraduate student population. As such, the present study investigated these relationships within the context of the graduate student body.

The results demonstrated that there was a significant difference in the way food secure and food insecure graduate students perceived the relationship between their experience with food quality, quantity, and access and all variables of study. Specifically, the results suggested that the food insecure group perceived that their access, quality, and quantity of food negatively influenced their academic achievement, course load, and participation in courses as compared to their food secure peers. Additionally, food insecure graduate students were more likely to self-report that they would be doing better in their degrees if they had better access, quantity, and quality of food. Such findings are congruent with the research in the field. For instance, Betancourt-Núñez et al. (2024) demonstrate that food insecurity in university students is associated with lower mental health outcomes which in turn is negatively associated to academic variables such as academic progress, course attendance, and degree completions. Similarly, a study conducted in Canada highlighted that food insecure post-secondary students self-report adverse mental and physical health outcomes which they then report negatively influenced their academic achievement as well as their ability to maintain full course loads and actively attend courses (Hanbazaza et al., 2021). While the studies mentioned focus on the undergraduate

population, they showcase the influence which food insecurity holds within the university setting. That is, they provide tentative explanations and open the realm for further investigation into the role that mental and physical health may play for food insecure graduate students as it relates to the variables of study. The relationships uncovered in the present study were also further explored to identify whether the degree of food insecurity influenced the strength of graduate students' perceptions. The results indicated that the severity of food insecurity led to greater perceived influence on academic achievement, course load, and participation wherein severely food insecure graduate students felt this relationship most strongly followed by moderately food insecure graduate students followed by marginally food insecure graduate students. However, there were no significant differences between the moderately and severely food insecure graduate students in this regard. These findings suggest that as food security worsens, graduate students may be experiencing increasing hurdles in their abilities to fully engage in their studies through complete course loads and in-class participation thereby influencing their academic achievement. Importantly, these findings suggest that marginally food insecure graduate students perceive the influence of food insecurity differently than their food secure peers wherein they are more likely to self-report negative outcomes of food insecurity on their academic achievement, attendance, and degree completions.

Moreover, when considering quitting the degree of study and differing degree completion, again the food secure group were more likely to self-report a negative influence of food access / quality / quantity. Further investigation revealed that severely food insecure graduate students reported higher agreement followed by moderately food insecure students followed by marginally and food secure students. No differences were found between marginally and food secure graduate students. With that said, it is important to consider that all groups disagreed with these two statements overall indicating that while longer degree completion timelines and drop-out are thoughts which may occur, food insecure graduate students still express a desire to see their degrees through to completion within acceptable timelines. Again, these findings are consistent with research conducted amongst the undergraduate student population. For instance, Allen and Alleman (2019) demonstrate that the health outcomes associated with food insecurity ultimately hinder students' overall academic success and lead to lower academic achievement, longer degree timeliness, and higher rates of degree drop-outs. Furthermore, qualitative studies conducted by Meza et al. (2019) and corroborated by findings

reported by Beam (2020) demonstrate that undergraduate students report decreased participation in class as they are unable to focus their attention on the subject at hand due to the physical and psychological outcomes of food insecurity. However, students remain committed to their degree regardless of the experience of food insecurity (Beam, 2020), which may explain the weaker, yet still significant, differences in course load and in-class participation seen, as well as the lower agreements on the degree deferral and drop-out variables. In this way, it may be that graduate students are not intrinsically less engaged in their studies but are rather experiencing hurdles in their abilities to engage through an inability to focus. The findings from the present study provide some evidence that such relationships are also greatly felt through all severity levels of food insecurity, whether severe, moderate or marginal, compared to food secure graduate students. In this way, the findings contribute to the emerging evidence in Canada that marginal food insecure individuals may feel the impacts of food insecurity differently than food secure individuals. However, additional investigation is warranted to more carefully explore the aspects of food insecurity which are influencing the relationships found.

With regards to skipping class and considering dropping out of courses during the semester, food insecure graduate students reported higher agreement than food secure graduate students. Further exploration of this relationship revealed that severely and moderately food insecure graduate students reported higher agreement than food secure and marginally food insecure graduate students. However, no differences were found between severely and moderately food insecure graduate students nor between marginally and food secure graduate students. While previous studies did not explicitly document this tendency, qualitative studies do provide some tentative explanations for such occurrences. For example, Meza et al. (2019) demonstrate that food insecure students opted to skip class due to embarrassment that their stomach growling could be heard by peers in class. As a result of their decreased attendance, food insecure students may tend to lose track and focus on the course content and thus drop the course. Another potential explanation could be that food insecure students find themselves in need of accessing emergency food resources such as food pantries whose hours of operation tend to conflict with class time, thus making students choose between visiting the food bank or attending class (Smith-Carrier et al., 2017). Both hypotheses would also explain the reason no difference was reported between marginally food insecure and food secure graduate students, as marginal food insecure individuals are less likely to experience visible hunger, and are less likely

to access emergency food programs (Tarasuk et al., 2019; Statistics Canada, 2023). However, further examination is warranted to unveil the underlying factors of this finding.

Finally, when considering reports of feeling disconnected from the graduate studies community and missing academic events, the findings of the study indicated significant differences between the food secure and food insecure groups wherein higher rates of agreement were reported amongst food insecure graduate students. Further investigation revealed that higher rates of agreement were reported amongst severely food insecure, followed by moderately, followed by marginally food insecure graduate students, and then followed by food secure graduate students. Once more, studies conducted with undergraduate students demonstrate that food insecure students might experience increased social isolation because they are unable to participate in social activities such as student get-togethers or conferences as they do not have disposable income to allocate to cover their costs (Beam, 2020; Stebleton et al., 2020). Moreover, due to the physical and psychological impacts of food insecurity, food insecure students tend to report feeling disconnected from the campus community and its services (Allen & Alleman, 2019; Bowers & O'Neill, 2019). In turn, the feelings of disconnect further feelings of isolation and poor mental health outcomes amongst food insecure students, thus deterring them further from engaging with the university community (Crutchfield et al., 2020b). The findings from this study demonstrated that graduate students also report a significant negative relationship between food insecurity on their sense of belongingness and active participation within the academic community. While previous research could provide a tentative explanation, further investigation is needed to explore the underlying factors. Nonetheless, it may be advisable to create avenues through which faculty, staff, and administration actively seek out food insecure students (Crutchfield, et al., 2020a).

**Conclusion**

The study's findings highlighted the high prevalence of food insecurity amongst graduate students in a post-pandemic era and the perceived relationship between low access to food items and their academic experience. These associations call for an improvement of the support offered to food insecure graduate students regardless of the severity of graduate students' experience of food insecurity. Indeed, historically, most studies and policies considered that the impacts of food insecurity were only felt on the moderate to severe end of the food insecurity scale

(Wyonch & Sullivan, 2019), considering marginal food (in)security as equating to food security (Tarasuk et al., 2019). That is, marginal food (in)security was believed to provide sufficient amounts of nutrients and food quantities to meet the nutritional needs of a household. However, an important finding from this study suggests that even marginally food insecure graduate students perceived a negative influence between their experiences of food insecurity and their studies which food secure graduate students did not report. This finding provides additional support for the Canadian call (Men & Tarasuk, 2022) to reconceptualize our understanding of marginal food insecurity and begin acknowledging marginal food insecurity as food insecure rather than food secure. As such, through improved support services, campuses should seek to address and mitigate all levels of food insecurity amongst their graduate students in a way that encourages the retention, active participation, and belongingness of graduate students to improve the academic experience and success within the university.

**Limitations**

This study presented limitations due to the methodology chosen. Firstly, convenience sample was used and thus may be subject to sampling bias wherein food insecure graduate students might have been more motivated to participate in the study due to the topic addressed (Concordia University, 2023). In addition, the research conducted was correlational in nature and does not permit for a causal link to be established between graduate student food insecurity status and academic variables. However, such methods are common in food insecurity studies due to the logistical aspects of recruitment and the constraints of exploring food insecurity (Mallison, 2021). Secondly, a large percentage of participants opted out of providing any demographic information including degree of study, gender, etc. which limits the ability to fully describe the sample and may affect the interpretation of the contextual characteristics. However, since these variables were only collected to describe the sample and were not used for the analysis of the results, the nonresponse is unlikely to impact the analytic results of the study. Additionally, recruitment methods were done in person within areas reserved for graduate students and through graduate courses in an effort to confirm that the target population was being surveyed. Thirdly, the study was reliant on self-reported data. Such data may be vulnerable to weakness as participants may be influenced by social desirability biases, ultimately decreasing the validity of the results (Brutus et al., 2012). However, self-reported data allows participants to describe their own perceptions and experiences about a given phenomenon (Chan, 2008; Austin,

2014), which aligns with the goal of the proposed study. Additionally, previous studies investigating food insecurity through survey methodologies have used similar approaches, which have been advanced as valid ways to capture students' experiences in higher education (El Zein et al., 2019; Bruening et al., 2016). Further research could incorporate qualitative interviews as a way to triangulate the findings of the current paper.

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# Chapter Four - Understanding food insecurity amongst graduate students: Influences, institutional barriers, and recommendations.


## Abstract

Food insecurity remains a prevalent concern in higher education, of which graduate students are no exception. Much of the literature in the field to date focuses primarily on undergraduate students' experience and targets this population in their proposed solutions and programs. Yet, as graduate students exhibit differing characteristics from undergraduate students, these propositions may not be adequate in meeting their needs. To this end, the current paper made use of semi-structured interviews with 14 food insecure graduate students to better understand the factors which mitigate or facilitate the prevalence of food insecurity on campus. The interviews revealed four themes: 1) food insecure graduate students expressed the multidimensional aspect of their experience incorporating proximity, affordability, quality, and time into their definition of food insecurity; 2) food insecure graduate students reported adverse outcomes on their physical and mental health, socialization, and academic progress; 3) institutional factors such as low accessibility, stigma, neoliberal influences, and low trust hindered help-seeking behaviours amongst food insecure graduate students; and 4) graduate students advocated for better support systems which addressed the barriers they experienced. This paper provides insights into the ways in which support systems can be modified to better address the needs of food insecure graduate students.


## Introduction

In Canada, food insecurity is characterized by a lack of financial resources within a household causing an uncertainty or inability to acquire sufficient amounts of food needed to meet the dietary requirements of household members (Health Canada, 2017), with food security being considered a fundamental human right (United Nations Centre for Human Rights, 1989). Yet, we continue to see a rise of food insecurity rates on North American campuses (El Zein et al., 2019; Concordia University, 2023). Additionally, “food insecurity is faceless, has no standard image, and is often silent” (Henry, 2017, p.9) within the halls of academia. This invisibility of student food insecurity in turn creates a normalization of the struggle to meet one’s basic needs, rendering the experience a necessary pain or right-of-passage in attending higher education (Crutchfield et al., 2020). That is, the colloquial narrative of the starving student

whose diet consists of low dietary quality items such as ramen noodles dismisses the severity of food insecurity by pushing the discourse that the lack of adequate and nutritional food access is normal (Maynard et al., 2018). Through such narratives, post-secondary students begin viewing disrupted eating patterns such as meal skipping as a necessary struggle in their efforts towards academic achievement (Crutchfield et al., 2020a). Additionally, the normalization of food insecurity has been shown to deter students from disclosing their hardships (Gupton, 2017) as they perceive their needs to be lesser than those of others (Crutchfield et al., 2020b) and may lead to students exhibiting help-seeking behaviour only when their needs are most dire (Crutchfield et al., 2020b). Finally, the held beliefs of privilege and the normalization of student experiences facilitates the invisibility of food insecurity and renders it forgotten within higher education (Keefe et al., 2021). Yet, research conducted to date highlights the negative impacts which food insecurity may have on post-secondary students.

***The relationship between food insecurity and student overall well-being.***

Food insecure individuals are more likely to consume diets which are lower in vegetables, legumes, and fruits (Farahbakhsh et al., 2017; Bruening et al., 2016; Martinez et al., 2019) instead favouring energy-dense foods which are low in nutrients and fibre (Larson et al., 2021; Niles et al., 2020). Such diets are correlated to lower physical activity (Moradi et al., 2019; Suzuki et al., 2016) and adverse metabolic outcomes (Moradi et al., 2019; Rebar et al., 2015). Within the context of post-secondary students, food insecure individuals tend to experience lower levels of physical activity as well as sleep insufficiency because of their diet quality and quantity (Martinez et al., 2019). In this way, food insecurity has been linked to a disruption in circadian rhythms, thereby decreasing sleep health (Becerra et al., 2020). In return, this decrease in sleep quality has been linked to poor mental health outcomes in post-secondary students (Hagedorn et al., 2021). To illustrate, food insecure post-secondary students are more likely to report feeling sluggish, fatigued, dizzy and unable to concentrate due to their diets as compared to their food secure peers (Crutchfield et al., 2020; Beam, 2020; Hanbazaza et al., 2017; Farahbakhsh et al., 2017).

Moreover, food insecure individuals also experience a lower access to sufficient food quantity which has been associated to irregular eating patterns such overeating and restricting food consumption (Dinour et al., 2007; Nettle et al., 2017). Within the post-secondary context,

this feast or famine cycle has been documented to increase the likelihood of developing eating disorders such as binge eating (Becker et al., 2019; Hooper et al., 2021), bulimia nervosa (Lydecker & Grilo, 2019), and other overeating behaviours (Christensen et al., 2021; Dinour et al., 2007). Unsurprisingly, food insecurity amongst post-secondary students has also been linked to the development of detrimental mental health outcomes such as anxiety and depression (Payne-Sturges et al., 2018; Darling et al., 2017; Heflin et al., 2005; Goldrick-Rab et al., 2015; Lin et al., 2013; McIntyre et al., 2013; Nagata et al., 2021) as well as social isolation, and loneliness (Martinez et al., 2021; Bowers & O'Neill, 2019; Crutchfield et al., 2020). Ultimately, the stress associated with the inability to afford to purchase food has been shown to negatively influence the educational experiences of food insecure students within higher education (Beam, 2020), putting them at greater risk for of experiencing delays within their studies (Phillips et al., 2018; Meza et al., 2019). In this way, universities may hold a responsibility when it comes to addressing food insecurity within their walls.

***The role of higher educational institutions in supporting food insecure students.***

Food pantries are one of the most common approaches used by university in North America to counter increasing rates of student food insecurity amidst decreasing affordability of pursuing a higher education (Daugherty et al., 2019). This reliance on emergency food pantries and on campus food banks as a first response is done with the belief that they are adequate in supporting and supplementing the diets of food insecure students (Cady, 2014). However, research investigating this assumption have refuted their efficacy. To illustrate, studies have shown that students often view these resources as a last resort in part due to the stigmatization of student food insecurity in higher education (Sabi et al., 2019; Daugherty et al., 2019; El Zein et al., 2019) and may therefore avoid visiting these establishments (Olauson et al., 2018). Secondly, food pantries tend to operate during hours which often conflict with class time forcing students to decide whether to participate in their courses or seek food assistance (Smith-Carrier et al., 2017). Finally, food pantries tend to carry items which are highly processed and energetically dense rather than nutrient rich foods such as fresh fruits and vegetables (Martinez et al., 2021; Hagedorn et al., 2019). One of the reasons for this is that food banks and food pantries are not meant to address chronic or prolonged experiences of food insecurity (Hagedorn-Hatfield et al., 2022) but rather are designed to provide assistance in times of acute crisis (Mook et al., 2020). Instead of food pantries or banks, the literature within the field has been suggesting

implementing more holistic programs within universities. One such initiative is found in food recovery models wherein meals or food items which would have otherwise been discarded are instead donated to students (Dubick et al., 2016; Swipe Out Hunger, 2019; MEANS, 2022). Another initiative recommended in the literature focuses instead on increasing access to fresh, nutritiously dense foods through the implementation of university farmer's markets and community gardens (Sharpe et al., 2018; Stluka et al., 2019; Manry et al., 2017; Osiecki et al., 2022). While such interventions are promising, they are only effective if leveraged by food insecure students. That is, institutions that put them in place must be cognizant of the barriers that may hinder students from accessing their support services. This is particularly important as university students who are most in need of support tend to be the least likely to seek out support services from the university (McKauge et al., 2009; Vogel et al., 2008). To illustrate, Clegg et al. (2006) find that students are reluctant to access support services as they fear being seen as needy or not coping with a specific, often quite personal, issue.

While little research has specifically investigated the factors mitigating help-seeking behaviours of food insecure students within higher education, research has been conducted on the factors influencing access to general academic support and mental health services within academia. For example, Hoyne and McNaught (2013) discuss barriers to help-seeking behaviours as it relates to individual attributes such as fear, denial that a need exists, and learned helplessness whereby students anticipate failure and thus do not seek out academic assistance when needed. When extrapolated to food insecurity, previous research has shown that food insecure students exhibit a tendency to downplay the severity of their own experiences, leading them to hold the belief that they are not food insecure enough to access emergency services (Crutchfield et al., 2021). Within the mental health sector, Nam et al. (2013) identify similar barriers, citing self-concealment, stigma, and anticipated risks as having a negative relationship with help-seeking behaviours. Again, applying such findings to the field of food insecurity, evidence points to the role of stigma in decreasing the likelihood of visiting a food bank for assistance (Olauson et al., 2018). While individual attributes are known to influence help-seeking behaviours, it is also important to consider the institutional factors which work towards hindering or facilitating access to support services, such as institutional trust.

Briefly, within the context of higher education, institutional trust can be defined as "students' willingness to be vulnerable based on the investment of faith that their institution is open, reliable, honest, benevolent and competent" (Carless, 2013; as cited in Payne et al., 2023). Specifically, trust can be broken down into two facets which are cognitive trust and affective trust (Choi et al., 2014). Regarding the cognitive dimension, trust can be understood as a student's belief in the reliability of their institution (Choi et al., 2014). Within such dimensions, aspects such as institutional reputation and previous experiences with individuals within the organization come into play. On the affective dimension, trust is conceptualized as a student's belief regarding the degree to which the institution is concerned and cares for its students (Choi et al., 2014). In other words, one can understand the affective dimension as the implicit messaging given to students regarding a particular issue within the institution. When students exhibit higher trust in their institutions, it creates a comfort zone which facilitates assistance-seeking both with regard to academic support and mental health services (Payne et al., 2023; Nam et al., 2013). Similarly, Schwei et al. (2014) identify previous negative experiences seeking help from institutions as a cause for low institutional trust. Beyond facilitating help-seeking behaviours, institutional trust has also been linked to student satisfaction, engagement and performance within higher education (Payne et al., 2023; Schlesinger et al., 2016). In this way, it is evident that institutional trust may be a key player in addressing food insecurity within campuses.

Many of the studies conducted to date mostly focus on the experiences of undergraduate students and graduate students are considered to be a noticeably understudied population in the field of food insecurity (Coffino et al., 2020). This presents a gap in our current understanding of food insecurity in higher education. Moreover, little research has been done investigating the ways in which graduate students understand their experiences of food insecurity and the ways in which food insecurity is addressed at the institutional level, including the barriers and facilitators which influence student help-seeking behaviours within the walls of academia. To this end, the purpose of this study was to explore the ways in which food insecure graduate students perceive their experiences of food insecurity within the academic setting and highlight their points of view regarding the intervention strategies used in higher education.

**Theoretical Framework**

The current study expanded on Maslow's Hierarchy of Needs framework (Maslow et al., 1970) by incorporating elements from the Social Determinants of Health Framework into its dimensions (Healthy People 2030) to enable a nuanced understanding of the various factors which influence the experience of food insecurity among graduate students. Briefly, Maslow's hierarchy of needs (Maslow et al., 1970) views human behaviours from a motivation standpoint wherein individuals are seen as being in a constant state of desire for a certain goal, which fuels the motivation to achieve that particular goal (John, 2009). In addition, Maslow's theory is depicted as a pyramid whereby the base of the pyramid represents the more vital needs, and the top of the pyramid represents needs which can only be met if the previous tiers of the pyramid are met (Crandall et al., 2020). Specifically, the first tier outlined by Maslow et al. (1970) is physiological needs, which are an individual's stable access to safe foods and water. Physiological needs are considered to be the most important of all needs in the hierarchy as they represent basic necessities for functioning (John, 2009). Once physiological needs are met, the next stage in Maslow's hierarchy of needs (Maslow et al., 1970) is safety needs, wherein individuals focus on obtaining financial security and housing security, as well as seeking out routine and familiarity (John, 2009). Recent research has expanded on the safety need with regard to graduate students and medical residents, emphasizing the need for job security, which is often difficult to achieve as students rely on short-term, contract-based employment (Shapiro et al., 2019). The third stage in Maslow's hierarchy of need relates to socials needs such as the need for belongingness, love, and affection whether it be through friendships, romantic relationships, or community connections (Maslow et al., 1970; John, 2009). Again, social needs have been expanded to include a sense of respect within the work sphere of the individual, whether it be on behalf of colleagues, supervisors, or administrators (Hale et al., 2020). Once social needs have been satisfied, individuals become motivated by their need for esteem (Maslow et al., 1970). The need for esteem encompasses both esteem for oneself, or self-esteem, as well as esteem from those surrounding the individual (John, 2009). Recent adaptations have conceptualized esteem from others with respect to fairness (Hale et al., 2020) as well as appreciation and fair compensation (Shapiro et al., 2019). Only once all previous dimensions have been satisfied can individuals then work on meeting their need for self-actualization, whereby one can work towards becoming the optimal version of oneself (Maslow et al., 1970).

While Maslow's hierarchy of needs focuses on the individual's motivation and drive, the social determinants of health framework (Healthy People, 2030) encompass the social dimensions outside of an individual's control, which influence a given public health concern.

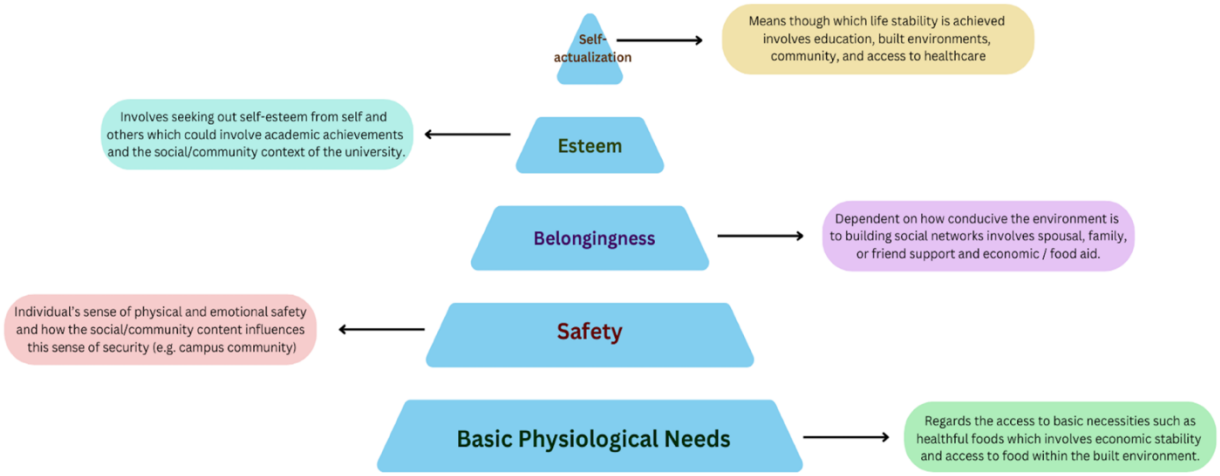
Indeed, the social determinants of health framework considers "the conditions in the environments where people are born, live, learn, work, play, worship, and age that affects a wide range of health, functioning, and quality-of-life outcomes and risks" (Healthy People 2030). In so doing, the framework focuses on five factors which should be considered when looking at health inequities within a population, namely economic stability, social/community context, education, health care access, and neighbourhood/built environments (Healthy People 2030; Yearby, 2020). Specifically, economic stability considers aspects such as income, socioeconomic status and cost of living; social/community context refers to factors such as workplace safety and community connectedness; education encompasses factors such as high school graduation rates and enrollment in higher education; health care access makes reference not only to the access to primary health care services but also to health literacy of individuals; and finally neighbourhood/built environments considers aspects such as access to safe housing and healthful foods (Hamilton, 2023). In this way, the social determinants of health framework facilitate the exploration of the communitarian and structural characteristics which influence an individual's behaviour in a way which influences their overall health. Moreover, combining the social determinants of health framework with Maslow's hierarchy of needs provides a holistic framework for the study of food insecurity in a community setting.

### *Integrating Maslow's hierarchy of needs with the social determinants of health framework for the study of food insecurity.*

When combining the two frameworks, the paper followed the structure of Maslow's hierarchy of needs. When considering the base of the pyramid, one can consider physiological needs both with regards to the individual's need for basic necessities such as food and water but also the means through which individuals can access those necessities, namely economic stability and access to food within their built environments. Within the context of food insecurity in higher education, the base of the pyramid is of primary concern as food insecure individuals tend to lack consistent access to healthy nutrition due to economic barriers. The second tier of the pyramid revolves around safety, whereby one can consider the individual's sense of physical

and emotional security and how social/community context influences this sense of security. For example, within the context of this study, one could consider the support and safety being provided by the university community. The third tier relates to the sense of belongingness whereby the individual focuses on building social networks, which are, in turn, influenced by the social/community context within which they are located. When looking at the issue of food insecurity in higher education, one could consider how conducive one's environment is to building social networks and the ways in which they mitigate food insecurity, such as through spousal, family, or friend economic and/or food aid. The fourth tier centers on the need for esteem, whereby individuals seek out self-esteem and esteem from others through achievements. Within the context of food insecurity in higher education, these achievements are outlined by not only the educational opportunities provided to them but also the social/community context of the university. The final tier relates to self-actualization whereby individuals seek out their full potential. Here, it becomes evident that all factors which relate to social determinants of health are applicable in the sense that education, built environments, social/community contexts, access to healthcare, and education may influence an individual's capacity to achieve self-actualization. Within the study of food insecurity, one could consider self-actualization as a means through which life stability is achieved, and thus, food insecurity is addressed. In this way, integrating Maslow's hierarchy of needs with the social determinants of health framework allows for a more comprehensive evaluation of the issue of food insecurity within higher education, incorporating both the individual and the individual's social determinants of health into the conceptualization and understanding of food insecurity.

**Figure 1**. Theoretical framework for the study of food insecurity amongst graduate students.




## Methods

This paper resulted from a cross-sectional, mixed methods, sequential, explanatory research project, which was conducted using a three-phase approach. The research project aimed to explore graduate student food insecurity within the University of Ottawa. This paper outlines the outcomes of the third phase of the project which sought to answer the research question "In what ways do food insecure graduate students perceive the intervention strategies used in higher education?"

### *Participant Recruitment*

In a previous phase of the research project, 363 anglophone graduate students attending the university answered a survey investigating food insecurity status and academic outcomes. At the end of the survey, graduate students were asked whether they would be interested in participating in follow-up interviews. A total of 49 students indicated interest and provided their contact information. The inclusion criteria were: 1) Have experienced moderate or severe food insecurity as measured by the Household Food Security Survey Module (Health Canada, 2020) administered in phase two of the study and 2) Have attended the University of Ottawa as a graduate student for at least one year. A total of 22 graduate students out of 49 were eligible for the study. Upon contact, 4 graduate students withdrew their interest in participating. Semi-structured interviews were first conducted with an initial sample of 10 moderately and severely food insecure graduate students attending the University of Ottawa which were selected at

random from the participant pool. The final sample consisted of 14 anglophone graduate students which is in line with sample recommendations of approximately 12 participants for qualitative research studies (Palinkas et al., 2015; Guest et al., 2006). All participation was voluntary. To preserve the confidentiality and privacy of the participants, each participant was given a pseudonym at random. Table 1 provides a summary of the participants' characteristics.

**Table 1.** Participant Characteristics

| **Pseudonym** | **Gender** | **Program** | **Student Status** | **Racial Status** | **Food Security Status** | **Other disclosed characteristics** |
|---|---|---|---|---|---|---|
| Charlize | Female | Masters | International | Visible Minority | Severe | N/A |
| Heather | Female | PhD | Domestic | White | Moderate | LGBTQ2S+ |
| Derek | Male | PhD | International | Visible Minority | Moderate | Married, Father |
| Ophelia | Female | Masters | Domestic | Visible Minority | Severe | LGBTQ2S+ |
| Michelle | Female | Masters | Domestic | White | Severe | Mature student |
| Denise | Female | PhD | International | Visible Minority | Severe | Single Mother |
| Mandy | Female/ Non-binary | Masters | Domestic | Visible Minority | Severe | LGBTQ2S+ |
| Rachel | Female | Masters | Domestic | Visible Minority | Severe | N/A |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sarah | Female / Non-binary | Masters | Domestic | Visible Minority | Severe | LGBTQ2S+<br>Living with disability |
| Theressa | Female | PhD | Domestic | White | Severe | N/A |
| Jessica | Female | Masters | Domestic | White | Moderate | N/A |
| Serena | Female | Masters | Domestic | Visible Minority | Moderate | N/A |
| Tina | Female | Masters | Domestic | White | Moderate | N/A |
| Monica | Female | Masters | International | White | Severe | LGBTQ2S+ |

***Data Collection***

A semi-structured interview protocol was used as it is the most commonly employed technique in qualitative research studies (DiCicco-Bloom & Crabtree, 2006). The semi-structured interview guide used for this study was developed after completing a review of recent literature on the topic of food insecurity in higher education and was informed by the theoretical frameworks. For example, the interview guide included questions on the social determinants of health variables such as built environments, as well as the accessibility and affordability of food within one's environment. Additionally, the interview guide included specific items related to the relationship of food insecurity to the self, such as on participants' health, socialization, and academic achievement. Following the analysis of the quantitative findings of the study, the interview guide was further modified in an effort to explore the main findings of the survey further. For instance, questions were added to investigate the relationship between academic achievement and food insecurity in a more nuanced fashion incorporating probing questions regarding participant's perceptions of academic performance, academic engagement, and belongingness to the academic community. Furthermore, the interview guide was piloted in accordance with best practice (Billups, 2021) with three graduate students who did not participate in the study to elaborate on the ways in which they understood the questions asked and the assumptions they held regarding the questions. Items were then reworked collectively

until a common understanding of the intent and purpose of each item was reached. The interview with the participants took place in the spring of 2024 in a virtual setting through a Microsoft Teams video call. All interviews were conducted by the author and their duration varied from 25 minutes to 1 hour and 30 minutes with an average length of approximately 40 minutes.

### *Data Analysis*

Each interview was first audio-recorded and immediately transcribed via the Microsoft Teams platform. The transcription was then anonymized by removing identifying elements such as names, programs of study, countries of origin, etc. Following, a quality check was done in which the audio recording was played as the transcription was read to catch any potential discrepancies. Following each interview, transcripts were evaluated to identify consistent and common patterns across participants by using thematic content analysis (Billups, 2021). To do so, an iterative and inductive process was used. First, each interview transcript was reviewed following the interview line-by-line, highlighting key information as they emerged. The key information was then reduced and assigned into preliminary codes. Following, the codes were themselves organized in tentative groupings to identify themes. As more participants were interviewed, codes were adapted, reviewed, and clustered into specific themes. Through this process, data saturation was determined to be reached when similar information was being provided by participants 13 and 14 which did not add any new key ideas, codes, or themes to the analysis of the data. Table 2 provides a summary of the codes expressed under each theme. At this point, the thematic framework was reviewed to verify whether any similar groups persisted which could be collapsed. Finally, the transcripts were reviewed to check whether additional quotes could be pulled for each subtheme identified. Table 3 outlines the thematic framework used to analyze the interview data. As the interview guide was informed by literature and the theoretical frameworks of the study, two themes were anticipated to emerge from the data and were deemed a-priori themes. However, throughout interviews with graduate students, two emergent themes were identified which were not previously informed by the literature.

### *Trustworthiness*

Standards of qualitative research trustworthiness (Billups, 2021) were implemented for the study. Firstly, credibility was sought through the establishment of rapport with participants. That is, the author was a fellow graduate student within the university of study and could thus

more aptly relate to the participants. The author also made use of active listening techniques and showcased empathy during the interviews. Additionally, prolonged engagement during the research process was done as the author conducted all 14 interviews and carried out the coding process. In this way, the author was deeply immersed in the data from the collection to the analysis phase, enhancing sensibility to nuances in the participants' narratives. Confirmability was sought by providing direct quotations from the participants in the analysis of the data from each interview. Dependability was done through the thorough documentation of the research process. Finally, transferability was achieved by following thick descriptions as defined by Geertz (1973). That is, sampling strategy, rationale, and criteria were documented. Furthermore, the context within which the research project took place was described including the identification of the university of study, available demographic information regarding the participant, and their characteristics relevant to the study (i.e. food security status). Finally, the data collection procedure including the semi-structured interview guide (see Appendix D), duration of interviews, and the mode of interviews, was provided.

**Table 2.** Coding summary broken down by sub-theme

| **Theme 1: Participants' understanding of food insecurity.** | | | |
|---|---|---|---|
| *Sub-theme 1. Access* | *Sub-theme 2: Affordability* | *Sub-theme 3: Quality of food* | *Subtheme 4: Time* |
| Walkability<br>Public transportation<br>Neighbourhood<br>Geographic location<br>Distance to healthy food outlets | Inflation<br>Price of food items<br>On-campus foods<br>(In)affordability of nearby food outlets<br>Cheap items – unhealthy<br>Budgeting / Prioritizing | Diversity of food items<br>Cultural food items<br>Balanced diet<br>Nutritional quality<br>Fresh fruits and veggies<br>Dietary restrictions<br>Canned / Frozen foods<br>Ingredients | Inexperience with North American budgeting techniques<br>Social media – blogs, YouTube, Instagram etc.<br>Searching for coupons / flyers<br>Time trade-off – cooking, grocery shopping, school tasks, hobbies<br>Prioritization of needs – work/school/food |

| **Theme 2: Participants' self-report of the impacts of food insecurity on the self.** | | | |
|---|---|---|---|
| *Sub-theme 1. Physical Health* | *Sub-theme 2. Mental health* | *Sub-theme 3. Socialization* | *Sub-theme 4. Academics* |
| Weight – loss and gain | Anxiety | Connection to peers through food insecurity | Grades – no impact |
| Cognitive functioning – brain fog / concentration | Stress | Inability to go out with friends | Disengagement in class |
| Food allergy | Overwhelm | Group problem-solving | Difficulties following in classes |
| IBS | Exhaustion | Batch cooking | Difficulties achieving milestones on time |
| ADHD | Burnout | Grocery division | Playing catch-up |
| Body image | Irritability | Isolation | Disruption in study routines |
| Feeling sick | Mood shifts | Lack of understanding / disclosure | Mental space / Energy |
| | Eating disorders | | Feeling of suboptimal work / bare minimum |
| | | | Low interest in academic events |

| **Theme 3: Participants perceive low recognition and support on behalf of the university.** | | |
|---|---|---|
| *Sub-theme 1. Lack of awareness of support.* | *Sub-theme 2. Stigma and Neoliberalism* | *Sub-theme 3. Lack of trust* |
| Low awareness of resources | Viewing the university as a business | Lack protection |
| Lack of previous conversations around FI | Stigma | Distrust |
| Food bank | Inauthenticity | Institutional Reputation |
| Bureaucracy – barrier to access | Lack of recognition of the student struggle | Word of mouth |
| FI research focused vs. student focused | Feeling that nobody cares / being ignored | Feeling unsafe in disclosing FI |
| Difficult to find information | Individualism | Previous experiences – barrier to seeking help |
| University resources hard to navigate | Perception that FI is personal failure | Lack of honesty |
| | | Feeling unvalued |

| | | |
|---|---|---|
| | Normalization of student struggle<br>University policies<br>Lack of transparency<br>Maintaining professionalism | Neglect of students<br>Unsatisfactory / lack of response from support services<br>Unreliability of support services<br>Negative consequences after reaching out for help |
| **Theme 4: Areas for improvement identified by participants** | | |
| *Sub-theme 1. Information and communication* | *Sub-theme 2. Remuneration and work policies* | *Sub-theme 3. On-campus initiatives* |
| Increase access to resources<br>Leverage orientation<br>Leverage syllabi<br>Leverage email lists<br>Reduce bureaucracy<br>Educate staff/professors<br>Initiate conversations on FI<br>Remove stigma / shame | Increase access to TA/RAships<br>Scholarships / Funding<br>Work restrictions<br>Cost-of-living<br>University policy | Free food / meals<br>Grad student restaurants<br>Grad student stores<br>Subsidized foods<br>Leveraging on-campus events<br>Food stipends |

**Table 3**. Final thematic framework used to analyze the semi-structured interview data.

| | ***First-order Themes*** | ***Sub-Themes*** |
|---|---|---|
| ***A-priori themes*** | Food insecure graduate students expressed the multidimensional aspect of their experience incorporating proximity, affordability, quality, and time into their definition of food insecurity. | Theme 1: Proximity to food sources.<br>Theme 2: Affordability of food environments.<br>Theme 3: Quality, a matter of nutritionally and culturally appropriate foods.<br>Theme 4: Time management: a delicate |

| | | |
|---|---|---|
| | | balance between graduate student life and food strategies. |
| | Food insecure graduate students reported adverse outcomes on their physical and mental health, socialization, and academic progress. | Theme 1: Food insecurity is related to adverse physical health outcomes.<br><br>Theme 2: Food insecurity is related to adverse mental health outcomes.<br><br>Theme 3: Socialization within higher education: Both a sources of distress and of comfort for food insecure graduate students.<br><br>Theme 4: Food insecurity presents a hidden hurdle in achieving academic success in graduate studies. |
| ***Emerging themes*** | Institutional factors such as low accessibility, stigma, neoliberal influences, and low trust hindered help seeking behaviours amongst food insecure graduate students. | Theme 1: Low awareness and lack of accessibility to campus support services.<br><br>Theme 2: Stigma and neoliberal influences inhibit help-seeking.<br><br>Theme 3: Low institutional trust is exhibited by food insecure graduate students. |
| | Graduate students advocated for better support systems which addressed the specific barriers they experienced within the university of study. | Theme 1: Increasing information sharing and building a stigma-free environment.<br><br>Theme 2: Alignment of scholarships, funding, and |

| | | |
|---|---|---|
| | | work policies to the cost of living.<br><br>Theme 3: Providing on-campus resources which are easy to access and affordable. |

**Findings**

The participants in this study articulated four main themes which illustrated the ways in which graduate students understood their experiences of food insecurity and the role the university played in student food insecurity. The four themes were: 1) Food insecure graduate students define food insecurity in terms of proximity, affordability, quality, and time; 2) Food insecure graduate students perceive a relationship between food insecurity and their physical, mental, and social well-being, which ultimately presents a barrier to their academic success; 3) Institutional factors such as trust and reputation influence help-seeking behaviours amongst food insecure graduate students; and 4) Food insecure graduate students express common advice and opportunities for improved institutional support.

***Graduate student food insecurity: A matter of proximity, affordability, quality, and time.***

Food insecurity has long been characterized according to four dimensions, namely usage, availability, stability and access to food sources (Coates, 2018; FOA, 2006). The participants in the study held a similar conceptualization of food insecurity, identifying proximity to food sources, affordability of food environments, and quality of food items as key dimensions of their experience of food insecurity. However, in addition to those dimensions, graduate students emphasized the aspect of time management that played into their experiences of food insecurity and that they perceived as interconnected to the other three dimensions of food insecurity.

*Proximity to food sources*

Within the context of the study, proximity was understood as influencing the availability and access dimensions of food insecurity. To further define these concepts, availability refers to the actual foods present within an environment, while access is defined as an individual's ability to acquire said food within their environment (FOA, 2021). Food insecure graduate students

highlighted the importance of consistent and reliable availability and access to healthful food environments, be it on campus or within the surroundings of their homes. For example, when discussing access, Heather points out:

> Food insecurity I think of it as like distance to food. So like how close you are to like a grocery store or market or affordable restaurant […] public transit isn't always reliable especially in Ottawa. Ubers are expensive and I don't have a car so food should be accessible by walking. Like we recently moved to this area because it was affordable for us. We didn't think a 15-minute walk to the grocery store would be long, but for us, especially on bad days, that's too long.

Here, Heather illustrated the ways in which access to affordable grocery stores is an influential factor in achieving food security. Specifically, Heather pointed to the fact that in light of the city's unreliable transportation services, she was brought to make her habitation decisions based on walking proximity to healthful and affordable food sources. Indeed, it has been highlighted in research done with undergraduate students that unreliable public transportation acted as a barrier, interfering with students' ability to meet their dietary needs through reduced access to healthful foods (Martinez et al., 2021; Zigmont et al., 2021; Beam, 2020). Beyond access, the physical availability of healthful foods within the stores accessible to participants was highlighted as a concern. Within the current context, availability refers to items available for purchase within the individual's food environment (FOA, 2021). In other words, for participants, proximity was understood in terms of minimal distance to stores shelving various healthful and affordable foods. This concept was illustrated by Ophelia, who explained:

> So not having access to like what we consider healthy food or nutritious food that can be like because of space so how far you might be or the cost for the time that you have to go and do groceries. Like how much time you have like okay, if you wanna do like quick groceries so that kind of has to be by foot, closer by or you have to like schedule and like take public transportation which can also put strains on like how much you're buying.

Similarly to Heather, Ophelia considered proximity to stores in terms of walking distance and time when describing the dimension of proximity due to shortfalls with the public transportation system. Given such barriers, graduate students understood proximity and thus access and availability as stores within walking distance of their food environments, whether in the short

campus perimeter or their neighbourhoods. However, proximity is not the sole factor affecting food insecurity among graduate students. Indeed, both Ophelia and Heather highlighted the dimension of affordability within their descriptions of proximity.

*Affordability of food environments*

Economic stability is central to the concept of food insecurity and influences an individual's access to food (FOA, 2021; Stebleton et al., 2020; Frank, 2018). That is, economic stability is tightly linked to (in)affordability of food and is defined as inadequate access to food due to financial constraints (Tarasuk et al., 2016). Within the context of higher education, students most at risk of experiencing food insecurity tend to be particularly vulnerable to financial precarity and thus may struggle to make ends meet (Broton et al., 2018). In this study, participants demonstrated a similar understanding of the effects of food affordability. For example, Rachel shared:

> So to me it means not being able to afford groceries. Of you know, we try to be healthy and you know what? We can only afford the cheaper things which end up not being healthy unfortunately so that's what [food insecurity] means to me.

As such, it is not sufficient to be in close proximity to healthful food. Rather, high food prices within food stores are a further barrier to achieving food security for graduate students. Students most at risk of financial precarity tend to be from racial/ethnic minority backgrounds and/or low socioeconomic backgrounds (Payne-Sturges et al., 2018). Within the current study, international graduate students were found to strongly stress the aspect of economic stability and affordability. For instance, Charlize expressed:

> I have to rely on some food bank or some kind of outside help in order to get sufficient food to sustain my living […] I think that inflation, like the price, has been rising every year. Every year the inflation is like accelerating.

Charlize's statement highlighted a further dimension of food insecurity as it relates to food stability within the household (FOA, 2021; Begley et al., 2019). Indeed, in her statement, Charlize was referring to the difficulty of withstanding unexpected events or challenges that may arise, such as post-pandemic inflation, which has substantially increased food prices in a short period. In this way, the dimension of food affordability, as expressed by the participants, can be

understood not only in terms of economic access to healthful foods but also in the ability to retain a stable supply of healthful food within one's household. Of particular note, participants viewed the affordability of food within their overall food environment, which incorporated both neighborhood environments and campus environments. To illustrate, Theressa elaborated on the lack of affordability of the food made accessible to her, putting particular emphasis on the unaffordability of campus food environments:

> [On-campus food] is unattainable really. I feel like that's why you see like a fifty person line at Time Hortons cause it's the same as if you went to a Tim Hortons off campus. But then any other place on campus, you're gonna go buy a bowl for like $17.00 and it's gonna be like it's not even a full meal. Like I'm in the new building and they put a café in there. It's so expensive. I can't believe they sell anything.

In her statement, Theressa discussed the high prices of on-campus foods, reflecting findings from previous studies. For example, Beam (2020) demonstrates that on-campus food items tend to be less affordable than off-campus foods adding on an additional barrier to achieving food security for students who are required to be on campus during work hours. While all three graduate students emphasized the need for affordable foods, they also referred to the nutritional quality of those items, namely the need to have access to affordable, good-quality foods such as fresh produce.

*Quality: A matter of nutritionally and culturally appropriate foods*

The experience of food insecurity can be understood in terms of the quantity of food consumed and the quality of the food consumed (Alaimo et al., 2001). That is, food insecure individuals may be consuming sufficient amounts of food and thus not experience hunger, but the quality of those food items would be of low nutritional quality, therefore not meeting nutritional needs (Economic Research Service, 2019; Broton & Goldrick-Rab, 2018). In this way, low food quality could be conceptualized as the absence of high nutritional quality items and a lack of diverse food items within an individual's diet. Individuals who experience food insecurity are more likely to compromise on the quality of the food they consume rather than the quantity consumed (Beam, 2020; Begley et al., 2019). Some scholars have advanced low food literacy as leading to poor diet quality amongst food insecure adults (Begley et al., 2019). Briefly, food literacy refers to making healthy nutritional decisions within complex food

environments, encompassing food skills such as cooking and reading food labels and broader environmental contexts such as sociocultural food practices and food environments (Health Canada, 2022). While food literacy may lead to food insecurity, studies conducted within a Canadian context do not demonstrate such findings (Slater et al., 2016). In support of the latter, the findings from the current study showed that participants expressed the need to consume low-quality foods not through low food literacy but rather as a survival mechanism. That is, participants were cognizant of the influence of poor nutrition on their health while also understanding that low-quality items would allow them to eat at more regular intervals. Thus, they made the decision to sacrifice quality for quantity due to external factors rather than personal preferences or knowledge gaps. For example, Derek explained:

> We tend to get what is available and though what is available might be in mass in its quantity it does not mean that it is balanced and therefore is just an indication that there is a deficiency in the nutrients or diet that has been consumed […] I'm able to get food, able to get what I need but it's not really the standard for which is supposed to be so you may end up getting a lot of starchy substance but less fruits or those heavy nutrient fruits that provide more energy.

Sarah and Denise echoed Derek's statements whereby they express being able to access food but not the types of food they needed such as fresh fruits and vegetables and other nutritious foods. As can be deduced from Derek, Denise, and Sarah's statements, graduate students were concerned with the nutritional quality of the foods they consume while also balancing the need to meet their basic need for food. This finding corroborates the work done by Crutchfield et al. (2020) showcasing reduced quality and desirability of diet rather than food quantity amongst food insecure undergraduate university students. Another dimension added to the understanding of quality by the participants in this study related to food appropriateness.

Food appropriateness relates to aspects such as illness-specific and culturally affirming foods and is considered an important aspect of food insecurity, specifically within culturally and ethnically diverse populations (Hanbazaza et al., 2021; Loopstra & Tarasuk, 2012). For instance, international students may experience increased barriers in accessing religious or culturally affirming foods within the host country thereby decreasing their sense of food appropriateness (Aljaroudi et al., 2019). As such, food insecure students who are unable to access foods which

align with their cultural, religious, or illness-related food preferences experience an additional hurdle in achieving food security. To illustrate the importance of food appropriateness, Mandy shared:

> I think for me [quality is] definitely more related to access to my dietary restrictions and in an affordable price range because the food tends to be very expensive and not always available in like a lot of like the cheaper places to eat on campus that have like ready hot meals often don't have any vegan options and if they do it's very limited and more expensive than the regular stuff.

Elaborating on the cultural aspect of dietary choices and the need for culturally affirming foods, Serena explained:

> I think for me it [quality] will link to the cultural factor. So culturally, I'm Nigerian. So having grown up in Nigeria and living in Canada, in Ottawa specifically, Ottawa is less diverse from my experience especially when it comes to food. So, there are certain foods that I would access back home that I don't necessarily have access to here in Ottawa.

Ophelia expressed similar concerns elaborating on her desire for more affordability culturally sound foods. In this way, quality can be defined not only as the consumption of nutritionally adequate food items from diverse food groups but also as the incorporation of appropriate food items which conform to the various needs of a given individual, whether it be from an illness prevention, dietary preference, or culturally affirming standpoint. While proximity, affordability, and quality are factors which are tightly aligned with the predominant definitions of food insecurity (see FOA, 2021), graduate students in the current study unanimously advanced time management as a fourth influential factor in their experiences of food insecurity.

*Time management: A delicate balance between graduate student life and food strategies*

According to Weaver et al. (2020), time management can be classified as a behavioural-level variable within the context of food insecurity in higher education. Specifically, the authors highlight the ways in which food insecure students are required to invest additional time in securing food by engaging in food obtention strategies or working additional hours to save up for groceries (Weaver et al., 2020). Time management is particularly relevant when considering full-time students who are faced with the need to balance between attending classes or engaging in

research activities and seeking out food (Hanbazaza et al., 2021; Zigmont et al., 2021). The participants in this study similarly viewed time management as a barrier to achieving food security. For example, Sarah stated “I’m sure I can use coupons but it’s one of those things where I’m like oh, I would rather like take on a little bit of extra debt than potentially waste so much time and I can’t handle it”. That is, Sarah saw food-attaining strategies such as couponing as taking away time from school-related activities, preferring to spend time focused on studies. This is also expressed by Charlize, who elaborated on how the time she spent searching for techniques to save money on groceries prevented her from spending that time focusing on her academic progress. Here, both Sarah and Charlize viewed food strategies such as couponing as a time trade-off similarly to that reported in Hanbazaza et al.’s (2021) study. That is, time was seen as a valuable resource that needed to be distributed between study-related and food-obtaining strategies. In this way, time is not only a result of proximity to the nearest food outlet as previous described but also relates to the time spent worrying and researching on ways to obtain healthful food items in an affordable manner such as through the use of coupons. Additionally, time management was reported as a deterrent for seeking out alternative venues or strategies for food attainment. For example, Ophelia shared:

> I know there are other initiatives because other people tell me about them, but like considering the schedule or like having to actually go and ask, I'm like, OK, I'm, I'm strained for time, so I might as well just go to the ones that I already know and that are certain.

In this way, food insecurity was expressed not only regarding the food environments surrounding graduate students but also in terms of the time trade-off needed to access various resources and strategies within those environments. In other words, food insecure graduate students were reporting difficulty accessing affordable, healthful food sources that conformed to their dietary and time management needs within their food environments. Through such factors, the participants reported eating lower-quality diets, which they unanimously reported as influencing their physical and mental well-being, ultimately presenting additional hurdles to their academic journeys.

***Food insecurity is related to well-being and presents a barrier to academic success.***

It has been documented that food insecurity is correlated to many adverse physical and psychological outcomes among undergraduate students. Regarding physical health, research conducted to date documents that food insecure individuals are more likely to experience chronic fatigue, dizziness, and sluggishness on a day-to-day basis (Crutchfield et al., 2020) and, on the more long-term aspect, are at greater odds of developing metabolic diseases (Hooper et al., 2021; Myers, 2020; Seligman et al., 2010). The graduate students interviewed in the current study reported adverse physiological health outcomes, expressing how food insecure diets were related to their mental clarity and irritated pre-existing medical conditions. For example, Michelle detailed the ways in which her cognitive functioning is affected by her diet, saying:

> Because I'm in my graduate studies, I feel like there's a lot more research and uh pressure to have like, you know, your cognitive function to work. So you wanna eat more healthy than you did prior […] so you wanna eat more healthy foods in order to help your brain process but healthy foods means a lot more money and it provides a little like a catch 22.

Serena further corroborated Michelle's report by elaborating on how lacking nutritional benefits in her food led to her feeling lethargic, sick, and going to class feeling tired. In their statements, both Michelle and Serena highlighted how food insecurity was related to their level of attentiveness both inside and outside of the classroom. Such an observation is critical when considering that university professors tend to misinterpret food insecure students' lack of focus in class as a lack of caring and engagement with the course material (Diaz & Gaylor, 2020). Yet, Michelle and Serena both expressed a desire to stay engaged in their learning throughout the degree, but the influence of food insecurity on their health hindered their ability to focus as much as they would have liked to. Beyond mental acuteness, the participants in the study also shared how food insecurity worsened their pre-existing medical conditions, such as irritable bowel syndrome (IBS). To illustrate, Monica stated:

> When I moved here I developed very severe IBS. So eating certain food makes you like sick because it makes you bloated so I had to start watching what I eat [...] but when I moved out on my own, it's kind of like you get like harder because now it's not like you can afford it easily. So you just buy what's necessarily marked down you know?

As can be seen, food insecurity was putting Monica in a situation where she had to compromise between eating what she could access and feeding her body foods which would not irritate her diagnosis of IBS. Similarly, Ophelia shared the ways in which her pre-existing medical diagnosis of IBS provided an additional hurdle to procuring food while also contributing to an increased risk of continued food insecurity. Just like Monica, food insecurity resulted in Ophelia feeling stuck, needing to either compromise on the amount of food eaten to conform with her dietary restrictions or eating sufficient amounts of food but experiencing a flare-up of IBS symptoms. As such, similar to undergraduate students (Hagedorn et al., 2021; Frank, 2018), the graduate students in the study reported a link between their experience of food insecurity and their physical health as it related to cognitive functioning and feeling ill. Moreover, food insecurity was also reported to influence students' weight and overall body image. For example, Denise explained:

> Before I went back to my home country, I gained a lot of weight because I'm not used to having so much gluten in foods. I'm not used to eating pastry this much. I don't know like the sweets in everything I realized like the cheaper you pay, the more sugar you get. I realized that way later so I gained a lot of weight. So now I'm kind of working on losing that weight […] and that really affected my psychology because I couldn't fit my dresses. I couldn't fit anything in my wardrobe.

Jessica supported Denise's sentiment by sharing how food insecurity had built additional pressure at it related to her lack of access to healthful foods and the ways in which it impacted her appearance. Previous studies have documented that food insecure diets tend to be correlated to increased weight gain and obesity due to the consumption of energetically dense foods (Crutchfield et al., 2020; Hooper et al., 2021; Pan et al., 2012). However, the study elaborated on the cognitive load associated with weight gain. As seen in both Denise's and Jessica's statements, weight gain was associated with a sense of stress and guilt wherein they were knowledgeable of the influence of the foods they were consuming on their overall health but had no option but to continue eating them due to financial constraints. In this way, graduate students were reporting additional stressors which, over time, had a negative effect on their mental health and overall well-being.

*Mental health outcomes*

Food insecurity is known to be correlated to students' mental health and well-being. For example, stress caused by being in a situation of food insecurity disrupts sleeping patterns, leading to poor mental health outcomes such as depression and/or anxiety in addition to leading to poor physical health outcomes by disrupting circadian rhythms (Becerra et al., 2020; Hagedorn et al., 2021). Additionally, the emotional distress associated with the experience of food insecurity may lead to anxiety and depression (Beam, 2020; Martinez et al., 2021). The graduate students in the study reported lower overall mental health well-being. For example, Jessica explained:

> Stressing about being able to feed myself, like not knowing if I'll be able to pay for my groceries and have food in my fridge ready to eat when I need it. […] I'm in a situation now where I'm almost overworking myself like I've had to take some steps in my academic responsibilities like to step back and be like I need to focus on being able to pay my bills and being able to complete my workload without being overwhelmed and like too stressed.

This feeling of overwhelm and stress expressed by Jessica was echoed by Heather, who shared:

> Especially because I'm in my 4th year, people are looking to me for answers and I don't have any actually as I'm talking about it, I've noticing just a bit of emotion coming up for me of just like I could cry like just around the overwhelm around the feeling, the collective feeling of overwhelm and the collective feeling of who the f**k do we even talk to about this?

For Charlize, stress and anxiety associated with her experience of food insecurity have seeped into her sleep hygiene where she explained experiencing reoccurring nightmares as it related to the inability to afford food. As demonstrated in their statements, food insecurity presented as a constant mental load for graduate students, going so far as to disrupt sleeping patterns. The increased level of stress found amongst the participants reflects recent research conducted with undergraduate student populations where stress and anxiety were found to be a primary outcome of food insecurity on students' mental health (Meza et al., 2019; Pourmotabbed et al., 2020). In this way, it is evident that the stress associated with the experience of food insecurity is

substantially influential. Moreover, graduate students reported that the experience of food insecurity had a tendency to normalize pre-existing eating disorders. In fact, Mandy explained:

> So I think if I'm hungry and I'm stressing about that, I definitely am more anxious which makes me more irritable and less pleasant to be around overall. I feel like my food insecurity can sometimes encourage my eating disorder or like those types of tendencies because then it's kind of easier to skip a meal type thing if you will. Like kind of normalizes it because then I can kind of use the excuse that I don't have the time or the money to be able to eat or something like that.

Previous research corroborates this observation, demonstrating a correlation between food insecurity and disordered eating patterns, such as binge eating, due to the sporadic availability of food (Hooper et al., 2021; El Zein et al., 2019). In this way, food insecurity presents an invisible burden on graduate students' mental and physical well-being. As previously discussed, such physical and psychological outcomes may ultimately influence students' socialization.

*Socialization within higher education: Both a source of distress and of comfort.*

The lack of understanding and awareness regarding the experience of food insecurity in higher education has been reported to elicit feelings of embarrassment, resentfulness, and frustration (Meza et al., 2019), as well as a sense of disconnect and disengagement from campus life (Allen & Alleman, 2019). The graduate students participating in the study also experienced lower socialization and connection with the campus community. However, the disconnect was in part due to limited resources whether financial or with regards to energy stock. For example, Derek stated:

> You might not be able to fully interact because normally you don't have enough, so probably you'll have to, with the little energy you have, just use the energy to read instead of going out to socialize with your friends and stuff like that.

Here, Derek talked about the energy investment required to socialize within the context of higher education. That is, energy and time were seen as important yet limited resources to be placed towards satisfying degree milestones rather than used to socialize with others. On the other hand, Theressa elaborated on the financial aspect involved in socialization:

> But I think for peers it's actually it's a huge thing especially as a grad students, like you are budgeting around already not being able to buy just your typical groceries. So imagine being asked to like go and do something else. That's actually very taxing and you feel like well shoot. Do I have the money? Do I wanna spend the money and then can you go to these places? Probably not.

In this way, food insecurity decreased socialization with others due to financial constraints, corroborating previous work done with undergraduate students (Martinez et al., 2021). Despite these accounts, for other graduate students, food insecurity presented as a common ground with their peers thus facilitating socialization and leading to the creation of support networks. For example, Tina explained:

> I think it's interesting because in a way, food insecurity and conversations around the price of groceries is actually very commonly talked about amongst grad students, especially right now with the raising price like just in everything... You never feel like you really have enough money to keep going but at the same time because it's kind of a mutual experience and everybody is going through it.

Denise also expressed similar feelings by sharing "In my cohort, we were like, I think lucky to have people who are coming from different backgrounds and coming from like different countries so we could share some experiences". For both Tina and Denise, open conversations surrounding student precarity and food insecurity was seen as a bonding experience with other graduate students within their cohorts and programs. Ultimately, this facilitated socialization and experience sharing and provided an opportunity to explore additional resources and strategies to mitigate food insecurity. For example, Ophelia shared the ways in which the common experiences held amongst graduate students had opened the doors for group strategies such as dividing grocery bills and preparing batch meals in a group setting, aiding in lowering the cost per meal for all involved. In summary, socialization is decreased for graduate students who did not feel connected to their peers through common experience but was increased for graduate students who find commonalities and a sense of community with other students in their cohorts. Central to this finding is the openness of the environment within which graduate students interact, wherein an environment less prone to stigma invites experience-sharing and help-seeking behaviours such as communal cooking groups. Despite some students finding solace in

socializing with others, most food insecure graduate students reported experiencing higher levels of psychological stress, adverse physiological outcomes, and varying degrees of social adverse outcomes. Such findings are concerning as these psychological variables create an environment conducive to poor academic performance in an undergraduate setting (Goldrick-Rab et al., 2019).

*Food insecurity: A hurdle in achieving academic success.*

According to Crutchfield et al. (2020), food insecure undergraduate students are likely to report stress relating to the need to balance their academic workload with food insecurity. This increased stress placed on food insecure students translates into an additional psychological load which calls for coping strategies which consume substantial mental energy (Beam, 2020). Culminated, the lack of energy sourced from food insecure diets combined with the overuse of mental energy associated with the socioemotional aspects of food insecurity placed students in situations where they were unable to fully participate in academic activities. For example, Monica explained that worrying about finances was decisive in her not attending conferences and influenced her ability to focus on her studies. This additional stress and cognitive load associated with food insecurity is also shared by Rachel, who said:

> I would say there is a relationship between food insecurity and academic success because there is always that you know it's always in the back of your mind right? You know, it's like will you have enough money for groceries while you're in class or you're doing your research? I'm still doing okay in my classes so far but it's still there. Like you know, it's like a mental space that's being taken up, yeah.

Of note, Rachel mentioned that her grades were not necessarily correlated to food insecurity. This was further mentioned by other graduate students such as Charlize, Sarah, and Heather who discussed the impacts of food insecurity more with regard to the ability to meet graduate study milestones. This contradicts findings from work done with undergraduate students (Frank, 2018; Bruening et al., 2017; Meza et al., 2019). In sum, food insecure graduate students experienced difficulties balancing their academic work and personal lives due to a lack of basic needs such as proper nutrition. As a result, they experienced higher cognitive load and stress related to procuring healthful foods, leaving them at a crossroads wherein they were asked to sacrifice either their engagement with their studies or their nutrition and sleep. Unique to the case of

graduate students is that such a trade-off may not necessarily be visible at first glance as students did not report lower performance and grades in class. Rather, the relationship is reported more so on the less assessed dimensions of graduate studies, such as attendance at faculty events and conferences as well as thesis progress rate.

***Institutional factors influence help-seeking behaviours among food insecure students.***

Studies conducted to date have highlighted the ways in which institutional factors may influence help-seeking behaviours in food insecure students. For instance, increased service awareness, on-campus promotion of services, and building stigma-free environments have been put forth as facilitators of food insecure students' engagement with campus support services (Crutchfield, 2016; Crutchfield & Maguire, 2018). On the other hand, fear, previous negative experiences with support services, and the service's reputation for not being helpful present as psychological barriers hindering help-seeking behaviours (Hoyne & McNaught, 2013). When asked about available on-campus resources, participants unanimously expressed frustrations with on-campus resources or lack thereof. Specifically, participants reported a lack of awareness and accessibility, which they associated with a system embodying neoliberal values and placing blame on the self rather than addressing food insecurity as an institutional issue, thereby lowering their trust in the institution and hindering their willingness to seek out help within the walls of academia.

*Low awareness and lack of accessibility to campus support services.*

When considering the success of support services, it is vital that the target population be made aware of the initiatives being implemented. Within the context of food insecurity in higher education, raising awareness of support services to all students was reported as an initial step towards de-stigmatizing the help-seeking behaviours of students (Wright et al., 2020). Such awareness can be raised through statements on syllabi (Goldman, 2018) combined with regular communications on food services by faculty staff (LaBelle, 2020) and other administrative activities such as podcasts and faculty events (Wright et al., 2020). Despite the relative ease of raising awareness of on-campus support services, participants in the study overwhelmingly reported a lack of accessibility to such information even when actively searching for it. For example, Theressa shared:

> I've never actually seen – I actually haven't seen any sort of service offered. I feel like if you dug deep enough, maybe you could find something but nothing that I've ever had easy access to see like hey this is what we're offering. If you need it, show up here.

Jessica further echoed the perceived lack of information and awareness by saying:

> We don't really get told about it or informed about it very much like even when we had our like our first day here when we're meeting all the profs in the faculty like there's not a lot of mention of financial aid or other kinds of aids for food insecurity. I think it's a little bit swept under the rug.

As can be gleaned from the above statements, without appropriate promotion and visibility, available institutional resources may remain veiled to those who need them. In this way, the programs already implemented within the university and any future initiatives should aim to increase awareness and visibility of their services to graduate students. Indeed, difficulty locating on-campus resources is a major challenge for students seeking help (Dubick et al., 2016; Concordia University, 2023). An additional concern regarding accessibility to services related to administrative staff and faculty's perceived lack of awareness and knowledge when graduate students sought information. In fact, graduate students such as Charlize, Denise, and Rachel reported that, oftentimes, information received from student support services was unreliable and thus unhelpful. This is concerning as such contact points are considered essential referral points to both on and off-campus resources for food insecure students (Crutchfield et al., 2020). In this way, graduate students found themselves in positions where not only was information hard to access on their own, but reaching out for support was also proving futile and unreliable. Of note, the lack of accessibility to information was not only felt by graduate students but also by professionals working within the university network. To illustrate, Michelle explained:

> I feel like there are individuals like my psychotherapist and psychiatrist that wanna help. Like the help is very for lack of better work, like under a veil. It's like mysterious because even my psychotherapist was telling me, like, she doesn't really know the process for getting a dietitian to see me but she's going to try her best to help me find one and get me in contact with one.

It is evident through graduate students' testimony that the university's method of information sharing and communication related to food insecurity was inadequate, as students and professionals were both unsure of where to begin their search and who to contact to receive additional information. In this way, accessing help within the university presented as an added hurdle for graduate students experiencing food insecurity. This is particularly concerning given the fact that food insecure students tend to avoid discussing their experiences of food insecurity with on-campus support staff (Crutchfield et al., 2020) and in the case where they do, often wait until their needs are most urgent before seeking campus support (Crutchfield & Maguire, 2019). These behaviours are reflections of the institutional climate surrounding food insecurity, which typically renders the experience stigmatizing and isolating.

*Stigma and neoliberal influences*

Briefly, stigma is a by-product of deviating from a reference group's norms and exhibiting behaviours that are not considered normal within a given society's norms and standards (Goffman, 1963). As a result, individuals who do not belong to the reference group may be considered socially unacceptable (Falk, 2001). When applied to food insecurity, the reference group would be food secure individuals, rendering food insecurity a stigmatized experience. Within neoliberal societies such as Canada, normalizing narratives such as that of the starving student and ideations of personal autonomy only work towards increasing the stigmatization of food insecure students (Crutchfield et al., 2020). That is, food insecurity within higher education may be considered a personal concern and thus normalized to the point wherein seeking out help becomes subjected to stigmatization, as Derek elaborated:

> I think we live in a very complex world now that sometimes everything is just considered to be personal, personal, personal, like you don't want to ask me have you eaten? Then maybe you get into trouble. […] If you want to tell people what you're going through, you don't know what can happen if maybe it's embarrassment or harassment or this or that.

In his statement, Derek alluded to the concept of personal autonomy wherein individuals are held responsible for their own experiences of food insecurity through assumptions that it results from personal failure to achieve prosperity (Lardier et al., 2017). In other words, accountability for the

experience of food insecurity rests on the shoulders of graduate students rather than on the system within which they engage. This is also echoed by Charlize, who stated:

> The only way [that food insecurity is dealt with by the university] is that it doesn't care. Why? Why would they care? Please forgive me for saying this. It is pretend […] I don't think the university is gonna make any difference because they don't care. I'm an international student and I'm the major contributor to tuition fees. It's like this. I pay the tuition, I go to school, and then they grant me a diploma.

Charlize's statement highlighted the ways in which food insecurity is related to a sense of belongingness to the campus community. According to the validation theory proposed by Rendon & Munoz (2011), students' success is partly explained by the quality of support received through exchange between students, staff and faculty. That is, students who perceive the exchange with staff and faculty as being of lesser quality will more likely avoid seeking help from those individuals and thus feel more disconnected from the academic community. As can be seen in Charlize's statement, this lack of validation translated her academic experience into a business exchange rooted in neoliberal values. Similarly, Heather iterated the feeling that those within the university continue to endorse neoliberal viewpoints regarding student support. For example, she shared:

> I think [food insecurity] is ignored and not addressed and something that they just turn a blind eye […] It's not part of the conversation and anything I have heard has been incredible disappointing and actively counters the policies that they are forcing us to agree to. So that becomes very demoralizing. […] I just like any other person just wants their experience to be validated by like the authorities that be.

Monica further explained how the current neoliberal norms within universities hinder qualitative exchanges between students and staff through low awareness. Data from the study suggested the permeation of neoliberal values within higher education wherein individualistic competitiveness and reduced social support culminate in placing the blame of food insecurity onto food insecure individuals themselves (Long et al., 2020). In other words, as neoliberal values endorsed by the bootstrap myth wherein individuals' experience of food insecurity is blamed on a lack of personal autonomy and self-perseverance (Crutchfield et al., 2020; Lardier et al., 2017), graduate students not only experienced a sense of stigma with regards to their food security status but also

perceived that their experiences were not being validated by the university community. As such, students did not perceive their experiences as important to the university, leaving place for stigmatization of food insecurity to settle. In return, students' willingness to seek out and receive needed assistance is hindered (Loftin, 2013). As a result of neoliberal forces, many graduate students reported a lack of trust in the institution and its support services, which ultimately decreased their likelihood of engaging in help-seeking behaviours.

*Low institutional trust*

Within the current norms of higher education institutions, student precarity continues to be ignored and normalized (Bahrainwala, 2020). Yet, environments which reject and stigmatize a given experience discourage help-seeking behaviours (Nam et al., 2013). Indeed, according to Gupton (2017), many students within higher education intentionally hide the hardships they experience and often avoid discussing them with others who could be in positions to help due to the neoliberal climate of their institutions. This sentiment was reflected in Mandy's reflection, who shared:

> I had a friend who had reached out for a different type of resource, and it didn't go over super well. So, I know for me and at least most of my friends don't really use all the resources because we have – I don't wanna say like trustworthiness, but like there is a bit of […] a reputation of like neglect and so I think that's why a lot of my friends and I don't know about these things.

Mandy brought up the attribute of institutional trust, or lack thereof, as an influential factor in engaging with the university's support services. It is known that trust and institutional reputation are key determinants of student satisfaction and belongingness in higher education (Schlesinger et al., 2016; Heffernan et al., 2018). Additionally, institutional trust plays a vital role in seeking assistance within the healthcare (Schwei et al., 2014) and academic sectors (Hoyne & McNaught, 2013). That is, if students do not trust their institutions to support them, they are less likely to disclose their personal circumstances. This lack of trustworthiness towards the institution was further echoed by Sarah, who shared:

> I honestly, this is maybe gonna sound bad, but like I have so little faith in so many resources [at the university] that I haven't really looked into it that much. […] I think at

> least from my perspective, from a lot of people I know, like we don't have faith in the university to actually have good programs or actually take care of students.

Similarly, for Heather, the lack of trust in both the institution and the academic community influenced the ways in which she engaged with others, hindering her from honestly sharing her experiences with peers and supervisors. From Mandy, Sarah, and Heather's statements, it can be gleaned that as food insecure graduate students interacted within the academic community, they were continuously faced with instances wherein their trust in the institution was gradually being reduced. Ultimately, all three graduate students expressed the ways in which a lack of institutional trust hindered their efforts to seek out help when needed. That is, the students adopted a form of learned helplessness (Hoyne & McNaught, 2013) wherein the university's reputation and previous experiences with staff instilled an expectation of failure and, therefore, decreased assistance-seeking. Indeed, when looking at the psychology of seeking support, many researchers have highlighted the hindering role of fear of disclosure, previous denial of need, and learned helplessness (Hoyne & McNaught, 2013; Nam et al., 2013) all of which were expressed by the participants in this study. As such, the dissatisfaction expressed by food insecure graduate students throughout the study was not surprising. Despite such perceptions, graduate students were hopeful for change and provided valuable insights into the ways food insecure students could be better supported in the future.

### *A way forward: Advice and recommendations from food insecure graduate students.*

To initiate reflections, all graduate students were asked to imagine a hypothetical world where they received all the support needed to achieve food insecurity and describe what that may look like. All interviewed graduate students outlined three areas for improvement, namely: 1) building a stigma-free environment through information sharing, 2) aligning funding and work opportunities with post-pandemic cost-of-living, and 3) providing accessible and affordable resources on campus.

#### *Increasing information sharing and building a stigma-free environment*

As previously discussed, stigma may create an environment wherein students no longer feel comfortable disclosing their experiences nor seeking help. This is only worsened when stigma is coupled with difficulty in accessing information (El Zein et al., 2018; Hallett et al., 2018). The university within which the interviewed graduate students studied did not provide

enough awareness nor easy access to information from the perspective of graduate students, which stigmatized the experience of food insecurity. As a result, the interviewed graduate students highlighted the importance of addressing these issues as a first step towards mitigating food insecurity. To illustrate, Denise shared that she felt it necessary to provide additional information to students through accessible platforms, which she deemed particularly important for students coming from various cultural systems. In fact, she stated:

> One other thing would be you know giving these like basic information about you know like how to use coupons especially for graduate students, because not everyone comes from a background that has coupons in their cultural system. So like I don't I had no idea how that works? You know like where can we access that information or […] like even the food bank, you know, like how does it work? Who can apply?

By providing information on the resources provided by the institution in a systematic and accessible manner, graduate students held the opinion that the veil of secrecy surrounding the topic would be lifted, making leeway for conversations to take place on campus. For example, Theressa reflected:

> I think your supervisor holds a responsibility to be aware of your mental physical status in a sense that they are your guider through this program and not only should it be like an educational guide but of resources of success. I don't believe your supervisor needs to be funding you […] but, they should be able to advocate for you if they believe that you are being underfunded or you need resources.

Theressa expressed the need for faculty to be a source of information for food insecure students, acting as a referral point and advocating for their graduate students' well-being which was further corroborated by Jessica who stated that instructors, professors, and supervisors should become a source of information for food insecure students. The call made by students for clearer pathways of information sharing reflects current strategies advocated for by researchers within the field (Daugherty et al., 2019; Freudenberg et al., 2011). Importantly, the interviewed graduate students highlighted the importance of faculty members being made aware of the support services offered to students to serve as an initial referral point for students who required support. Additionally, graduate students voiced that such education may also render staff and faculty more aware of the prevalence and influences of food insecurity on graduate students,

aiding in breaking down the stigma surrounding the topic. Such recommendations are also found in the literature wherein trained faculty are seen as important referral points for students, empowering them to engage in help-seeking behaviours within the campus community (Crutchfield et al., 2020; Stebleton et al., 2020). While students stressed the importance of building a stigma-free environment, they also highlighted the criticality of addressing the underlying cause of food insecurity, which they identified as insufficient funding and work opportunities within their programs.

*Aligning scholarships, funding and work policies to the cost of living*

Much of the current neoliberal institutional policies and practices are centred around the idea of the traditional student (Payne et al., 2023). In this view, students are believed to be financially supported by others, have no dependents, and, above all, do not need to seek outside employment to pay tuition fees (Bahrainwala, 2020). Yet, we are witnessing an increase in "non-traditional" students within higher education for whom those assumptions are not a reality (Sybing, 2019). While university financial aid programs are helpful for some students (Benz, 2016; Hodara, 2017), not all students are in positions to receive such aid. For example, Charlize shared her frustrations regarding the lack of scholarship and work eligibility:

> When I was an undergrad, there was a merit scholarship. But there isn't any scholarship for graduate students in the faculty as far as I know. I think they should let everybody apply for TA positions. If I'm unable to apply for a position because I'm a course-based graduate student then they should also admit less students.

According to Charlize, the university should expand on its policies surrounding scholarship eligibility and hiring priorities to be more inclusive of their student population. While important, recent evidence indicates that even receiving financial aid and scholarships is often only sufficient to cover the cost of tuition, with little left to cover the cost of non-academic expenses such as food (Crutchfield et al., 2020b). Many of the interviewed graduate students alluded to the need to change the policies surrounding scholarships. In the context of the study, graduate students admitted with a scholarship receive a portion as direct credit towards their tuition fees and the remaining portion is to be obtained through research assistantship or teaching assistantship positions. Additionally, graduate students are informed that in order to maintain their full-time student status and thus receive their scholarships, they must abide by policy *C*-

*1.2.2 Full-time status and paid employment* of the university wherein "students wishing to work more than 10 hours per week will be required to consult with their thesis supervisor and/or program director to ensure that their progress is maintained at an adequate and satisfactory pace." (University of Ottawa, 2024). While the policy is put in place in an attempt to ensure that graduate students complete their studies in a timely manner, participants did not view the policy as realistic, especially when considering their perceived inability to have open and honest conversations about food insecurity with staff and faculty. For example, Jessica stated:

> You're giving me these boundaries that outside of the academic universe is impossible. Like where am I gonna find a job other than a TAship or a research position within the university that's gonna pay me enough for me to survive on 10 hours a week? It's really difficult to find a position that risks like that criteria and that respects my needs as a person and if they're gonna impose that kind of restriction on us, they should offer a little more than oh you *might* be able to get a TAship.

For Jessica, the second portion of her scholarship package, consisting of paid RA/TA work, was not guaranteed, and finding outside employment that would respect the university's policies was unrealistic. This was further elaborated by Heather who advocated for an increase in student wages which would permit them to follow university work regulations. In this way, guaranteed employment (or lack thereof) was seen as a pivotal role that the university should ensure for its graduate student population, given the requirements set onto them. As such, graduate students stressed the importance of aligning wages, scholarships, and policies with the current realities of inflation as an initial and vital step toward mitigating food insecurity on campus. Given the close relationship between living wages and the likelihood of experiencing food insecurity (Glantsman et al., 2022), such alignment may have the potential to mitigate food insecurity. While the participants thought such changes would be most impactful for food insecure students, they also presented ideas for on-campus resources that could accompany previously stated solutions.

*Providing on-campus resources which are easy to access and affordable*

Many institutions in Canada have a history of relying on charitable organizations such as food banks and emergency food pantries in addressing student food insecurity (Silverthorn, 2016). Yet, only a small percentage of food insecure students opt to visit a food bank due to the stigma and psychological attributes associated with them, making them ineffective in mitigating

food insecurity (Frank, 2018; Olauson et al., 2018). To illustrate, Theressa shared, “walking into a food bank that would be extremely challenging for me. I'm not sure I could do that”. As such, creating support programs within universities rather than emergency resources is essential to better support food insecure graduate students. In fact, such programs have been shown to increase help-seeking behaviours, especially in the face of inconsistent treatment by faculty (Twill et al., 2016; Crutchfield & Maguire, 2018). In addition, programs which increase on-campus food access and address institutional policies support students’ degree completion (Beam, 2020). The participants in the study unanimously presented two support programs they perceived as most appropriate in addressing food insecurity, namely on-campus affordable food markets and reduced-price on-campus meals. To illustrate, Denise shared initiatives which were put in place at her previous universities of study and which she felt best supported food insecure students:

> I’ve been in other universities before […] the university was providing free meals for every student, every lunchtime or dinnertime. Sorry, one of them was free the other was one very cheap. With a ridiculously small amount you could buy like 4 different types of food. So it was like through the university meal house and then my other institution was in the US but they were providing coupons. They were providing free meal access to graduate students and to international students.

Similarly, Tina used her previous experience volunteering at a sexual and reproductive health pantry as a building block for her recommendation sharing how she believed the university should implement pantries where nutritiously dense foods such as protein, canned goods, and rice could be made available to grab, free of cost to graduate students in need. Finally, Monica similarly based her recommendations on her previous experiences, putting forth the recommendation of a graduate student restaurant which serves subsidized meals for students:

> In my previous university, we were really fond of this little Irish pub established on campus that was only for postgraduate people so like grad students and you had to like become a member of it so you pay a fee, become a member of it, but then you get like subsidized alcohol and get really good subsidized food as well.

Through such initiatives, food insecure graduate students perceived that not only would access to healthful food be increased, but the stigma surrounding the experience of food insecurity would

also be decreased. Evidence would suggest that programs such as subsidized meals and food markets aid in curbing student food insecurity within American campuses. For example, some campuses in the US have implemented the Matching Excess and Need for Stability (MEANS) program, which makes use of a mobile application encouraging dining halls, restaurants, and other food facilities to post when they have excess food available for pick-up at a reduced price or for free which has proved fruitful (Beam, 2020; MEANS, 2022). Others have implemented programs that facilitate food access through campus gardens and/or farmer's markets (Sharpe et al., 2018; Stluka et al., 2019). These programs are intended to supplement fresh fruit and vegetables that are typically lacking in food insecure diets and are used concomitantly with other initiatives (Manry et al., 2017; Osiecki et al., 2022). That is, such interventions do not on their own address student food insecurity on campus (Merjia et al., 2020), but rather, the success of these programs is dependent on the campus community, starting with faculty and staff awareness (Crutchfield & Maguire, 2018). In this way, food insecure graduate students advocated for efforts to be made by the institution and campus community in a way which would complement adjusted funding and work opportunities with post-pandemic cost-of-living with accessible and affordable on-campus resources in building a stigma-free environment and mitigating food insecurity.

**Discussion**

Food insecurity continues to hold negative outcomes on university students, including graduate students, on a daily basis. In the post-pandemic era, marked by inflation, geo-political competition, disrupted supply chains and international trades, as well as war (Bank of Canada, 2023; Khan et al., 2022; Song & Agarwal, 2023), meeting one's needs is becoming incrementally difficult. Indeed, graduate students expressed difficulties consistently meeting their nutritional needs through social determinants of health variables such as affordability, quality, and proximity to healthful food resources. As a result, graduate students reported experiencing adverse physical health outcomes such as lower energy levels, inability to concentrate, disrupted sleep, and weight gain. Food insecure graduate students also reported a decrease in psychological well-being from experiencing anxiety to worsening binge eating symptoms. Such outcomes are well documented in the undergraduate and K-12 student population, wherein food insecurity has been correlated to similar health outcomes (Hooper et al., 2021; Myers, 2020; Seligman et al., 2020). When referring back to the conceptual framework

of the study, food insecure graduate students were lacking consistent and reliable access to healthful food within their built environments thereby hindering their abilities to reach the second-tier in which they perceive a sense of security and safety within the university community.

Indeed, as demonstrated by the findings of the study, central to their experience, graduate students highlighted how the university environment worked towards silencing and normalizing food insecurity, thereby creating a sense of unease in divulging their lack of access to food with members of the academic community which hindered help seeking behaviours. Specifically, graduate students identified a low awareness of student food insecurity combined with a lack of accessibility to campus support services as a facilitator for stigma. Additionally, such aspects left room for neoliberal values to be instilled wherein normalizing narratives surrounding food insecurity were perceived, such as that of the starving student and bootstrap myth (Crutchfield et al., 2020; Lardier et al., 2017). That is, students felt that the university was putting the onus of responsibility onto students rather than shouldering some responsibility themselves. This perception was also worsened by the reputation of, and personal experiences graduate students had with student support services within the institution, leaving graduate students with very little trustworthiness in the campus community. This lack of trust resulted in graduate students' reluctance to approach staff, faculty, and services, which in part explained their unwillingness to exhibit help-seeking behaviours within the walls of academia. Such disconnect from support services is not surprising given the fact that trust, reputation, and anticipated benefits/risks of seeking support are pivotal factors influencing help-seeking behaviours amongst students (Hoyne & McNaught, 2013; Schlesinger et al., 2016; Crutchfield et al., 2020). As a result, food insecure graduate students described a feeling of alienation from the remainder of the academic community, decreasing their sense of belongingness. That is, when looking back to the third-tier of the theoretical framework, food insecure graduate students felt dishonest in their connections to some peers, faculty, and staff members which hindered the formation of meaning social networks and attainment of support. Yet, the current findings of the study highlighted the ways in which forming social networks such as those between food insecure peers may work towards alleviating the individual burden resulting from food insecurity through support networks and group problem solving initiatives.

With that said, food insecure graduate students held hope for changes and improvements within the campus community, which they believed would work towards mitigating graduate student food insecurity in the future. Such recommendations first relied on building a stigma-free environment through information sharing, both with regard to increasing awareness of student food insecurity amongst the campus community and better communicating programs, strategies, and initiatives being put in place to curb food insecurity on campus. By doing so, graduate students held the belief that stigma would be reduced, thus facilitating help-seeking behaviours, a belief which has been demonstrated in the literature (Stebleton et al., 2020; El Zein et al., 2018; Hallet et al., 2018). Indeed, by removing the veil which covers food insecurity in academia, it is possible that food insecure graduate students would feel safer in disclosing their experiences with others thus increasing the creation of support networks and working towards building a stronger sense of belongingness within the walls of academia. A second aspect stressed by graduate students in addressing food insecurity related to the need to align funding and work opportunities with the post-pandemic cost of living. As the experience of food insecurity in Canada is tightly correlated to financial instability (Tarasuk et al., 2017), increasing eligibility and assurance of scholarships and student work placements such as TA and RA positions for all graduate students was seen as necessary, especially given the policies put in place for full-time students within the institution. Such opportunities could be interpreted as fulfilling the need for esteem of food insecure graduate students by providing them with guaranteed opportunities to demonstrate their aptitudes for teaching and research within academia while also providing a source of income to facilitate the attainment of their basic needs such as healthful nutrition. Finally, as a complement to the previous recommendations, graduate students advocated for the provision of accessible and affordable resources on campus, such as subsidized healthful meals and food markets, as well as the creation of a graduate student restaurant which serve food at a reduced cost. Once more, such initiatives target not only the attainment of one's basic needs but also seeks to establish a sense of community and belongingness by proposing solutions which also emphasize the importance of socialization. Additionally, all proposed initiatives were based on actual programs put in place within other universities which graduate students had attended previously and were thus seen as realistic and attainable options in addressing graduate student food insecurity.

## Limitations and Conclusions

The current study showcased the experiences of food insecure graduate students within academia. The study highlights graduate students' perceptions on underlying factors contributing to graduate food insecurity and explores the ways in which they influence overall well-being and academic outcomes. Furthermore, the study delves into the interplay between food insecurity and institutional factors and puts forth considerations for the improvement of support given to food insecure graduate students. However, it is important to note that the graduate students were interviewed during a short period of time and were all students at the same institution in Ottawa. In this way, the study's findings may be unique to the characteristics of that institution. For instance, work policies and bursaries mentioned by students may not be applicable elsewhere. Additionally, other Canadian institutions may offer additional services to students that may vary from the current institution of study. Furthermore, the sample included only one male participant. Future research could seek to include more male voices in understanding the influences of food insecurity on graduate students. Nonetheless, the current study provides insights into the points of view of graduate students experiencing food insecurity and presents valuable recommendations made by graduate students for graduate students. Future work may benefit from incorporating the study's findings in assessing their benefits in mitigating graduate student food insecurity in Canada.

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# Chapter Five - General Discussion and Conclusion

My thesis aimed to investigate food insecurity amongst graduate students in a Canadian context within a post-pandemic era marked by economic hardships. To do so, a three-phase research project was implemented to explore 1) the prevalence of food insecurity and its relationship to the academic experience of graduate students; 2) the changes in graduate students' food environments; and 3) the ways in which food insecure graduate student understand their experience of food insecurity within higher education. The final chapter first discusses the findings from my thesis in relation to one another and then implements them within the proposed conceptual framework to gain a more holistic understanding of graduate student food insecurity. The chapter then ends by discussing the implications of the findings and suggestions for future research which were beyond the scope of my thesis.

## Answering the research questions

The overall goal of my thesis project was to explore the issue of graduate student food insecurity within the University of Ottawa. By integrating the results from chapters two, three, and four, a deeper understanding of the dynamics of graduate student food insecurity emerges. The first area of inquiry investigated the food environments within which graduate students engage. One of the key findings in chapter two was that the overall quality of Ottawa's food environments had declined post-pandemic, with both the affordability and quality of foods worsening as well. Alone, these findings only provide situational information for the study. However, chapters three and four provide insights into how these changes may be influencing the experience of food insecurity within the graduate student population.

Indeed, the results of chapter three showed that food insecure graduate students were more likely to report that challenges with food quality, quantity, and access negatively influenced their academic journey. Further analysis done in chapter four found that potential variables contributing to this association could be environmental barriers such proximity and walkability to affordable, healthy food sources. This explanation would also be supported by the findings of chapter two which found decreased food affordability as a widespread problem across Ottawa's neighbourhoods. These results are also consistent with existing research which highlights that better access and walkability to healthy food outlets is linked to improved dietary

habits and that the (in)affordability of healthy foods has a strong influencing factor on the items consumed (Martinez-Perez et al., 2021; Jian et al., 2023; Keat et al., 2024).

Chapter four also highlighted that food insecure graduate students perceived the food environment within the university as unhealthy, and that the few healthy options available on-campus were often unaffordable and unattainable. This aligns with other studies reporting that on-campus food is frequently both unhealthy and expensive (Beam, 2020; Li et al., 2022). Furthermore, the graduate students explained that the barriers they experienced within their food environment led to them opting for cheaper, calorically dense foods which is a pattern echoed in the literature (Gupta & Freedman, 2020; Li et al., 2022). In this way, food environment attributes such as food affordability, quality, and proximity which have worsened post-pandemic is perceived by food insecure graduate students as a barrier towards their healthy eating and may in part help explain the associations uncovered in chapter three. Overall, the findings suggest that food environment affordability should be a central focus on studies investigating food insecurity within university campuses.

A second area of inquiry incorporated in my thesis aimed to explore the link between food security status and the graduate student academic experience. As previously mentioned, chapter three's key finding was that food security status influenced graduate students' academic achievement, course load, and was a factor taken into considering when considering dropping out, deferring studies, or withdrawing from courses. Chapter four provided some clarifications into these findings wherein it was explained that food insecure graduate students defined academic achievement not through grades but rather by the progress they were making in their programs of study. They also shared the ways in which their food insecurity led them to feel lethargic, ill, and tired which they reported influenced their ability to meet program milestones. These milestones were explained as being able to maintain a full course load and completing thesis requirements. These findings suggest that food insecurity may impact the health of graduate students, presenting as a hidden hurdle slowing their progress towards their degree completion, building on similar trends found in undergraduate research (Allen & Alleman, 2019; Crutchfield et al., 2020).

Another important finding from chapter three was the link between food insecurity and lower participation in class or academic events, which declined as insecurity status worsened.

Again, chapter four provided context to these findings, revealing that financial stress and the uncertainty about the next meal occupied students' mental energy, limiting their ability to engage. This is supported by research within higher education which documents that food insecure students experience more adverse mental health outcomes such as anxiety and stress which affects their academic involvement (Meza et al., 2019; Pourmotabbed et al., 2020; El Zein et al., 2019). Of particular interest is the finding from chapter three that marginally food insecure graduate students reported a higher likelihood of disengagement in class and at academic events than their food secure counterparts. This may be explained by the fact that, by definition, marginally food insecure individuals experience ongoing worries related to their ability to purchase food (Health Canada, 2020). That is, these worries may be contributing to greater stress and mental fatigue in a similar way experienced by moderately to severely food insecure students, reducing their abilities to fully engage. However, more research is needed to further explore this relationship.

Chapter three also revealed that the severity of food insecurity experienced by graduate students was linked to feelings of disconnection from the graduate community. Chapter four further explored this association revealing two key distinctions. On the one hand, food insecure students reported feeling isolated from the broader academic community, citing distrust, stigmatization, and a sense that university leadership were not adequately addressing food insecurity on campus. The literature corroborates these findings, showing the ways in which stigmatization of the student experience of food insecurity can lead to a decreased sense of belongingness, loneliness, and isolation (Allen & Allenman, 2019; Crutchfield et al., 2020; Martinez et al., 2021). However, on the other hand, the thesis also revealed that food insecure graduate students developed a sense of within-group belongingness, discussing challenges with one another and supporting each other by sharing resources such as sharing grocery items and batch cooking to make healthy food more affordable. This nuance was not captured in chapter three and illustrates strategies which may emerge in campuses when barriers such as stigma are mitigated.

Overall, food insecurity amongst graduate students at the University of Ottawa was shown to be influenced in part by their food environments and institutional variables, which together may present hidden barriers in their academic journeys. In this way, addressing food

insecurity amongst this population requires a multi-faceted approach. That is, it is vital to mitigate barriers in accessing healthy foods, with affordability being the most prominent obstacle in both neighbourhoods and on campus. It is not surprising then that graduate student recommended raising wages to match the rising cost of food in chapter four, a solution which in line with current research documenting a tight link between food insecurity and household income (PROOF, 2025; Glantsman et al., 2022).

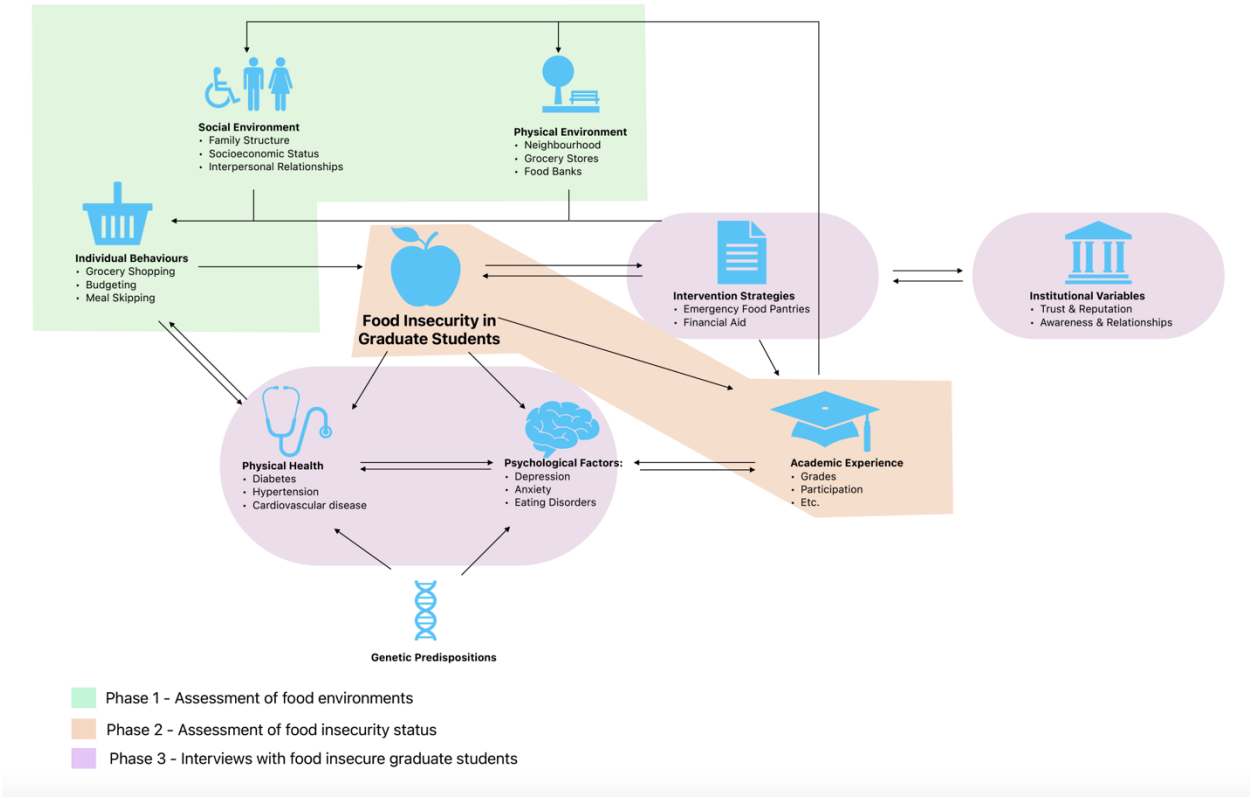
That said, it is important to note that based on the findings of the research, increasing wages alone may not fully address the issue at hand as it may not address the decreased quality and accessibility to food within local environments highlighted in the thesis. Again, this supports the call made by graduate students in chapter four advocating for more on-campus healthy food outlets designed especially for graduate students such as farmers' markets and subsidized healthy meals. Similar programs have proven successful, improving both diet quality and academic outcomes (Beam, 2020; Crutchfield & Maguire, 2018; MEANS, 2022; Merja et al., 2020; Stluka et al., 2019). In this way, increasing access to and affordability of high-quality foods for graduate students may work towards mitigating the influence of lower quality food environments. Finally, the overall thesis project provided support in advocating that universities work towards reconsidering their current approach to graduate student food insecurity, using data on food insecurity prevalence and food environment quality as well as actively engaging and involving graduate students into crafting solutions.

**Bringing it all together – Updating the conceptual framework**

As a reminder, the thesis project made use of a modified version of the health field model of health proposed by Evans and Stoddart (1990) to illustrate the multi-dimensional aspect of food insecurity. In summary, the model redefined how health is conceptualized moving away from the belief that health is a lack of illness. Instead, the model advocates to define health as a state of complete physical, psychological, and social well-being. In this way, the model highlights the relationships amongst the determinants of health which may surround a given population health issue (Evan & Stoddart, 1990). That is, the model encourages a multi-dimensional investigation of public health concerns including the role which one's social environment plays in the mitigation or facilitation of disease (Weissman, 1996). As previously mentioned throughout the thesis project, food insecurity is considered as a public health issue

touching close to 5.8 million Canadians in 2021 (Canadian Public Health Association, 2023). Additionally, throughout the course of the previous three chapters of the thesis, it has become evident that food insecurity is both influenced by one's environment and in turn influences one's ability to engage in one's environment. As such, the modified health field model as proposed in Figure 1 presents a holistic framework which may aid in better visualizing the various impacts and influences of food insecurity on graduate students.

**Figure 1**. Updated Modified health field model as applied to graduate student food insecurity.




Each phase of the study aimed at exploring various dimensions of food insecurity which may have adverse outcomes on the graduate student experience. Combining the findings from the various phases allowed for a more holistic understanding of the issues surrounding graduate student food insecurity. Specifically, phase two of the study aimed at providing a capture of the degree of food insecurity within the graduate student population revealing high prevalence of food insecurity and a significant relationship between food insecurity and the graduate student experience. Given such findings, one should now turn to the variables which may be contributing

to graduate student food insecurity within higher education. The findings of phase one of the study which explored the quality of food environments demonstrated that those living within lower socioeconomic status neighborhoods in Ottawa have lower access to healthful food options within their environment. It is also important to consider that the university of study, namely the University of Ottawa, is in one of the lower socioeconomic status neighborhoods of Ottawa. Additionally, the study revealed that food environments in general are of lower quality and affordability post-pandemic compared to pre-pandemic days. In this way, access to healthful foods may become even more difficult for those living in lower socioeconomic environments and with lower financial freedom. As such, the food environments within Ottawa may be contributing to the prevalence of food insecurity amongst graduate students at the University of Ottawa by making access to healthful foods more challenging.

Indeed, this proposition was further expressed by graduate students in phase three of the study. While the initial purpose of phase three was to explore the relationship between food insecurity and the overall wellbeing of students and its effects on their academic experience as well as the role the university plays in mitigating food insecurity, throughout the discussions graduate students touched on the role of food environments as well. That is, regarding physical environments, graduate students shared the difficulty of accessing healthful foods within their immediate environments (e.g., neighborhood, university, etc.) due to pricing and limited availability. Furthermore, they shared the ways in which lack of reliable transportation made it difficult to visit other food environments which they knew were more affordable and had a higher variety of healthful food options available for purchase. In this way, physical environments within which graduate students engage may contribute to the prevalence of food insecurity amongst graduate students.

When looking at social environments, graduate students elaborated on the protective nature of friendships and peer support in creating solutions to mitigate food insecurity such as preparing meals in groups to lower the cost per person of ingredients. While peers were a source of support, graduate students described the ways in which the overall social climate at university made room for stigma thus discouraging them from seeking out support from university contact points such as student services, faculty, and staff. Following, when looking at the influence on the self, it is, unfortunately, unsurprising to see graduate students disclose lower overall mental

and physical well-being as a result of their experiences of food insecurity. Given the psychological, physical, and social aspects reported by graduate students experiencing food insecurity, one naturally turns to the exploration of support systems put in place within the institution. Yet, through interviews with food insecure graduate students, almost all reported not knowing of nor accessing food programs within the university. In fact, when probed further, graduate students shared the ways in which institutional trust, reputation, and approachability influenced their willingness to seek out help and support. In the current case study of the University of Ottawa, graduate students viewed the institution's poor reputation in supporting students and fellow students' poor experiences with support services combined with the low access to information on available resources as promoting lower levels of institutional trust thus deterring students from exhibiting help-seeking behaviours. As such, institutional variables presented as barriers which may contribute to the high prevalence of food insecurity seen in graduate students attending the University of Ottawa.

Ultimately, when looking at the issue of food insecurity in graduate studies at the University of Ottawa holistically, it is clear that food insecurity is multi-faceted, wherein various surrounding attributes outside of the individual's control facilitate food insecurity amongst the graduate student community. To summarize, within the current case study, the food environment, social climate, and institutions that graduate students engage with are invisible barriers holding an adverse influence on their ability to consume healthful meals. In this way, the risk of living with food insecurity is heightened, increasing the likelihood of experiencing lower mental and physical well-being. In return, graduate students may have less energy to allocate to their studies and may be wrongly presumed to be less engaged and committed to their learning and research. As such, the current thesis reiterates the call to action for institutions to problematize and reconsider their approaches to addressing graduate student food insecurity in hopes of building support systems that better address their students' needs and better mitigate food insecurity within its walls.

**Limitations**

The studies presented within this thesis were subject to unavoidable limitations. Firstly, the participant recruitment was non-random and thus could have been subject to sampling bias wherein food insecure students might have been more motivated to participate in the study than

their food secure counterparts. Additionally, the qualitative data only included one male student in its sample and thus the findings of the study may be more biased towards the experiences of graduate students who identify as women. As such, this may limit the degree to which findings can be generalized to the overall population (Emerson, 2015). Another limitation was that the research conducted was correlational, and thus a causal link was not established between food insecurity and the various dependent variables of study within the thesis project. However, the findings of the study still provide room to make inferences about the experience of graduate students and provides suggestions into the associations which may exist. Additionally, the epistemological stance used in the study aimed to critique held and generalized beliefs and practices through at least one counter occurrence. In this way, the study does not seek to generalize its findings to the population but rather contribute to evidence disproving current approaches to student food insecurity within higher education. Furthermore, food insecurity was evaluated through two dimensions namely through the survey of food environments and the survey of graduate students. Unlike the survey of students, that of food environments uses observational data collection techniques which are not based on self-reported data. In addition, the inclusion of food environments in the study has merit as food insecure students are typically at an increased risk for unhealthy eating habits due to the greater accessibility of unhealthful foods within environments as compared to healthful food items (Nackers et al., 2013; Beam, 2020). In this way, two indicators of food insecurity were evaluated for the study.

Secondly, portions of the study are reliant on self-reported data. Such data may be vulnerable to weakness as participants may be influenced by social desirability biases, ultimately decreasing the validity of the results (Brutus et al., 2012; Althubaiti, 2016). Additionally, self-reported data assumes that participants are equipped with introspective abilities, which allows for an accurate assessment of themselves. However, self-reported data allows participants to describe their own perceptions and experiences about a given phenomenon (Chan, 2008). Nonetheless, the use of self-reported data such as that provided in interviews are still recognized as providing rich data which has the possibility of providing valuable insights into a given phenomenon (Bilups, 2021). Furthermore, in hopes of mitigating this limitation, the current thesis project made use of a mixed-methods approach, which not only provided two measurements of the same construct, namely qualitative interview data and quantitative survey data of food insecurity but also assessed food insecurity using two different aspects of the

construct of food insecurity, namely food environments and food insecurity. As such, the study is designed in such a way that findings are triangulated by measuring the same construct twice as well as measuring different facets of the same construct, thereby decreasing the friability of self-reported data (Fryer & Dinsmore, 2020).

Thirdly, both the quantitative and qualitative findings of my thesis were highly context specific as they relate to the experiences of food insecure graduate students within one institution of study notably the University of Ottawa and are also bounded within a novel socioeconomic timeframe of post-pandemic. In this way, the generalizability of the findings outside of this context may not be appropriate and thus a need for periodic re-evaluation of food insecurity within higher education in Canada may be warranted. That is, the recommendations put forth in the current thesis may be appropriate at this given time. Nonetheless, the findings from the thesis work towards increasing the evidence showcasing the inefficiency of charitable-based initiatives to mitigate food insecurity within higher education and adds to the advocacy for better adapted and holistic programs to curb basic needs insecurity within our graduate community.

Finally, the theoretical and epistemological perspectives adapted in my thesis determined the directionality of the research taken. The goal of the overarching project was to disprove current ideations and initiatives help within universities as a way to highlight gaps in our understanding of graduate student food insecurity and provide insights into ways in which the support provided could be improved. That said, for future work, making use of alternative perspectives could be beneficial. For instance, a queer epistemological stance could be an interesting perspective to take since many of the graduate students interviewed in the final phase of the study self-identified as queer. By adapting this lens, it is possible that additional barriers specific to the experience of queer graduate students could be identified and thus improve our conceptualization of graduate student food insecurity. In the same vein, a critical race theory framework could allow for a deeper investigation into the experiences of minority students and international students. Furthermore, use of an interobjective epistemology could prove beneficial when further investigating and establishing proposed solutions and seeking to put them in place at the institutional level. Nonetheless, as the topic of graduate student food insecurity in Canada is widely understudied, it was first important to seek to understand the influences it holds on

students and the ways in which our built environments whether at the university or neighbourhood level play into the issue.

**Knowledge contributions and direction for future research**

While the current project puts a spotlight on graduate student food insecurity, it also provides valuable insights shared by food insecure graduate students, which may be put into practice in revamping institutional approaches to mitigating food insecurity amongst graduate students. In particular, chapter four puts forth recommendations which may serve as general guidelines for future efforts. For instance, graduate students in the study advocated for improved access to information, destigmatization of food insecurity through the normalization of open discussions not only between peers but also between staff/faculty and students, as well as the implementation of resources for food insecure students such as subsidized meals, reduced price food markets, and student restaurants. Previous studies have explored new avenues for food aid, which have demonstrated success. For example, the Swipe Out Hunger program put in place across campuses within the United States allows for students to donate unused meal plan account balances to others (Swipe Out Hunger, 2019). A further example is found in the Matching Excess and Need for Stability (MEANS) program, which allows on-campus restaurants to sell excess food to students at the end of the day at a reduced price for pick-up (MEANS, 2022). Similar programs are found within the community in Ottawa through applications such as Too Good To Go, which allows grocery stores and restaurants to offer reduced-price meals or grocery hauls for pickup (Too Good To Go International, 2024). The caveat of this program is that individuals must get to the store offering the sale within a specific timeframe, which may not be feasible for graduate students.

Additionally, the current project adds to the little research conducted alongside the graduate student community, with most studies conducted in the K-12 setting and those conducted in higher education focusing primarily on the undergraduate population. Given the findings of the current thesis, it is evident that food insecurity is equally present among graduate students as compared to K-12 and undergraduate students. Therefore, future research should look at more intentionally incorporating graduate students within their study samples. Additionally, the current project was delimitated by the boundaries of the University of Ottawa due to the constraints of the project. Thus, its findings and conclusions may be unique to the institution. In

this way, future work could study food insecurity amongst graduate students more broadly across various institutions in different provinces to more aptly capture the dimensions of food insecurity within graduate studies.

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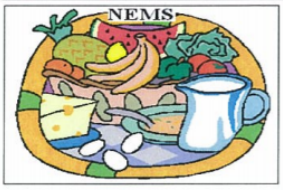
# Appendices

## Appendix A: NEMS-S Survey

**Nutrition Environment Measures Survey (NEMS)**
**Food Outlet Cover Page**




Rater ID: ☐☐

○ Grocery Store
○ Convenience Store
○ Other_____

Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐
Month Day Year

Start Time: ☐☐:☐☐ ○ AM ○ PM

End Time: ☐☐:☐☐ ○ AM ○ PM

Number of cash registers: ☐☐

○ SD ○ FC ○ FF ○ Specialty ○ Other

Restaurant ID: ☐☐-☐-☐☐-☐☐☐

**Site Visit** Date: ☐☐/☐☐/☐☐ Month Day Year

Start Time: ☐☐:☐☐ ○ AM ○ PM
End Time: ☐☐:☐☐ ○ AM ○ PM

**Menu/Internet Review** Date: ☐☐/☐☐/☐☐ Month Day Year

Start Time: ☐☐:☐☐ ○ AM ○ PM
End Time: ☐☐:☐☐ ○ AM ○ PM

**Other Visit/Interview** Date: ☐☐/☐☐/☐☐ Month Day Year

Start Time: ☐☐:☐☐ ○ AM ○ PM
End Time: ☐☐:☐☐ ○ AM ○ PM

Comments: _____

**Nutrition Environment Measures Survey (NEMS)**
**Cover Page**



8250013302

Measure Complete ☐

## Nutrition Environment Measures Survey (NEMS)
## Measure #1: MILK

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

○ Grocery Store ○ Convenience Store ○ Other

**Marking Instructions**

Please use a pencil or blue or black ink. Correct ● Incorrect ✓ ⊗ ◒ ◉

### A. Reference Brand

1. Store brand (preferred) ○ Yes ○ No

2. Alternate Brand Name: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Comments: _____

### B. Availability

Comments:

1. a. Is low-fat (skim or 1%) available? ○ Yes ○ No _____

b. If not, is 2% available? ○ Yes ○ No ○ NA _____

2. **Shelf space:** (measure only if low fat milk is available)

| Type | Pint | Quart | Half gallon | Gallon |
|---|---|---|---|---|
| a. Skim | ☐☐ | ☐☐ | ☐☐ | ☐☐ |
| b. 1% | ☐☐ | ☐☐ | ☐☐ | ☐☐ |
| c. Whole | ☐☐ | ☐☐ | ☐☐ | ☐☐ |

### C. Pricing All items should be same brand

Comments:

1. Whole milk, quart $☐.☐☐ _____

2. Whole milk, half-gallon $☐.☐☐ _____

3. Skim or 1% milk, quart $☐.☐☐ _____
(Lowest-fat milk available)

4. Skim or 1% milk, half-gallon $☐.☐☐ _____
(Lowest-fat milk available)

**Alternate Items:**

5. 2%, quart $☐.☐☐ ○ N/A _____

6. 2%, half-gallon $☐.☐☐ ○ N/A _____

8898156331

Measure Complete ☐

## Nutrition Environment Measures Survey (NEMS)
## Measure #2: FRUIT

Rater ID: ☐☐

Date: ☐☐ / ☐☐ / ☐☐
Month Day Year

Store ID: ☐☐-☐-☐☐-☐☐☐

O Grocery Store O Convenience Store O Other

### Availability and Price

| Produce Item | | Available Yes | Available No | Price | # | Unit pc | Unit lb | Quality A | Quality UA | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. **Bananas** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 2. **Apples** | O Red delicious<br>O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 3. **Oranges** | O Navel<br>O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 4. **Grapes** | O Red seedless<br>O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 5. **Cantaloupe** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 6. **Peaches** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 7. **Strawberries** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 8. **Honeydew Melon** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 9. **Watermelon** | O Seedless<br>O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | |
| 10. **Pears** | O Anjou<br>O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | |

11. **Total Types:** (Count # of yes responses) ☐☐

0450176946

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
# Measure #3: VEGETABLES

Rater ID: ☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

Store ID: ☐☐-☐-☐☐-☐☐☐

O Grocery Store O Convenience Store O Other

## Availability and Price

| Produce Item | | Available Yes | Available No | Price | # | Unit pc | Unit lb | Quality A | Quality UA | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. **Carrots** | O 1 lb bag O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 2. **Tomatoes** | O Loose O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 3. **Sweet Peppers** | O Green bell peppers O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 4. **Broccoli** With Stem | O Bunch O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 5. **Lettuce** | O Green leaf O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 6. **Corn** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 7. **Celery** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 8. **Cucumbers** | O Regular O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 9. **Cabbage** | O Head O_____ | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |
| 10. **Cauliflower** | | O | O | $☐.☐☐ | ☐ | O | O | O | O | _____ _____ |

11. **Total Types:** (Count # of yes responses) ☐☐

6577396766

Measure Complete ☐

## Nutrition Environment Measures Survey (NEMS)
## MEASURE #4: GROUND BEEF

Rater ID: ☐☐

Date: ☐☐ / ☐☐ / ☐☐
Month Day Year

Store ID: ☐☐-☐-☐☐-☐☐☐

O Grocery Store O Convenience Store O Other

### Availability and Price

| Item | Available Yes | No | N/A | Price/lb. | Comments |
|---|---|---|---|---|---|
| **Healthier option:** | | | | | |
| 1. Lean ground beef, **90% lean, 10% fat** (Ground Sirloin) | O | O | | $☐.☐☐ | |
| **Alternate Items:** | | | | | |
| 2. Lean ground beef, (<10% fat) ☐☐ **% fat** | O | O | O | $☐.☐☐ | |
| 3. Ground Turkey, (≤10% fat) ☐☐ **% fat** | O | O | O | $☐.☐☐ | |

4. # of varieties of lean ground beef ( ≤10% fat) O 0 O 1 O 2 O 3 O 4 O 5 O 6+

| | | | | | |
|---|---|---|---|---|---|
| **Regular option:** | | | | | |
| 5. Standard ground beef, **80% lean, 20% fat** | O | O | | $☐.☐☐ | |
| **Alternate Item:** | | | | | **Comments** |
| 6. Standard alternate ground beef, if above is not available ☐☐ **% fat** | O | O | O | $☐.☐☐ | |

4349643520

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
# MEASURE #5: HOT DOG

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

O Grocery Store O Convenience Store O Other

## Availability and Price

| Item | Available Yes | No | N/A | Price/pkg. | Comments |
|---|---|---|---|---|---|
| **Healthier option:** | | | | | |
| 1. (ti Maple Lodge Chicken Wieners | O | O | | $☐.☐☐ | |
| **Alternate Items:** (≤ 9g fat) | | | | | |
| 2. Fat-free other brand 0g fat ☐☐☐☐☐☐☐☐☐☐☐☐☐☐ (Brand name) ☐☐☐ (Kcal/svg) | O | O | O | $☐.☐☐ | |
| 3. Light Wieners (turkey/pork) | O | O | O | $☐.☐☐ | |
| 4. Light beef Franks (usually 1/3 less calories, 50% less fat) | O | O | O | $☐.☐☐ | |
| 5. Turkey Wieners (1/3 less fat) | O | O | O | $☐.☐☐ | |
| 6. Other ☐☐☐☐☐☐☐☐☐☐☐☐ | O | O | O | $☐.☐☐ | ☐☐ oz pkg ☐☐ Hot dogs/pkg ☐☐ g fat ☐☐☐ kcal/svg |
| **Regular option:** | | | | | |
| 7 (t Schneiders All Pork original recipe | O | O | | $☐.☐☐ | |
| **Alternate Items:** (≥10g fat) | | | | | |
| 8. Beef Franks (regular) | O | O | O | $☐.☐☐ | |
| 9. Other ☐☐☐☐☐☐☐☐☐☐☐☐☐☐ | O | O | O | $☐.☐☐ | ☐☐ oz pkg ☐☐ Hot dogs/pkg ☐☐ g fat ☐☐☐ kcal/svg |

5986187936

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
# MEASURE #6: FROZEN DINNERS

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

O Grocery Store O Convenience Store O Other

## A. Reference Brand

1. Stouffer's brand (preferred) O Yes O No

2. Alternate brand (with reduced-fat dinners available) Brand Name: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Comments: _____

## B. Availability

Smart Ones can be used as an alternative to Lean Cuisine

1. Are reduced-fat frozen dinners available? ( ≤9g fat/8-11 oz.) O Yes O No _____

**Shelf space**:(measure only if reduced-fat frozen dinners are available)

2. Reduced-fat dinners/regular dinners: Proportion O < = 10% O 11-33% O 34-50% O 51%+

## C. Pricing (All items must be same brand)

| Reduced-Fat Dinner | Price/ Pkg | Regular Dinner | Price/ Pkg | Comments |
|---|---|---|---|---|
| 1. Lean Cuisine **Lasagna** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Stouffer's **Lasagna** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |
| 2. Lean Cuisine **Roasted Turkey Breast** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Stouffer's **Roasted Turkey Breast** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |
| 3. Lean Cuisine **Meatloaf** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Stouffer's **Meatloaf** ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |

| Reduced-Fat Alternate (≤ 9g fat) | Price/ Pkg | Regular Alternate (≥ 10g fat) | Price/ Pkg | Comments |
|---|---|---|---|---|
| 4. Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |
| 5. Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |
| 6. Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | Other _____ ☐☐ oz. ☐☐☐ Kcal. ☐☐ g fat | $☐☐.☐☐ | |

7422087785

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
# MEASURE #7: BAKED GOODS

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

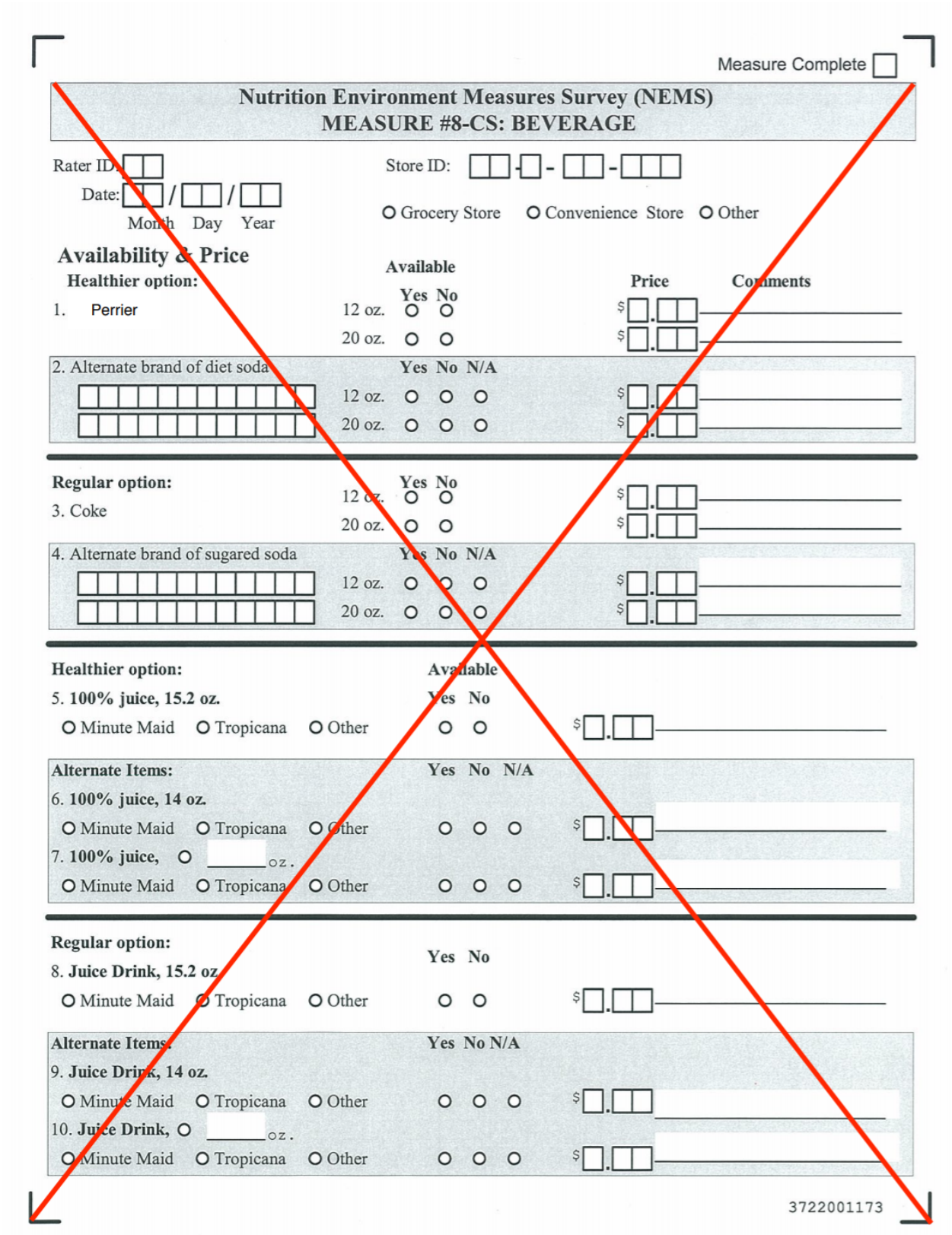
O Grocery Store O Convenience Store O Other

## Availability & Price

Low-fat baked goods ≤3g fat/serving

| Item | Available Yes | Available No | Amt. per package | g fat/ per item | kcal/ per item | Price | Comments |
|---|---|---|---|---|---|---|---|
| **Healthier option:** | | | | | | | |
| 1. Dempsters Whole Wheat Bagels Single | O | O | | ☐☐ | ☐☐☐ | $☐.☐☐ | |
| | **Yes** | **No** | **N/A** | | | | |
| Package | O | O | O | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |
| **Alternate Items:** | **Yes** | **No** | **N/A** | | | | |
| 2. English muffin | O | O | O | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |
| 3 a. Low-fat muffin ☐☐☐☐☐☐☐☐☐☐ | O | O | O | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |
| b. # varieties of low fat muffins | O 0 | O 1 | O 2 | O 3+ | | | |
| **Regular option** (≥ 4g fat/serving or 400 Kcal/serving): | | | | | | | |
| 4. Regular muffin | O | O | | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |
| **Alternate Items:** | **Yes** | **No** | **N/A** | | | | |
| 5. Regular Danish | O | O | O | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |
| 6. Other | O | O | O | ☐☐ | ☐☐ | ☐☐☐ | $☐.☐☐ |

2816345830



Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
## MEASURE #8-CS: BEVERAGE

Rater ID: ☐☐

Date: ☐☐ / ☐☐ / ☐☐ (Month / Day / Year)

Store ID: ☐☐-☐-☐☐-☐☐☐

○ Grocery Store ○ Convenience Store ○ Other

### Availability & Price

| | | Available | | | Price | Comments |
|---|---|---|---|---|---|---|
| **Healthier option:** | | Yes | No | | | |
| 1. Perrier | 12 oz. | ○ | ○ | | $☐.☐☐ | |
| | 20 oz. | ○ | ○ | | $☐.☐☐ | |
| 2. Alternate brand of diet soda ☐☐☐☐☐☐☐☐☐☐ | | Yes | No | N/A | | |
| | 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| | 20 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| **Regular option:** | | Yes | No | | | |
| 3. Coke | 12 oz. | ○ | ○ | | $☐.☐☐ | |
| | 20 oz. | ○ | ○ | | $☐.☐☐ | |
| 4. Alternate brand of sugared soda ☐☐☐☐☐☐☐☐☐☐ | | Yes | No | N/A | | |
| | 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| | 20 oz. | ○ | ○ | ○ | $☐.☐☐ | |

| | Available | | | |
|---|---|---|---|---|
| **Healthier option:** | Yes | No | | |
| 5. **100% juice, 15.2 oz.** ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | | $☐.☐☐ |
| **Alternate Items:** | Yes | No | N/A | |
| 6. **100% juice, 14 oz.** ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | ○ | $☐.☐☐ |
| 7. **100% juice,** ○ _____ oz. ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | ○ | $☐.☐☐ |
| **Regular option:** | Yes | No | | |
| 8. **Juice Drink, 15.2 oz** ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | | $☐.☐☐ |
| **Alternate Items:** | Yes | No | N/A | |
| 9. **Juice Drink, 14 oz.** ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | ○ | $☐.☐☐ |
| 10. **Juice Drink,** ○ _____ oz. ○ Minute Maid ○ Tropicana ○ Other | ○ | ○ | ○ | $☐.☐☐ |

3722001173

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
## MEASURE #8-GS: BEVERAGE

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

○ Grocery Store ○ Convenience Store ○ Other

### Availability & Price

| Healthier option: | Available size | Available Yes | No | N/A | Price | Comments |
|---|---|---|---|---|---|---|
| 1. Perrier | 12 pack 12 oz. | ○ | ○ | | $☐.☐☐ | |
| | 6 pack 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| 2. Alternate brand of diet soda ☐☐☐☐☐☐☐☐☐☐☐☐ | 12 pack 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| ☐☐☐☐☐☐☐☐☐☐☐☐ | 6 pack 12 oz | ○ | ○ | ○ | $☐.☐☐ | |
| **Regular option:** | | **Yes** | **No** | | | |
| 3. Coke | 12 pack 12 oz. | ○ | ○ | | $☐.☐☐ | |
| | 6 pack 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| 4. Alternate brand of sugared soda ☐☐☐☐☐☐☐☐☐☐☐☐ | 12 pack 12 oz. | ○ | ○ | ○ | $☐.☐☐ | |
| ☐☐☐☐☐☐☐☐☐☐☐☐ | 6 pack 12 oz | ○ | ○ | ○ | $☐.☐☐ | |
| **Healthier option:** | | **Yes** | **No** | | | |
| 5. Minute Maid 100% juice, (64 oz., half gallon) | | ○ | ○ | | $☐.☐☐ | |
| **Alternate Items:** | | **Yes** | **No** | **N/A** | | |
| 6. Tropicana 100% juice, (64 oz., half gallon) | | ○ | ○ | ○ | $☐.☐☐ | |
| 7. Other: ☐☐☐☐☐☐☐☐☐☐☐☐ | | ○ | ○ | ○ | $☐.☐☐ | |
| **Regular option:** | | **Yes** | **No** | | | |
| 8. Minute Maid juice drink, (64 oz., half gallon) | | ○ | ○ | | $☐.☐☐ | |
| **Alternate Items:** | | **Yes** | **No** | **N/A** | | |
| 9. Tropicana juice drink, (64 oz., half gallon) | | ○ | ○ | ○ | $☐.☐☐ | |
| 10. Other: ☐☐☐☐☐☐☐☐☐☐☐☐ | | ○ | ○ | ○ | $☐.☐☐ | |

2399270080

Measure Complete ☐

# Nutrition Environment Measures Survey (NEMS)
## MEASURE #9: BREAD

Rater ID: ☐☐

Date: ☐☐ / ☐☐ / ☐☐
Month Day Year

Store ID: ☐☐-☐-☐☐-☐☐☐

O Grocery Store O Convenience Store O Other

## Availability & Price

| Item | Available Yes | No | N/A | Loaf size (ounces) | Price/loaf | Comments |
|---|---|---|---|---|---|---|
| **Healthier Option: Whole grain bread** (100% whole wheat bread and whole grain bread) | | | | | | |
| 1. Dempsters 100% Whole Wheat Bread | O | O | | ☐☐ | $☐.☐☐ | |
| **Alternate Items:** | | | | | | |
| 2. Sara Lee Classic 100% Whole Wheat Bread | O | O | O | ☐☐ | $☐.☐☐ | |
| 3. Other: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ | O | O | O | ☐☐ | $☐.☐☐ | |

4. # of varieties of 100% whole wheat bread and whole grain (all brands) O 0 O 1 O 2 O 3 O 4 O 5 O 6+

| | | | | | | |
|---|---|---|---|---|---|---|
| **Regular Option: White bread** (Bread made with refined flour) | | | | | | |
| 5. Dempster's White Bread | O | O | | ☐☐ | $☐.☐☐ | |
| **Alternate Items:** | | | | | | |
| 6. Sara Lee Classic White Bread | O | O | O | ☐☐ | $☐.☐☐ | |
| 7. Other: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐ | O | O | O | ☐☐ | $☐.☐☐ | |

8320121759

Measure Complete ☐

## Nutrition Environment Measures Survey (NEMS)
## MEASURE #10: BAKED CHIPS

Rater ID: ☐☐ Store ID: ☐☐-☐-☐☐-☐☐☐

Date: ☐☐/☐☐/☐☐ (Month Day Year)

○ Grocery Store ○ Convenience Store ○ Other

### Availability & Price

Low-fat chips ≤3g fat/1 oz. serving

| Item | Size (oz.) | Available | Price | Comments |
|---|---|---|---|---|
| **Healthier Option :** | | **Yes No** | | |
| 1. PopCorners | ☐☐ oz. | ○ ○ | $☐.☐☐ | |
| **Alternate Item:** | | **Yes No N/A** | | |
| 2. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐ | ☐☐ oz. | ○ ○ ○ | $☐.☐☐ | |
| 3. # of varieties of popcorn chips ny brand) | | ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+ | | |
| **Regular Option** (select most comparable size to healthier option available): | | **Yes No** | | |
| 4. Lays Potato Chips Classic | ☐☐ oz. | ○ ○ | $☐.☐☐ | |
| **Alternate Item:** | | **Yes No N/A** | | |
| 5. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐ | ☐☐ oz. | ○ ○ ○ | $☐.☐☐ | |

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Measure Complete ☐

## Nutrition Environment Measures Survey (NEMS)
## MEASURE #11: CEREAL

Rater ID: ☐☐

Date: ☐☐ / ☐☐ / ☐☐
Month Day Year

Store ID: ☐☐-☐-☐☐-☐☐☐

O Grocery Store O Convenience Store O Other

### Availability & Price

Healthier cereals < 7 g sugar per serving

| Item | Available Yes | No | N/A | Size (ounces) | Price | Comments |
|---|---|---|---|---|---|---|
| **Healthier Option :** | | | | | | |
| 1. Cheerios (Plain) | O | O | | ☐☐ | $☐.☐☐ | |
| **Alternate Item:** | **Yes** | **No** | **N/A** | | | |
| 2. Other _____ | O | O | O | ☐☐ | $☐.☐☐ | |
| 3. # of varieties of healthier cereals | O 0 | O 1 | O 2 | O 3+ | | |
| **Regular Option** ( ≥7g of sugar per serving): | | | | | | |
| 4. Cheerios (Flavored) _____ | O | O | | ☐☐ | $☐.☐☐ | |
| **Alternate Item:** | **Yes** | **No** | **N/A** | | | |
| 5. Other _____ | O | O | O | ☐☐ | $☐.☐☐ | |

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**Appendix B: NEMS-S Scoring Sheet**

| | **Availability** | **Pricing** | **Quality** |
|---|---|---|---|
| **Milk** | Yes low-fat = 2<br>Proportion > 50 = 1 | Lower for lowest fat = 2<br>Same for both = 1<br>Higher for low fat = -1 | |
| **Fruits** | < 8 varieties = 0<br>8 varieties = 1<br>9 varieties = 2<br>10 varieties = 3 | | 80% = 1<br>90% = 2<br>100% = 3 |
| **Vegetables** | < 8 varieties = 0<br>8 varieties = 1<br>9 varieties = 2<br>10 varieties = 3 | | 80% = 1<br>90% = 2<br>100% = 3 |
| **Ground Beef** | Yes, lean meat = 2<br>2-3 varieties = 1<br>Over 3 = 2 | Lower for lean = 2<br>Same = 1<br>Higher for lean = -1 | |
| **Hot dogs** | Yes = 2 | Lower for light = 2<br>Higher for light = -1 | |
| **Frozen Dinners** | Yes, all 3 = 3<br>Yes 1 or 2 = 2<br>None = 0 | Lower for reduced fat = 2<br>Same = 1<br>Higher for reduced fat = -1 | |

| | | | |
|---|---|---|---|
| **Baked Goods** | Yes = 2 | Lower for low-fat = 2<br>Same = 1<br>Higher for low fat = -1 | |
| **Beverages** | Yes = 1 | Lower for Perrier = 2<br>Same = 1<br>Higher for Perrier = -1 | |
| **Bread** | Yes = 2<br>>2 varieties = 1 | Lower for whole wheat 2<br>Same = 1<br>Higher for whole wheat = -1 | |
| **Baked Chips** | Yes = 2 | Lower for baked = 2<br>Same = 1<br>Higher for baked = -1 | |
| **Cereal** | Yes, healthy cereal = 2 | Lower for healthy = 2<br>Same = 1<br>Higher for healthy = -1 | |

## Appendix C: Food Insecurity Survey

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| | Fully disagree | Disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Agree | Fully agree |
| I have felt worried regarding the nutritional value of the meals myself or my household have been consuming. | | | | | | | |
| I have felt worried that the quantity of foods available within my household was not sufficient to feed each family member. | | | | | | | |
| I have felt worried that I would not be able to purchase new food items before the food within my household ran out because I did not | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| have enough money to do so. | | | | | | | |
| The food I purchased for my household did not have a long enough shelf-life to last until I was able to get the financial resources to purchase more food items. | | | | | | | |
| I can afford to purchase foods and create meals that reflect the Canadian dietary guidelines : 50% fresh produce (e.g. salad), 25% lean protein (e.g. chicken breast) and 25% carbs (e.g. rice). | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Due to a lack of financial resources, I need to purchase low-cost meals such as frozen meals, packaged foods, and fast foods to feed my household. | | | | | | | |
| Due to a lack of financial resources, I needed to rely on charitable food organizations (e.g. food banks, emergency food | | | | | | | |
| Due to a lack of financial resources, my household could not eat well-balanced meals (according to the | | | | | | | |
| Due to a lack of financial resources, members of my household have | | | | | | | |
| In the past, I have skipped meals or cut down the size of my meals due to | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I have experienced hunger due to a lack of financial resources. | | | | | | | |
| Members of my household have experienced hunger due to a | | | | | | | |
| I have access to healthful foods and healthy eating resources (e.g. | | | | | | | |

**Demographic questions**

Question 15: What university do you attend?

Question 16: What degree and year of study are you completing? (e.g. Biology, year 3)

Question 18: What is your current cumulated GPA?

Question 19: How do you self-identify? [select all that apply]

a. Male
b. Female
c. Non-binary
d. Heterosexual
e. LGBTQ2S+
f. BIPOC
g. White
h. International Student
i. Mature Student
j. Other (please specify)

**Open-ended questions**

For the following questions, please reflect on the experience of your household over the past week.

Question 20: Describe your typical breakfast (e.g. scrambled eggs, frozen waffles, cereal with 3% milk, etc.).

Question 21: Describe your typical lunch (e.g. club sandwich on white bread).

Question 22: Describe your typical dinner (e.g. pasta with packaged tomato sauce).

Question 23: Where do you most commonly access food? (e.g. Walmart, Tim Hortons, food bank)

Question 24: How much money do you spend on groceries every week on average?

Question 25: Is there anything you would like to add regarding your access to food?

Question 26: If you wish to be contacted for the second phase of the study, please insert your email below.

## Appendix D – Interview Guide

### Interview guide for "Graduate student food insecurity on campus: A hidden hurdle"

Thank you for taking the time to meet with me today and for agreeing to take part in the second phase of the study. Today, I will be asking nine questions regarding your personal experiences as a graduate student relating to food insecurity. Please feel free to share as much or as little as you'd like. If you are not comfortable answering a question, please let me know and we can skip it. The interview will be audio recorded for transcription purposes. Only myself and my supervisor will have access to the transcription and recording. Your personal identity will remain anonymous and confidential since I'll be using pseudonyms. Did you have any questions before we begin?

Before I start, I just need to get your verbal consent for your participation so do you consent to participate in the second phase of the study?

Question 1: What does the term "food insecurity" mean to you?

Question 2: Please describe your experience of food insecurity as a graduate student.

Question 3: In your own experience, do you see a relationship between food insecurity and academic success as a graduate student? Please explain.

> Probe 1: In your experience, do you see a relationship between food insecurity impact on academic performance?

Probe 2: In your experience, do you see a relationship between food insecurity impact on academic engagement?

Probe 3: In your experience, do you see a relationship between food insecurity impact on your sense of belongingness to the university community?

Probe 4: In your experience, do you see a relationship between food insecurity impact on your socialization with peers?

Probe 5: In your experience, do you see a relationship between food insecurity impact on your mental and physical wellbeing?

Question 4: How do you cope with the experience of food insecurity?

Probe: What strategies or programs do you use to alleviate food insecurity?

Question 5: In your experience, how is food insecurity dealt with by the university as a whole?

Probe 1: Have you had conversations related to food insecurity with faculty members? How did you feel about those conversations?

Probe 2: Have you had conversations related to food insecurity with graduate student unions or representatives? How did you feel about those conversations?

Probe 3: Have you had conversations related to food insecurity with administrative staff? How did you feel about those conversations?

Probe 4: Have you had conversations related to food insecurity with support services such as the wellness center? How did you feel about those conversations?

Question 6: What resources, if any, are available to you within our university to help you in alleviating food insecurity?

Probe 1: Are there any programs or organizations on campus which you have access to and that could help in alleviating your experience with food insecurity?

Question 7: What responsibility do you believe the university holds in addressing student food insecurity of its graduate students?

Probe 1: What responsibility do you believe administrators play in alleviating food insecurity?

Probe 2: What responsibility do you believe faculty play in alleviating food insecurity?

Probe 3: What responsibility do you believe student associations play in alleviating food insecurity?

Question 8: Suppose the university provided you with the access to all resources needed to achieve food security. What might that look like?

Probe 1: In what ways do you believe the university should improve?

Probe 2: What resources would you like to see implemented within the university?

Probe 3: What specifically is the university doing which you think is meeting the needs of food insecure graduate students?

Question 9: Would you like to add anything else regarding food insecurity that I did not touch on?

Question 10: Did you have any questions or comments for me?

I will stop the recording here. Thank you very much for sharing your personal experiences with me.