

The Prevalence, Correlates, and Academic Consequences of Food
Insecurity Among University of Oregon Students

by

KIARA KASHUBA

A THESIS

Presented to the Department of Planning, Public Policy and Management
and the Robert D. Clark Honors College
in partial fulfillment of the requirements for the degree of
Bachelor of Arts

May 2017

An Abstract of the Thesis of

Kiara Kashuba for the degree of Bachelor of Arts
in the Department of Planning, Public Policy and Management to be taken May 2017

The Prevalence, Correlates, and Academic Consequences of Food Insecurity Among
University of Oregon Students

Approved: _____

Laura Leete

Studies are emerging across the United States indicating that college students experience food insecurity—the limited or uncertain availability of nutritionally adequate and safe foods needed to live a healthy and active life—at a rate well above the national average, which may adversely affect academic success and students’ overall mental and physical wellbeing. This study aims to contribute to this growing field of literature by exploring how the issue of student food insecurity takes shape at the University of Oregon.

The present study investigated the prevalence of food insecurity among University of Oregon students ($n = 1,236$), the correlation between food insecurity and various demographic indicators, and how food insecurity may impact academic performance. It employed a self-administered, cross-sectional online survey, utilizing the U.S. Department of Agriculture’s six-item Short Form Food Security Survey Module and various student self-reported demographic variables.

Results indicate that 52% of the students in the overall sample were classified as food insecure after the sample data were weighted to approximate the gender, race/ethnicity, and degree level (undergraduate versus graduate) of the UO student population. Students at higher risk of food insecurity included those who reported being Hispanic or Latinx, international, LGBTQ, and first-generation college students ($p = 0.05$), and black/African American students ($p = 0.10$).

Food insecurity was found to be significantly associated with a lower GPA ($p < 0.01$). Furthermore, food insecure students were significantly more likely to report that problems accessing enough food caused them to miss and drop classes, miss study sessions and club meetings, opt to not join extracurricular activities, not buy textbooks ($p < 0.01$), and put them at risk of not graduating in four years ($p = 0.05$). As with other studies in this area, this study is subject to the limitation of response bias.

Acknowledgements

I would like to thank Professors Laura Leete, Stephen Wooten, and Galen Martin for guiding me through the process of examining the issue of student food insecurity on our campus. I am sincerely grateful for the opportunity and experience of being mentored by such an inspiring and dedicated group of educators. Thank you for your guidance and support—this project would not have been possible without the time, energy, and care you devoted to helping me see its completion.

An immense thank you to Whole Foods Market Eugene, specifically Sarah Heth, Marketing and Communications Liaison, for your generous donation of four-hundred dollars in the form of gift cards to offer students as an incentive to participate in my research. I have no doubt that your donation increased participation rate and bolstered the overall strength of my study. And thank you to Jim Blick, Assistant Registrar, Statistical Reporting and Analysis, for working with me to obtain the cross-tabulated weights I needed to perform my analysis.

I would also like to thank my family, friends, roommates, and coworkers for supporting me through this year-long thesis process. I would like to extend special gratitude to my mom for always encouraging me to excel, and my supervisors at the Mills International Center, Sonja Rasmussen and Kate Stoysich, for their motivation and support throughout this process.

I would like to thank the colleges, departments, professors, and student organizations who distributed my survey link. Last but not least, I would like to thank the participants of my study for taking the time out of their busy schedules to take my survey and contribute to the understanding of student food insecurity.

Table of Contents

Introduction	1
Literature Review	5
Global Food Security	5
United States Food Security	7
Oregon Food Security	13
Student Food Security Studies	14
Methodology	26
Survey Development	26
Data Collection	29
Response Rate	31
Statistical Analysis	32
Results	33
Study Sample	33
Food Insecurity Prevalence	35
Demographic Correlates of Food Insecurity	37
Perceived Barriers to Accessing Healthy Foods	41
Association with Academic Performance	43
Discussion	49
Discussion of Results	49
Study Limitations and Biases	50
Selection Biases	50
Measurement Biases	52
Recommendations for Future Research	54
Conclusion	56
Appendices	59
Bibliography	70

List of Figures

Figure 1: Weighted food security breakdown by severity level	35
Figure 2: Breakdown of food security question responses	36
Figure 3: Percent of food secure and insecure students who identified certain barriers they face to eating healthy meals	42
Figure 4: The specific perceived impacts on education caused by problems accessing or getting enough food	44

List of Tables

Table 1: Domestic, peer-reviewed, college student-specific food security studies	15
Table 2: Non- peer-reviewed, domestic, college student-specific food security studies	16
Table 3: Peer-reviewed, international, college student-specific food security studies	17
Table 4: Theses and student research projects regarding student food security	18
Table 5: Survey sample characteristics	34
Table 6: Descriptive statistics of food insecurity percentages by variable	38
Table 7: Relationships between food insecurity and demographic variables	40
Table 8: Coefficients of how food insecurity effects academic performance	46
Table 9: Relationship between GPA and food insecurity	48

Introduction

Various studies have emerged within the last decade indicating that college students experience food insecurity at a rate well above the national average, and that food insecurity may be adversely affecting students' mental and physical health as well as academic success. The present study aims to add to this growing field of knowledge and contribute to the understanding of student food insecurity and its effects on the academic experience by exploring how the issue takes shape at the University of Oregon (UO). This study seeks to answer the following questions: what is the prevalence of food insecurity among UO students; which student demographics are significantly correlated with food insecurity; and what impact does food insecurity have on academic success?

Beyond just economic barriers to accessing enough food—and nutritious food at that—this study also considers additional, non-economic barriers to fulfilling food needs, such as time, knowledge, and physical barriers. Students who may be nutritionally deficient due to non-economic constraints are not necessarily food insecure by official standards, but the health and academic consequences of this deficiency are worrisome all the same. These non-economic factors influencing undernutrition are even less studied by academia than traditional, economic-based food insecurity.

Past studies have indicated that students of color, nontraditional, first-generation, and low-income students experience food insecurity at a rate greater than their peers. Studies also suggest that food insecurity negatively impacts academic performance and mental and physical health in college students and other populations. Higher education has been regarded as our country's "greatest equalizer" and the

“facilitator of the American Dream” (Odland, 2012). But if the students who overcome the hurdles in place to even make it to enrolling in college are negatively affected by food insecurity after they arrive, higher education’s function as a tool of economic advancement is compromised.

The notion of a stereotypical or “traditional” college student may conjure images of a young adult 18-22 years of age, attending college directly after graduating high school, living on or near campus, and receiving financial support from their families. While this demographic certainly exists, it is naïve to assume that this is every college student’s situation. In fact, today’s college students are more racially and ethnically diverse, older, more likely to be first-generation college-goers, and from lower-income communities than ever (Nellum, 2015). Students today are also more likely to be balancing school with full-time work and raising families (Nellum, 2015).

These “post-traditional” college students break the stereotypical image of who pursues higher education. Some speculate that the influx of socioeconomically diverse student populations is attributable to the fact that a college degree now carries the same worth and necessity as a high school diploma once did (Saul, 2016). It is estimated that by 2020, “65% of all jobs in the economy will require postsecondary education and training beyond high school,” and 35% of all jobs will require a Bachelor’s degree or higher (Carnevale, Smith & Strohl, 2013). These figures have steadily increased over time: in 1973, only 16% of jobs required a degree from a four-year institution; in 1992, 29% did so; and in 2010, 32% required a Bachelor’s degree (Carnevale et al., 2013). In the past, low-income students “might have entered the workforce right after high school but now they realize that a college degree is practically a necessity” (Saul, 2016).

The effects of more low-income and socioeconomically diverse students attending college is multiplied by rapidly rising tuition costs. Tuition has risen at double the rate of inflation, but not all forms of financial aid have increased proportionally (Odland, 2012). For example, in the 1980s a Pell Grant covered 77% of tuition to a four-year public institution—it now covers 36% (Kingkade, 2012).

Students are from more diverse and lower-income backgrounds and are paying higher tuition costs, a combination of factors that may be the driving force behind student food insecurity. Grocery bills are the most flexible of living costs for students—you must pay tuition to be enrolled as a student, and you must pay rent to avoid being evicted. Grocery bills, however, allow for wiggle room and thus food may be the first basic need students compromise to make ends meet.

Some students may joke about subsisting off ramen noodles, but for others, this may be a reality. This is student poverty and can be detrimental to student wellbeing and success (Schackner, 2016). Student poverty has the tendency to be swept under the rug because the “notion of starving college students conjures a romanticized image of young people away from home for the first time, temporarily making do with ramen noodles on their way to a degree and the good life,” and thus may not be taken seriously (Schackner, 2016). This has been referred to as the “Ramen Effect,” in which student poverty is easily disregarded because being broke and hungry in college is culturally viewed as a rite of passage (Alajmi, 2016).

Understanding the issue of food insecurity at the UO and other colleges and universities is a prerequisite to action. We must first understand the issue at hand in order to then take steps to ensure a college degree is accessible by all who seek it, and

that academic success is not limited by students' food situations. As we strive to make higher education more accessible and equitable, it is not enough to just recruit and enroll a more diverse student population—we must take measures to ensure that students' basic needs are met once they are here. Identifying the prevalence, correlates, and academic consequences of food insecurity among UO students contributes to the understanding of the issue as a whole, and can help guide policymakers and administrators act to ensure students' basic needs are met and are not deterrents to pursuing higher education.

Literature Review

Literature on food insecurity is vast, spanning across multiple disciplines such as nutrition, public health, and economics. This literature review provides a general background on the topic and examines the most crucial and relevant information. It follows a macro- to micro- scale organizational structure, beginning with exploring global food insecurity, followed by a discussion of domestic food insecurity, and concluding with an overview and analysis of college student-specific food insecurity studies.

Global Food Security

Hunger and malnutrition have been major concerns for human populations throughout history, but documented international recognition of the issue did not begin until post-World War I when the Health Division of the League of Nations produced *Nutrition and Public Health* in 1935, an international profile of food security and the first report of its kind (Shaw, 2007). Subsequently, the United Nation's (UN) Food and Agriculture Organization (FAO) was created in 1945, with the goal of "free[ing] humanity from hunger and malnutrition, and to effectively manage the global food system" (FAO, 2017).

The FAO's 1974 World Food Summit defined food security as the "availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (FAO, 1974). This definition reflected the decade's looming threat of mass starvation due to inadequate global food production in relation to the exponentially growing population. However, the technological advances heeded from the Green Revolution

dramatically increased global food production capacity to a point at which mass starvation was avoided. Food insecurity then shifted from an issue caused by agricultural underproduction to a matter on the side of consumption. There is now enough food produced to feed an estimated ten billion people, but economics, politics, and other human-inflicted factors inhibit achieving global food security (Holt-Gimenez, 2012). As of 2016, 793 million people worldwide were classified as undernourished (i.e., not consuming enough food to meet energy needs) by the FAO (FAO, 2016).

As pointed out by agricultural and food security economist Per Pinstrup-Andersen, food “availability does not assure access, and enough calories do not assure a healthy and nutritional diet” (Pinstrup-Andersen, 2008, p. 1). This sentiment is reflected in the FAO’s revision of the definition of food security in the 1996 World Food Security Summit, which redefined food security as:

“a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 1996).

In contrast, food insecurity was defined as:

“A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution or inadequate use of food at the household level. Food insecurity, poor conditions of health and sanitation and inappropriate care and feeding practices are the major causes of poor nutritional status. Food insecurity may be chronic, seasonal or transitory” (FAO, 1996).

The United States (US) is relatively food secure as a nation compared to developing and undeveloped countries, but nonetheless food insecurity plagues the lives of millions of Americans.

United States Food Security

US food security statistics are reported by the Economic Research Service (ERS), a department within the USDA. The figures are generated based on a survey measure developed by the US Food Security Measurement Project in response to the National Nutrition Monitoring and Related Research Act of 1990 (NNMRR), which recommended the development of a “standardized mechanism and instrument(s) for defining and obtaining data on the prevalence of ‘food insecurity’ and ‘food insufficiency’ in the US and methodologies that can be used across the NNMRR Program and at State and local levels” (USDA, 2017). The data has been collected annually since 1995 via the US Census Bureau’s Food Security Supplement to the Current Population Survey (CPS) using the 18-question Core Food Security Survey Module (CFSM) (USDA, 2017).

The USDA broadly defines food security as: “access at all times to enough food for a healthy, active life” (USDA, 2016). Food insecurity, in contrast, is defined as the:

“limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways... (that is, without resorting to emergency food supplies, scavenging, stealing, or other coping strategies)” (USDA, 2016).

The USDA categorizes food security into four levels:

- (1) High food security: households had no problems, or anxiety about, consistently accessing adequate food.
- (2) Marginal food security: Households had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced.
- (3) Low food security: Households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted.

- (4) Very low food security: At times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food (USDA, 2016).

When assessing food insecurity as a binary variable, high and marginal food security are combined to constitute food security whereas low and very low food security are combined to constitute food insecurity.

In 2015, 12.7% of US households were deemed food insecure by USDA standards (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2016). This figure has significantly declined from the peak food insecurity rate in 2011 of 14.9%, but has yet to drop below the 2007 pre-recession level of 11.1% (See Appendix 1) (Coleman-Jensen et al., 2016). As a general trend, households with annual incomes “near or below the Federal poverty line, households with children headed by single women or single men, women and men living alone, and Black- and Hispanic-headed households” experience food insecurity at a rate significantly higher than the national average (Coleman-Jensen et al., 2016, p. 8).

While annual household income is a variable significantly correlated with food insecurity, a study by Gundersen, Kreider, and Pepper (2011) argues that poverty is not necessarily synonymous with food insecurity, and that having a household income above the poverty line does not ensure food security. The researchers observed an unsurprising inverse relationship between income and food insecurity, but point out that there exists a somewhat surprising number of poor households that are food secure, and non-poor households that are food insecure (Gundersen et al., 2011). According to their research, about 65% of households close to the poverty line are food secure, and as the “income-to-poverty ratio approaches two, food insecurity rates are slightly over 20%,”

and, even as the ratio approaches three, food insecurity rates hover around 10% (Gundersen et al., 2011, p. 287). These findings suggest that current income, the information gathered from the CPS, does not adequately portray a household's ability to avoid food insecurity. Average incomes over two or more years, the possession (or lack thereof) of liquid assets, and the occurrence of negative income shocks may be better determinants of food insecurity (Gunderson & Gruber, 2001; Leete & Bania, 2010).

As mentioned, food security data is collected via the USDA FSSM. Five variations of this questionnaire exist: (1) the Core Food Security Module (CFSM), also known as the Household FSSM, (2) the Adult FSSM, (3) the six-item Short Form of the FSSM, (4) the Self-Administered FSSM for Youth Ages 12 and Older, and (5) a Spanish Translation of the CFSM (see Appendix 2 for detail). All FSSMs are available translated into Spanish, and all surveys' reference periods can be adjusted to either twelve months or thirty days.

The USDA's CFSM is generally regarded as a standard, adequate instrument to measure both household and individual food insecurity, but there are critiques and shortcomings of the measurement tool that need to be considered. For one, although the concepts are included in the USDA definition of food security, the FSSMs do not include questions regarding socially unacceptable methods of food acquisition (i.e., relying on charitable donations, dumpster diving, or stealing to meet one's food needs). If an individual or household is meeting their food needs because they utilize these coping mechanisms, their food insecurity is not captured by the USDA FSSMs.

As far as nutritional security, the modules do ask one question about the subject being able to afford to eat "balanced meals," but the term "balanced" is quite open to

interpretation by the participant and has been criticized as an invalid and unreliable measure (Derrickson et al., 2001). No questions are asked regarding food safety.

Another interesting criticism of the CFSM and its subsets is that while they intend to measure food security, they never actually confirm that a household or individual is food secure (Tarasuk, 2001). This is because the questions measure the absence of food insecurity, not the presence of food security (Tarasuk, 2001).

Furthermore, the four food security levels have been criticized for their arbitrariness and ability to accurately capture food insecurity. For example, if a participant responds affirmatively to the question: “I could not afford to eat balanced meals” but negatively to all other questions, they are deemed marginally food secure (raw score of 1), which is then translated into food secure at the binary measurement level. Marginal food security is when households or individuals “had problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced” (USDA, 2016). But if one often cannot afford to eat balanced meals, I would argue that the quality and variety of their food intake is reduced and they should be considered food insecure.

Furthermore, the FSSM questions only measure food insecurity by inquiring into a household or individual’s ability to purchase food, and thus the measurement tool assumes economic constraint is the only barrier to realizing food security. This assumption is inconsistent with the USDA’s definition of food insecurity, which does not specify that one must have sufficient economic access to nutritious and safe food to be considered food secure, but rather requires one simply has “access” to enough such food. “Access” could be interpreted as more than just economic access: physical access

to food, as well as time, knowledge, and cultural barriers could affect whether one is consistently meeting their food needs.

I argue that the definition of food insecurity should be expanded to consider non-economic factors. At least in terms of public health, the value of food is in its consumption, not in its acquisition. Therefore, consumption of food should determine food security, not just the financial ability to purchase it. If we measured factors inhibiting the consumption of enough nutritionally adequate and safe food that is needed to live a healthy, active life instead of focusing solely on economic barriers to purchasing it, we would have a more holistic understanding of the issue.

The current USDA measurement system assumes that one has the knowledge, time, and other means to prepare food in a way that meets their nutritional needs once food is physically obtained (e.g., economically accessed). This assumption may not hold true for all populations. A theoretical example of this could be new immigrant populations, or more specific to the present study, international students: perhaps they have the economic means to purchase enough food, but cultural and knowledge barriers prevent them from acquiring and preparing the foods they need to be healthy and successful.

Physical access to food should be considered when measuring food insecurity as well. The relatively new term “food desert,”—while various definitions exist—generally refers to a geographic area in which “residents’ access to affordable, healthy food options (especially fresh fruits and vegetables) is restricted or nonexistent due to the absence of grocery store within convenient travelling distance” (Food Empowerment Project, 2017). Populations in such areas may have enough money to

buy food, but cannot access it easily due to physical location. However, a lack of physical access to food, such as food deserts, is a barrier that could be considered as an indirect economic barrier to food insecurity since food deserts tend to be located in low-income areas (most definitions even require the area to be low-income to be considered a food desert). If one was financially stable, they could in theory move into a higher-income area that is not a food desert (Beaulac, Kristjansson & Cummins, 2009). Or, similarly, they could afford a car and expenses related to automobile ownership, which counteracts the consequences of residing in a food desert because it makes travelling to grocery stores accessible (Bania, Leete & Sparks, 2011).

Cases exist, however, where physical access is in and of itself a barrier to accessing food rather than a function of economic ability. For example, a qualitative study consisting of in-depth interviews with a sample of 53 elders concluded that many elders were not meeting their food needs, but were not considered food insecure by USDA FSSM standards because the barriers inhibiting them from accessing adequate food were not necessarily economic, but physical. The study concluded that:

“although money is a major cause of food insecurity, elders sometimes have enough money for food but are not able to access food because of transportation or functional limitations, or are not able to use food (i.e., not able to prepare or eat available food) because of functional impairments and health problems” (Wolfe et al., 2003, p. 1).

These findings are supported by another study by Lee & Frongillo (2001), who conclude that “food insecurity in elderly persons comprises not only limited food affordability, availability, and accessibility but also altered food use,” meaning that the ability of elderly populations to prepare food was inhibiting food security attainment (Lee & Frongillo, 2001, p. 1). The insight Wolfe et al. and Lee & Frongillo’s studies provide regarding the shortcomings of the USDA CFSM begs the question of if other

populations may not be meeting their food and nutritional needs due to factors other than economics, and whether the USDA FSSMs are accurate and valid of determining food insecurity in these populations. While such individuals may not be technically food insecure as defined by the USDA measurement system because they do have the economic means to access food but the ability to meet their dietary needs are inhibited by other factors, the effects of not getting enough to eat or being nutritionally deficient no matter what the cause are worrisome and potentially detrimental all the same.

Time, knowledge, cultural appropriateness, and physical accessibility are all factors that are not necessarily economic that may cause an individual to experience the same negative effects of not getting enough healthy food to eat as someone who is food insecure due to economic constraints. These additional variables that may potentially affect individual health and wellbeing are especially interesting in the context of a college student population, where many “emerging adults” may lack the financial and time management skills or food preparation and nutritional knowledge needed to meet their dietary needs for an active and healthy life. Perhaps a more appropriate term for this population subset may be “nutritional insecurity,” recognizing that an individual may be food secure by USDA economic standards, but is nutritionally insecure due to other non-economic factors.

Oregon Food Security

Oregon’s most recent food insecurity rate of 16.1% is statistically significantly higher than the national average (Oregon Food Bank, 2015). This figure ranks Oregon as the sixth most food insecure state in the US, surpassed only by Kentucky, Alabama, Louisiana, Arkansas, and Mississippi (Feeding America, 2017). According to an

analysis performed by the Oregon Center for Public Policy (OCPP) using USDA-collected data, Oregon's food insecurity rate increased 18.4%—the second highest rate of increase in the nation—from 2011-2014, a period during which the average national food insecurity rate decreased by 2.7% (OCPP, 2015). Lane County's most recent food insecurity rate, where the UO is located, is slightly higher at 16.5% (Feeding America, 2014).

Student Food Security Studies

While the issues of national-level and household food security have been explored in academia for several decades, literature in the field of college student food security is relatively new and the topic generally understudied. To my knowledge, there are eight peer-reviewed American studies, five non-peer-reviewed studies, four peer-reviewed international studies, and five theses and student projects pertaining specifically to food insecurity among the college student demographic (see Tables 1-4).

Table 1: Domestic, peer-reviewed, college student-specific food security studies

Peer-reviewed Studies (United States)				
Study Site	Food Insecurity Rate	Response Rate	Dissemination Method	Citation
University of Alabama	14%	87%	In class	Gaines, Robb, Knol & Sickler, 2014
University of Hawai'i at Manoa	21%	99%	In class	Chaparro, Zaghloul, Holck & Dobbs, 2009
University of Massachusetts Boston	24%	unspecified	In class	Silva, Kleinert, Sheppard, Cantrell, Freeman-Coppadge, Tsoy & Pearrow, 2015
Four public Illinois Universities	35%	4%	Email, does not specify if random sample	Morris, Smith, Davis & Null, 2016
Arizona State University	37%	42%	Residence Hall meeting	Brennhofer, Van Woerden, Todd & Laska, 2016
University of Michigan	42%	7%	Emailed random sample	Mirabitur, Peterson, Rathz, Matlen & Kasper, 2016
Two Community Colleges in Maryland	56%	unspecified	Convenience sample, no further specificity	Maroto, Snelling & Linck, 2014
Western Oregon University	59%	7%	Emailed entire student population	Patton-López, López-Cevallos, Cancel-Tirado & Vazquez, 2014

Table 1 presents a compilation of all domestic, peer-reviewed studies to date conducted on college student food security known to researcher.

Non- Peer-reviewed Studies (United States)				
Study Site	Food Insecurity Rate	Response Rate	Dissemination Method	Citation
City University of New York (all 17 campuses)	39%	16%	Emailed random sample; distributed survey in-person at 8 campuses with the "highest rates of students receiving public assistance"	Freudenberg, Manzo, Jones, Kwan, Tsui & Gagnon, 2011
Wisconsin HOPE Lab (10 community colleges across 7 states)	40%	9%	Emailed random sample	Goldrick-Rab, Broton & Eisenberg, 2015
University of California (all 10 campuses)	42%	14%	Emailed random sample	Martinez, Maynard & Ritchie, 2016
College and University Food Bank Alliance (8 community and 26 four-year colleges across 12 states)	56%	0.5%	Tabling or leaflet with survey linked handed out in classrooms	Dubick, Matthews & Cady, 2016
Wisconsin HOPE Lab (70 community colleges across 24 states)	56% ¹	5%	Emailed entire student population of all colleges	Goldrick-Rab, Richardson & Hernandez, 2017

Table 2: Non- peer-reviewed, domestic, college student-specific food security studies

Table 2 presents a compilation of all non- peer-reviewed, domestic studies to date conducted on college student food security known to researcher.

¹It is important to note that the 2017 Wisconsin HOPE Lab study misleadingly presents a 67% food insecurity rate in its literature when the true rate is 56%. The inflated rate was arrived at by categorizing “marginally food secure” as food insecure category when according to USDA standards, these students qualify as food secure. This inflation, and more importantly the lack of mentioning that they were rearranging USDA-defined categories, illuminates a possible bias in the study’s intentions.

Peer-reviewed Studies (International)				
Study Site	Food Insecurity Rate	Response Rate	Dissemination Method	Citation
Queensland University of Technology (Australia)	26%	6%	Email sent to all students in university's Business and Health departments; web-based advertising and posters	Gallegos, Ramsey & Kai, 2014
Griffith University (Australia)	47%	72%	In person recruitment at multiple campus locations	Hughes, Serebryanikova, Donaldson & Leveritt, 2011
Deakin University (Australia)	48%	unspecified	In person; information flyers, bulletins and posters; in class announcements; unit websites	Micevski, Thornton & Brockington, 2014
University of Alberta (Canada)	90%	unspecified	In person recruitment at University's Campus Food Bank	Farahbakhsh, Ball, Farmer, Maximova, Hanbazaza & Willows, 2015

Table 3: Peer-reviewed, international, college student-specific food security studies

Table 3 presents a compilation of all peer-reviewed, international studies to date conducted on college student food security known to researcher.

Theses and Student Research Projects				
Study Site	Food Insecurity Rate	Response Rate	Dissemination Style	Citation
Bowling Green State University (<i>Undergraduate thesis</i>)	19%	11%	Informed of survey in class, unspecified if survey administered in class	Koller, 2014
University of Alaska Anchorage (<i>Undergraduate research project</i>)	31%	unspecified	In class	Chriest & Wintz, 2013
Fresno State University (<i>Master's thesis</i>)	31%	unspecified	In class	Espinoza, 2013
University of Alaska Anchorage (<i>Undergraduate research project</i>)	55%	unspecified	Email sent to all campus residents	Lindsley & King, 2014
Portland State University (<i>Master's thesis</i>)	59%	22%	Email, does not specify if random sample	Cole, 2014

Table 4: Theses and student research projects regarding student food security

Table 4 presents a compilation of all Theses and student research projects regarding student food security known to researcher.

This literature review focuses mainly on the domestic peer-reviewed and non-peer-reviewed studies under the assumption that they are the most reliable (the non-peer-reviewed studies, while not published in academic journals, are extensive and professionally conducted), and for the sake of being concise. The general methods, results, and limitations of these studies are discussed hereafter.

Most studies were conducted internally by university personnel, and thus had the resources necessary (e.g., complete student and/or faculty email lists) to conduct their research via a random sampling recruitment method. These studies either directly emailed random students to invite them to participate in the research via online surveys,

or emailed random professors asking for permission to administer their survey in class. Some studies used the non-random sampling recruitment method of tabling.

As a general trend, studies with higher response rates—specifically those that collected data via pen-and-paper, in-class surveys as opposed to disseminating surveys via email or performing in-person recruitment such as tabling—produced lower rates of student food insecurity (see Tables 1-4). For example, the University of Hawai'i Manoa study collected their data by having research personnel attend 31 randomly selected classes to administer the survey in person (Chaparro et al., 2009). This dissemination method resulted in a 99% response rate, and the study cited a relatively lower 21% student food insecurity rate (Chaparro et al., 2009). The University of Alabama and the University of Massachusetts Boston utilized similar in-class recruitment methods, and their studies produced student food insecurity rates of 14% and 24%, respectively.

In contrast, Western Oregon University disseminated their survey by emailing it to all enrolled students, 7% of whom responded. This study produced a 59% food insecurity rate among students surveyed. As a general trend, studies that invited students to participate in their research via email produced lower response rates and higher food insecurity rates than studies that administered pen-and-paper surveys in classes. This may be because students experiencing food insecurity may be more apt to respond to the online survey since it is a relevant issue for them, whereas an in-class survey encourages all students to participate regardless of food insecurity status.

The College and University Food Bank Alliance (CUFBA) study collected student information by way of tabling (Dubick et al., 2016). This recruitment method, similar to email recruitment, lends itself to a major self-selection bias where students

affected by food insecurity may be more apt to participating in the research. This bias is arguably more significant for tabling methodology than in random sampling methods because students had to physically approach the survey table to participate in the research, which is less convenient than an online or in-class survey format. Thus, the CUFBA study might be expected to have overestimated the food insecurity rate (56%).

All studies, including the international ones, used some format of the USDA FSSM (usually either the ten-item Adult or six-item Short Form to minimize response bias) to measure student food insecurity, thus producing relatively comparable results. All studies compared food security scores to basic demographic information collected from students such as race, gender, class standing, residency, age, and living arrangement. Across the board, students of color (excluding Asian students), first-generation, nontraditional, and low-income students (measured by household income or Pell Grant receipt) tended to experience food insecurity at a higher rate. Beyond determining food security prevalence and its basic demographic correlates, each study varied slightly in scope and purpose. There was an inconsistency and disagreement among studies about whether to include freshmen or graduate students in the sample. Housing insecurity, physical and mental health, and academic performance were common variables examined in association with food insecurity in some studies as well.

The first published college student-specific food insecurity study was conducted by the University of Hawai'i at Manoa (UHM) in 2009, which found 21% of students surveyed to be food insecure (Chaparro, Zaghloul, Holck, & Dobbs, 2009). This study asked students to recall eating behaviors over a 12-month timeframe, and thus excluded freshmen from the study in order to "ensure the results reflected college life experience"

(Chaparro et al., 2009, p. 2). Most studies followed suite of using a twelve-month reference period. A year-long recall period presents several problems, the most obvious of which is a potential recall bias due to the extended timeframe. Furthermore, students may leave their college living situations for periods such as winter and summer break, thus the timeframe does not capture students' experience while at school.

It is problematic to exclude freshmen students from the study as they are not a population that is immune to food insecurity and thus their data should be considered. A study conducted at Arizona State University (ASU) surveyed solely freshmen, and found a 37% food insecurity rate among the sample. The University of Alabama (UA) study excluded freshmen in addition to graduate, part-time, and pregnant students, and anyone not within the ages of 18-25 in order to "provide a sample that was more representative of the traditional college experience" (Gaines et al., 2014, p. 377). This study produced the lowest food insecurity rate (14%), a number that may have been influenced by excluding these "nontraditional" students from the study. Excluding such students is problematic because, as previously mentioned, university demographics are becoming increasingly nontraditional and so to exclude such students does not accurately represent the university's food insecurity rate as a whole.

Several studies inquired into student housing instability issues in addition to food insecurity (Freudenberg et al., 2011; Silva et al., 2015; Dubick et al., 2016; Goldrick-Rab et al., 2015). Food insecurity is just one product of economic impoverishment, so data on housing insecurity provides a more well-rounded picture of students' financial situations and overall economic hardships.

The first study to inquire into housing insecurity in addition to food insecurity was conducted across the seventeen City University of New York (CUNY) campuses in 2011. This study found that 43% of students were housing insecure, 39% were food insecure, and 24% experienced both types of basic material needs insecurity (Freudenberg et al., 2011). The CUFBA study's results indicate that 48% of all students (and 64% of food insecure students) reported experiencing some form of housing insecurity within the prior year, and 9% of all students (15% of food insecure students) reported being homeless at some point in the previous year (Dubick et al., 2016). In the University of Massachusetts Boston (UMB) study, 5% of participants indicated they had experienced homelessness since attending college, and an additional 4% reported experiencing extreme housing insecurity without homelessness (measured as not being certain they could continue to sleep in the same place they slept the previous night for the following two weeks) (Silva et al., 2015).

The largest and most recent study produced by the Wisconsin HOPE Lab, which surveyed over 33,000 students from 70 community colleges in 24 states, found that about half of students were housing insecure (which the study defined as an inability to pay rent or utilities, or the need to move frequently) and 14% were homeless (Goldrick-Rab et al., 2017). In the Wisconsin HOPE Lab's first study conducted in 2015, half of students were deemed housing insecure and 13% as homeless (Goldrick-Rab et al., 2015).

Several studies examined the association between student food insecurity and mental and physical health. Western Oregon University (WOU) and CUNY briefly inquired into this association and both found that students who reported fair or poor

physical health were more likely to be food insecure than those reporting good or excellent health (Patton-Lopez et al., 2014; Freudenberg et al., 2011). The CUNY study also found that students who reported symptoms of depression were over twice as likely to experience food insecurity (Freudenberg et al., 2011).

Arizona State University (ASU) examined the association between student food insecurity and health more closely by studying freshmen living in the University's residence halls (Bruening et al., 2016). Results indicated that those who reported experiencing food insecurity were almost three times more likely to report suffering from depression and anxiety disorders (Bruening et al., 2016). Fast-food consumption, fruit and vegetable consumption, binge drinking, stress, and being overweight were not significantly associated with food insecurity (Bruening et al., 2016).

Existing research indicates that financial struggles increase the risk of mental health issues such as depression and anxiety in college-student populations (Eisenberg, Gollust, Golberstien, & Hefner, 2007). Because food insecurity is a manifestation of poverty for some students, these results could be extrapolated to suggest that food insecure students may be at a higher risk of suffering from mental illnesses.

Furthermore, food insecurity could also increase stress, which in turn may worsen mental and physical health issues.

Another trend present in several studies was examining the association between food insecurity and academic performance, which was measured by either GPA or various qualitative indicators. Generally, food insecurity was associated with poorer academic performance.

A study conducted at two community colleges in Maryland concluded that food insecure students were more likely than food secure students to report a lower GPA (2.0-2.49) versus a higher GPA (3.5-4.0) when controlling for gender and income (Maroto et al., 2014). However, this observation became statistically insignificant when the variables of race and living situation were added to the regression. The WOU study found that food insecure students were less likely to report a GPA of greater than 3.0 (Patton-Lopez et al., 2014). The Illinois study also found a significant association between food insecurity and GPA. However, this was observed through a Chi-squared statistical test and therefore did not control for other variables associated with food insecurity such as income.

The study conducted at UMB observed that students experiencing food insecurity reported that food insecurity issues affected their ability to attend class at a rate significantly higher than food secure students (59% vs. 16%), and 88% of food insecure students (vs. 22% of food secure students) indicated that food insecurity issues affected their ability to perform in class (Silva et al., 2015). Furthermore, 30% of food insecure students reported that food insecurity issues had caused them to fail a class or withdraw or refrain from enrolling in courses (Silva et al., 2015). The significance levels for these statistics were computed via t-tests comparing rates between food insecure and secure students, and therefore did not account for other variables associated with academic performance such as income.

The UC study also examined the relationship between food insecurity and academic performance. They found that food insecure students reported a mean GPA of 3.1, compared to food secure students' mean GPA of 3.4 (Martinez et al., 2016). This

study also observed that food insecure students were more likely to report having to suspend studies due to financial hardship than food secure students (10% vs. 3%) (Martinez et al., 2016). The CUFBA study reported that 32% of students indicated that hunger or housing problems had had an impact on their education (Dubick et al., 2016). Of these students, 53% reported missing a class due to hunger or housing issues, 54% reported missing a study session, 37% reported missing a club meeting, 55% reported opting to not join an extracurricular activity, 55% reported not buying a required textbook, and, perhaps most severely, 25% indicated that hunger or housing problems has caused them to drop a class.

The effects that food insecurity has on college-aged students is relatively understudied, but the few results available are supported by studies examining food insecurity's impact on physical and mental health and academic performance researched in K-12 settings. A multitude of literature suggests that food insecurity negatively impacts academic ability in school-aged populations, adversely affecting math and reading scores, decreasing memory, and negatively impacting overall academic ability (Alaimo et al., 2001; Jyoti et al., 2005; Lacour & Tissingdon, 2011). One could assume that this negative relationship between food insecurity and academic performance and between poverty and health could be extrapolated and applied to the college-aged demographic (Cady, 2014). The limited research examining this relationship in a college-student population supports this assumption, but more research is needed to determine the extent to which this extrapolation may be accurately applied to college adults considering that nutritional needs and energy requirements for effective brain and bodily functioning may change as one ages.

Methodology

Survey Development

I developed the survey instrument over the course of fall 2016 with the help of my faculty advisors and drawing extensively on the literature of previously tested survey questions. I pilot-tested the initial draft of the survey among the 19 students in my Thesis Prospectus course. After completing the survey, participants provided oral and written feedback regarding question clarity, and I revised the survey accordingly. The final questionnaire, recruitment materials, and research plan were approved by the University of Oregon's Institutional Review Board in January of 2017.

I secured a donation of forty \$10 gift cards from Whole Foods Market Eugene to offer participants a financial incentive to complete the survey. Offering a monetary incentive was intended to increase response rate. Discussion of this incentive with my Focus Group indicated a high level of student interest in receiving such gift cards, regardless of student financial or food security status.

I carefully developed the survey to balance collecting maximum information while minimizing response burden (see survey in Appendix C). The survey opened with a statement of informed consent, which was followed by a screener question to ensure that only students enrolled in the University of Oregon during the reference timeframe ("in the last 30 days") could access the remainder of the survey. If participants indicated they had not been enrolled at the University of Oregon in the last 30 days, they were automatically dismissed from the survey. Participants who passed the screener question and were therefore qualified to participate in the study continued to the remainder of the

survey, which was organized into parts A, B, C, and D: food access, food assistance methods, impacts on education, and demographics, respectively.

Part A of the questionnaire measured food insecurity via the self-administered version of the six-item Short Form FSSM, utilizing a recall timeframe of thirty days. To minimize response burden, the two questions about cutting meals and the frequency of doing so is consolidated into one question. For this question, responses of “yes, almost every day” and “yes, some days but not every day” is scored as two affirmative responses, and a response of “yes, only one or two days” is scored as one affirmative response. For all other questions, each affirmative response received a score of 1, and a negative response received a score of 0. The sum of response scores produces a respondent’s raw score: a raw score of 0 represents high food security, 1 represents marginal food security, 2-4 represents low food security, and 5-6 represents very low food security. To analyze these food security levels as a binary, high and marginal food security are combined to constitute food security, and low and very low food security are combined to constitute food insecurity.

I utilized the six-item Short Form FSSM to minimize response burden and maximize response rate, as well as to produce results that could be compared to other studies in the field. The six-item format produces generally reliable results compared to the longer forms (Blumberg, 1999). A study conducted by Dr. Stephen Blumberg et al. (1999) assessed the effectiveness of the Short Form FSSM, and found that overall the shorter survey form identified the same food security level as the complete 18-item survey for 98% of households surveyed ($N = 44,647$) (Blumberg, 1999). Households with children were slightly less accurate at a 95% accuracy rate, whereas the shorter

survey accuracy rate for households without children was 99% (Blumberg, 1999). The study concluded that “despite its brevity, [the Short Form FSSM] maintains many of the essential indicators of food security” and is “robust when classifying the food security of households in the general population” (Blumberg, 1999). That being said, the Short Form FSSM does not directly inquire into children’s food security, nor does it measure the most severe form of adult food insecurity reflected by losing weight due to lack of food.

Part A also explored students’ perceived barriers to accessing healthy food. Time, knowledge, physical accessibility to affordable grocery stores, dining hall hours, and dining hall food options were factors students identified as a barrier to them accessing healthy foods. This question was inspired by the UC system’s 2016 study, but embellished to take more potential barriers into account.

Part B of the questionnaire explored alleviation methods utilized by students in response to food insecurity. Options included: government assistance, food pantry utilization, growing their own food, and attending events offering free food.

Part C explored the academic consequences that students perceive to results from lack of access to food. The two questions in this section are derived from the 2016 CUFBA study, although the questions’ wording was changed slightly for clarity. I added one possible answer regarding the impact of food access on students’ ability to graduate in four years, because increasing the four-year graduation rate at the University of Oregon is an institutional priority and may be of interest to this study’s immediate audience. This section also asks student to provide an estimate of their most

recent cumulative GPA to explore if there is an association between GPA and food insecurity, a trend that has been observed in previous studies.

Part D asked students to provide standard demographic information regarding gender, LGBTQA3+ status, race/ethnicity, and age. Questions regarding students' geographic origin, academic class standing, enrollment status, nontraditional student status, first-generation college student status, financial aid receipt, housing arrangement, and weekly hours of employment were also included.

Data Collection

The data collection period ran from Monday, February 13th, to Friday, March 23rd; a total of six weeks. I chose this timeframe because the staggered responses made it possible to capture students' experience during the entire duration of winter term.

The survey asked students to recall information from the last thirty days for several reasons, one of which was to reduce recall bias. A thirty-day reference period was also necessary to capture students' experience while in school: many students return home to their parents' houses during winter vacation where they may experience different levels of food security than they normally do while living in their college places of residence. To account for this, I released the survey thirty days after the first day of winter term in order to only capture information from students' time at school. A thirty-day reference period also allowed for the inclusion of freshmen students, unlike several studies whose twelve-month timeframes excluded the demographic.

Some studies in the field suggest that shorter reference periods yield lower instances of food insecurity. For example, the ASU study asked students to recall eating habits from a thirty-day timeframe, which produced a 32% rate of food insecurity, and

then a three-month timeframe, which increased the observed food insecurity rate to 37% (Bruening et al., 2016).

This study utilized a non-probability sampling recruitment method. While this method is more likely to produce more significant sample bias than random probability sampling, this was the most effective method available considering that I did not possess direct access to a student body email listserv. Instead, I relied on contacting those who did have access to student email listservs and asking them to forward the survey link to students, and recruited participation through social media as well.

I emailed all UO deans and department heads and asked them to distribute the survey link to the students in their units. I sent a reminder email to departments that had not responded after two weeks. At the close of the study, over half of contacted departments and colleges had been accounted for distributing the survey link to students in their units via either email, newsletter, Canvas, or social media platforms. I did not receive a confirmation from all departments that sent out the link (I discovered some departments had distributed the link without confirming with me that they had done so), so the exact number of departments that distributed the survey is undetermined.

The Robert D. Clark Honors College, the Graduate School, the School of Journalism and Communications, the College of Education, The Lundquist College of Business, and the School of Music and Dance distributed the survey link to all students enrolled in the respective colleges and schools, and some programs within the colleges distributed the survey link independently as well. The School of Law did not distribute the survey link as a whole, but the Juris Doctor (JD) program did. The College of Arts and Sciences also did not distribute the survey link as a whole, but half of the individual

departments within the college did distribute it. Numerous individual professors distributed the link as well.

In addition to departments, colleges, and professors, the survey link was distributed by several other entities, including: the Center for Multicultural Academic Excellence, the McNair Scholars Program, and University Housing. The link was also distributed via social media platforms, but the extent to which this occurred is unknown. I also verbally recruited participants by tabling at an exhibit opening at the Museum of Natural and Cultural History regarding world food.

Response Rate

Of the 22,469 students enrolled at the University of Oregon during winter term 2017, 1,579 participants responded to some portion the survey. Theoretically, if all students had received an invitation to participate in this research, this would entail a 7% response rate. However, because recruitment was mainly conducted through department listservs, students who had not yet declared a major or minor may have been less likely to receive the survey link. That being said, University Housing sent out the survey link to all students living in the residence halls, which is comprised of mainly first and second year students who are more likely to have not yet declared their majors. Furthermore, as mentioned, the College of Arts and Sciences (CAS), which houses the majority of majors, did not send out the survey link as a college, but over half of individual departments within CAS did distribute the survey link. It is possible that these students received the survey link through their major or minor department, or through social media or student groups avenues. Therefore, it is presumable that the response rate is at least equal to or greater than 7%.

Statistical Analysis

I used descriptive statistics to describe demographic characteristics of the unweighted sample and the population-weighted percentages of students experiencing food insecurity. Inferential statistics, specifically multivariate logistic regressions, were used to assess association between various demographic variables and food insecurity status, as well as the association between food insecurity and academic performance. Logistic regression coefficients were converted into linear probability coefficients to aid interpretation. *T*-tests were also used to compared the impact food insecurity may have on GPA. All statistical analyses were performed with Stata version 14.2, and graphs and tables were created with Microsoft Excel version 15.32.

Results

Study Sample

Of the 1,579 initial participants, six respondents were eliminated when they declined to participate after reading the statement of informed consent, and an additional 152 were eliminated from participation after they failed to pass the screener question confirming enrollment as a University of Oregon student at some point during the last 30 days. Another 181 were eliminated because, while they passed the consent and screener questions, they did not respond to the questions needed to weight their responses (gender, race/ethnicity, and degree level). Finally, three students were eliminated from the study because they failed to meet the legal age requirement (18 years old) for participation in accordance with IRB regulations. In total, 1,236 responses were used in data analysis.

The majority of the students who completed the survey were white (70%). One participant identified as American Indian or Alaska Native; for data analysis purposes, they were recoded into the “Race and ethnicity unknown or other” category. Similarly, respondents identifying as Native Hawaiian or other Pacific Islander ($n = 3$) were grouped into the Asian racial category. Despite various efforts to reach students of color, Asian and white students were overrepresented in the survey relative to the UO student population, whereas students identifying as black or African American, Hispanic or Latinx, two or more races, and Nonresident Aliens (international students whose race and ethnicities are not collected by the University of Oregon) were underrepresented (see Table 5).

A majority of respondents were female (73%). Females were overrepresented, and males were underrepresented, relative to the UO student population (see Table 5). Because UO student population demographic data does not separately identify non-binary gender-identifying individuals, for sample weighting purposes, respondents who identified their gender as “other” were recoded as males. The proportions of undergraduate and graduate level students in the sample were consistent with the overall proportions in UO student population. These three categories (gender, race, and degree level) were used to apply population weights to the sample in order to generate a more representative sample and help counteract sample bias. All results presented in this study are weighted accordingly.

Weight Variable	Sample Count	Sample Percent	Population Percent
Gender			
Female	901	73%	53%
Male	338	27%	47%
Race and Ethnicity			
Asian	88	7%	6%
Black or African American	6	0.5%	2%
Hispanic or Latinx	123	10%	10%
White	860	69.5%	61%
Two or more races	76	6%	6%
Nonresident	72	6%	13%
Unknown or other	11	1%	2%
Degree Level			
Undergraduate	1,041	84%	85%
Graduate	198	16%	15%
Total (N)	1,236		

Table 5: Survey sample characteristics

Weight variables' survey sample size and percent compare to that of the greater UO population.

Food Insecurity Prevalence

After weighting the survey sample to match the characteristics of the UO student population, results indicate that 33% of students were classified as highly food secure (raw score of 0), 15% of students were marginally food secure (raw score of 1), 30% of students had low food security (raw score of 2-4), and 22% of students had very low food security (raw score of 5-6) (see Figure 1). When categorizing food security as a binary measure, 48% of students were food secure and 52% were food insecure.

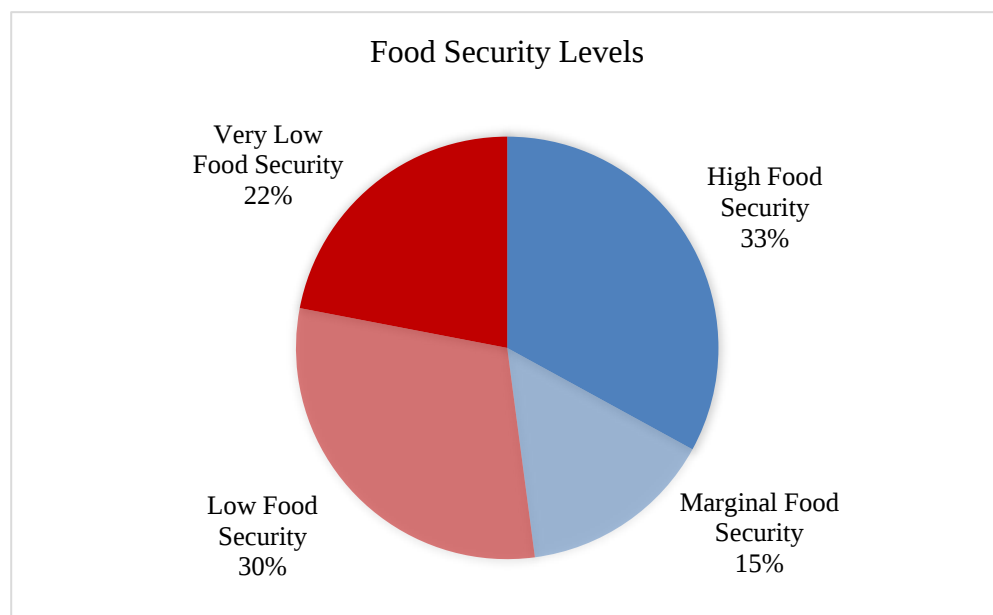


Figure 1: Weighted food security breakdown by severity level

This figure displays the weighted food security levels observed in the UO student population. High and marginal food security, displayed in blue, are combined to represent “food secure.” Low and very low food security, displayed in red, are combined to represent “food insecure.”

As previously mentioned, raw scores are the sum of the individual FSSM question scores. Figure 2 provides a breakdown of responses to each question across the UO student population.

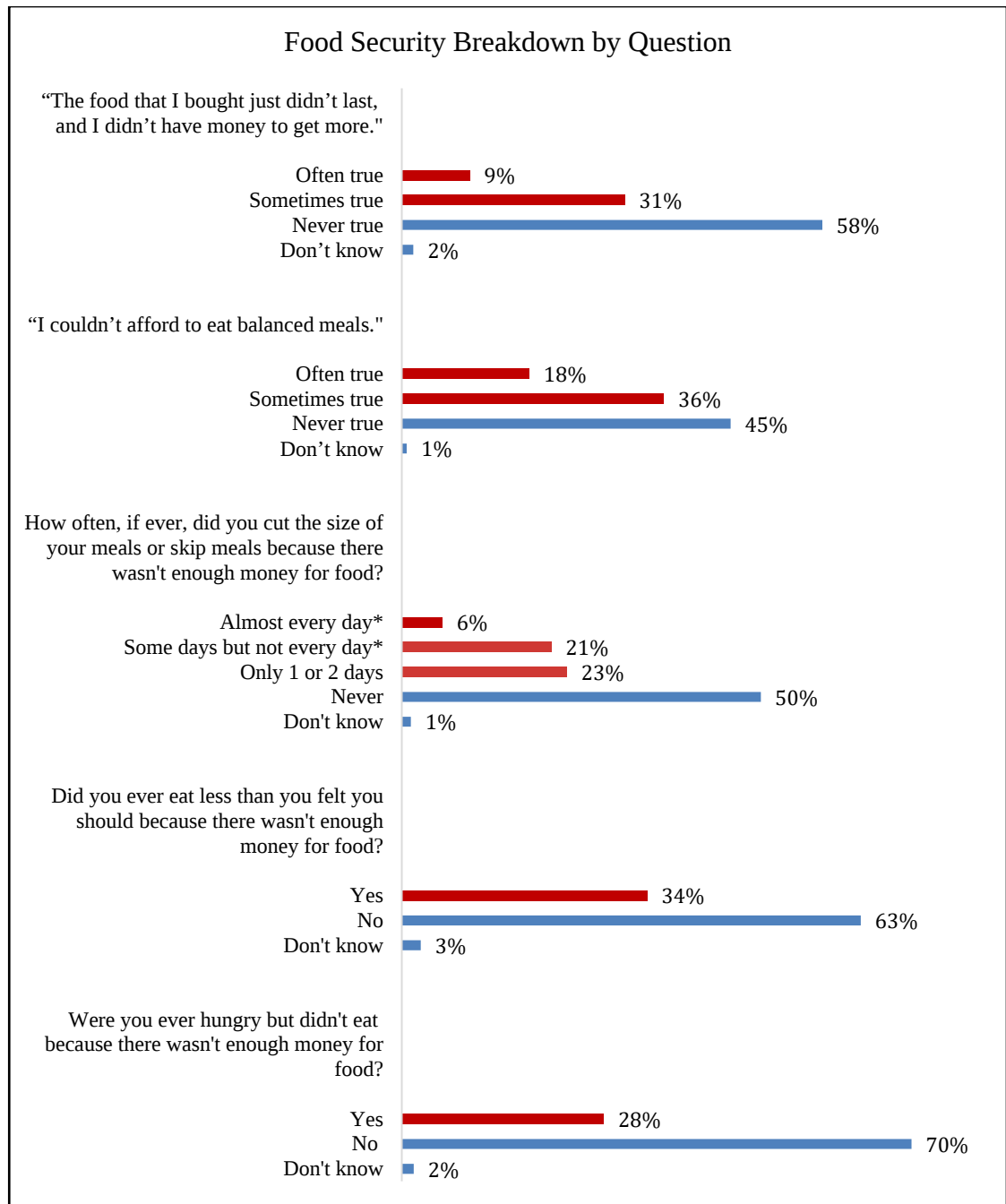


Figure 2: Breakdown of food security question responses

This table displays the breakdown of the five USDA food security question responses. All participants were asked to recall information from the last 30 days (see Appendix C). Responses with a blue bar are a negative response, and were coded as 0. Responses with a red bar are an affirmative response, and were coded as 1, except the two responses with an asterisk (*) count as two affirmative responses and were coded as 2.

Demographic Correlates of Food Insecurity

The study observed no statistically significant correlation between food insecurity and gender, type of living arrangement, employment status, or geographic origin ($p = 0.05$). Race and ethnicity, degree level, first-generation status, financial aid received aside from parental support and the “other type of aid” category, nontraditional status, all food assistance methods aside from growing one’s own food, grocery shopping transportation method, and LGBTQ status had a statistically significant correlation with food insecurity when measured with the Pearson’s Chi-squared statistical test (see Table 6).

Variable	% food insecure	Chi-square p value	Variable	% food insecure	Chi-square p value	Variable	% food insecure	Chi-square p value
Gender (n = 1,236)			Highest parental degree (n = 1,221)			Food assistance (n = 1,236)		
Female	53%	0.65	High school or less	62%	<0.01	Government assistance	73%	<0.01
Male	51%	0.65	Some college	61%	0.07	Student Food Pantry	73%	<0.01
			Bachelor's degree	50%	0.32	Other food pantry	81%	0.01
			Graduate degree	47%	0.02	Grows own food	53%	0.86
Race and ethnicity (n = 1,236)			Financial aid type (n = 1,236)			Events with food	66%	<0.01
Asian	43%	0.01	Merit-based scholarship	47%	0.01	None	38%	<0.01
Black or African American	90%	0.03	Need-based scholarship	60%	0.02			
Hispanic or Latinx	66%	<0.01	Pell grant	62%	0.00	Geographic Origin (n = 1,236)		
White	47%	<0.01	Government loan	63%	<0.01	In-state	52%	0.94
Two or more races	57%	0.49	Private loan	71%	<0.01	Out-of-state	49%	0.16
Nonresident	61%	0.10	Work Study	62%	0.01	International	61%	0.10
Unknown or other	65%	0.44	Parental support	53%	0.73			
Degree level (n = 1,236)			Other	48%	0.38	Main grocery shopping transportation method (n = 1,236)		
Graduate	33%	<0.01	None	40%	0.08	Walking	60%	<0.01
Undergraduate	55%	<0.01				Biking	41%	0.08
Living arrangement (n = 1,236)			Employment (n = 1,236)			Driving	52%	0.03
Residence Halls	55%	0.30	Employed	50%	0.19	Public transportation	69%	<0.01
University Housing	60%	0.30	Unemployed	54%	0.19	Does not grocery shop	33%	<0.01
Cooperative living	54%	0.77						
Off campus with roommates	50%	0.09	Nontraditional status (n = 1,236)			LGBTQ status (n = 1,234)		
Off campus with family	64%	0.37	Traditional	49%	<0.01	LGBTQ	51%	0.07
Homeless	100%	0.34	Nontraditional	62%	<0.01	non-LGBTQ	59%	0.07

Table 6: Descriptive statistics of food insecurity percentages by variable

Table 6 provides the weighted percentage of food insecurity observed in each demographic. The Chi-square p values are derived from performing a Chi-square analysis of food insecurity (0 or 1) and the individual variable (0 or 1, or for example: Asian vs. not Asian, or receives Pell Grant vs. does not receive Pell Grant).

A multivariate logistic regression explaining food insecurity was performed including the following right-hand side variables: race and ethnicity, gender, degree level, first-generation and nontraditional student status, and LGBTQ status. Logistic regression is similar to linear regression, except that the former is used when the outcome is dichotomous, such as in the case of examining the binary dependent variable such as food insecurity. Furthermore, using a multivariate logistic regression allows for the consideration of the effect that multiple independent factors have on a dependent variable holding all other independent variables constant. This is important because

independent variables can be correlated, making it difficult to determine which variable is in fact significantly affecting the outcome, and by how much. For example, let's say that first-generation students generally tend to also be lower income students. A multivariate logistic regression will separately identify the independent effects of these two variables on the dependent variable of interest.

The regression results indicate that, controlling for all other included variables, black students are 40% more likely and Hispanic/Latinx students are 16% more likely to experience food insecurity than white students. International students are 14% more likely, first-generation students are 9% more likely, LGBTQ students are 9% more likely, and undergraduate students are 19% more likely to experience food insecurity compared to students without those characteristics. These effects are derived as the linear probability coefficients approximations (estimated at the sample means). (see Table 7). While the overall food insecurity rate of this study may be overestimated due to response and measurement bias (further discussed in Conclusion section), these differentials are less likely to be affected by bias.

Variable	Without Financial Aid Variables			With Financial Aid Variables		
	Beta	Beta-LP	p value	Beta	Beta-LP	p value
Black or African American	2.356591	0.399860	0.06	2.039347	0.373020	0.10
Hispanic or Latinx	0.673219	0.159940	<0.01	0.585247	0.140488	0.02
Nonresident	0.602453	0.144338	0.03	0.720272	0.170099	0.01
First generation	0.366888	0.089928	0.02	0.204618	0.050696	0.22
LGBTQ	0.382382	0.093609	0.04	0.331019	0.081358	0.08
Undergraduate	0.800877	0.187081	<0.01	0.864014	0.199995	<0.01
Merit-based aid				-0.316741	-0.078895	0.03
Need-based aid*				0.195945	0.048569	0.24
Loans				0.628360	0.150094	<0.01
Parental aid				0.103964	0.025875	0.54
No aid				-0.318569	-0.079345	0.37

Table 7: Relationships between food insecurity and demographic variables

Multivariate logistic regression examining the effect certain variables have on food insecurity.²

*Need-based aid included need-based grants and scholarships, Pell Grants, and work study.

The survey did not ask students to provide income estimates, so the most accurate income level indication in this instance is financial aid receipt. As seen in Table 7, when financial aid receipt is included in the regression, the first-generation student variable loses its statistical significance, indicating that the variable may be a suitable proxy for low-income. So, even when controlling for income, Hispanic/Latinx, nonresident, and undergraduate students are more likely to experience food insecurity than their counterparts.

² For binary independent variables, β_{LP} is calculated from the logistic regression coefficient using the following equation:

$$\beta_{LP} = \left[\frac{1}{1 + \frac{(1-P)}{P} \text{EXP}(-\beta_L)} \right] - P$$

Perceived Barriers to Accessing Healthy Foods

Students were asked to identify which factors prevent them from eating healthy, balanced, and nutritious meals (see Figure 3). Cost, a lack of time to shop for healthy food, a lack of affordable and healthy dining hall meal options, and a lack of accessible, affordable grocery stores were reported as significant barriers to food insecure students' ability to eat healthy meals.

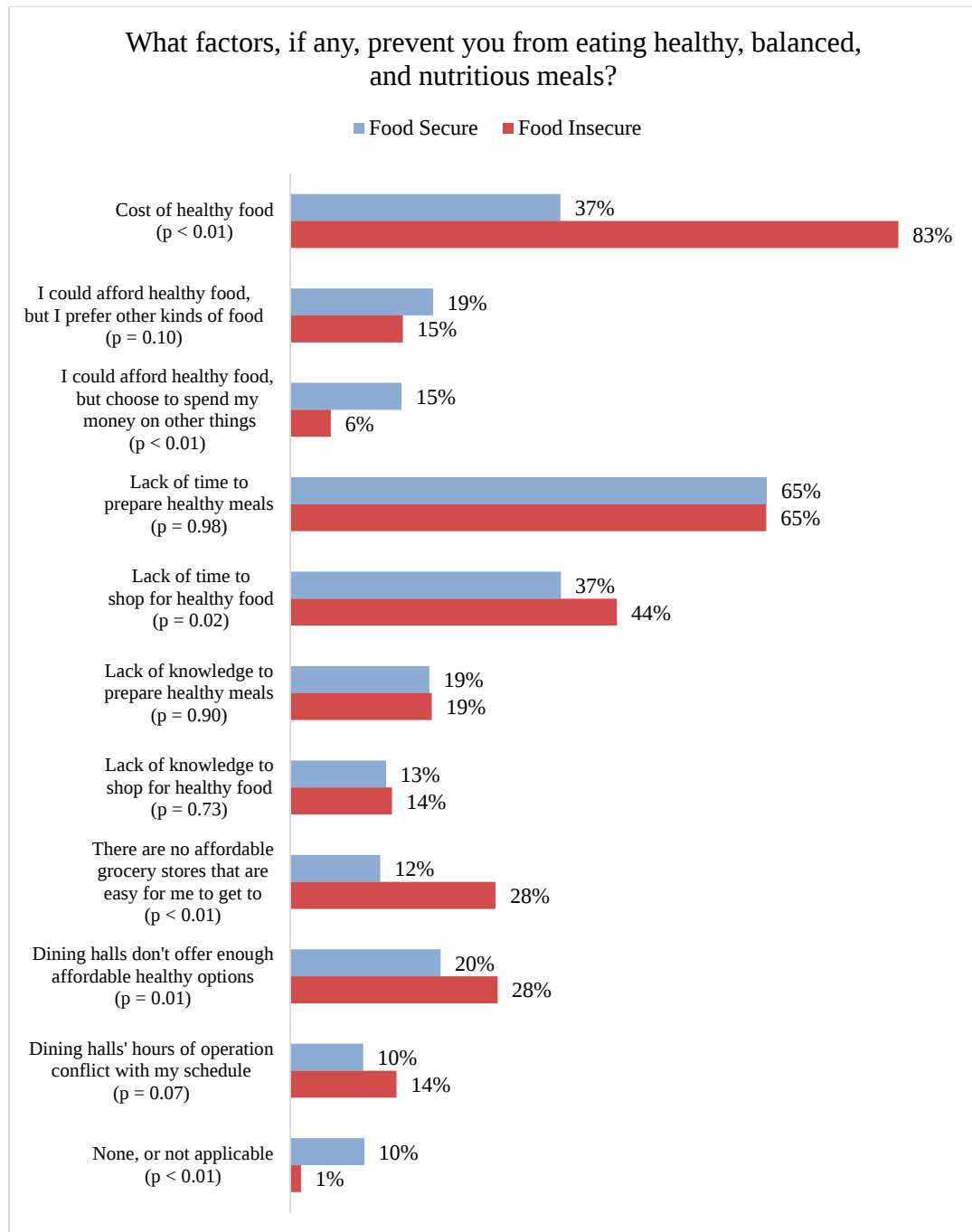


Figure 3: Percent of food secure and insecure students who identified certain barriers they face to eating healthy meals

The significance of the difference in percentages between food secure and insecure students reported barriers they face to eating healthy meals are measured by Chi-square tests.

Association with Academic Performance

Overall, 46% of students declared that problems accessing or getting enough food has had an impact on their education. When examining the breakdown of food secure versus food insecure students who declared problems accessing or getting enough food has had an impact on their education, 23% of food secure students reported it had negatively impacted their education in some form, whereas 68% of food insecure students reported that problems accessing or getting enough food has had some sort of impact on their education. The association between food insecurity and reporting that it impairs academic success was significant ($p < 0.01$).

Participants were then asked to identify specific impacts that problems getting enough food had on their education (see Figure 4). 18% of food insecure students reported that problems getting enough food caused them to miss a class, 13% missed a study session, 11% missed a club meeting, 22% opted to not join an extracurricular activity, 18% did not buy a required textbook, 5% had to drop a class, 6% were put at risk of not graduating in four years, and 38% reported not performing as well as they could have due to problems accessing food.

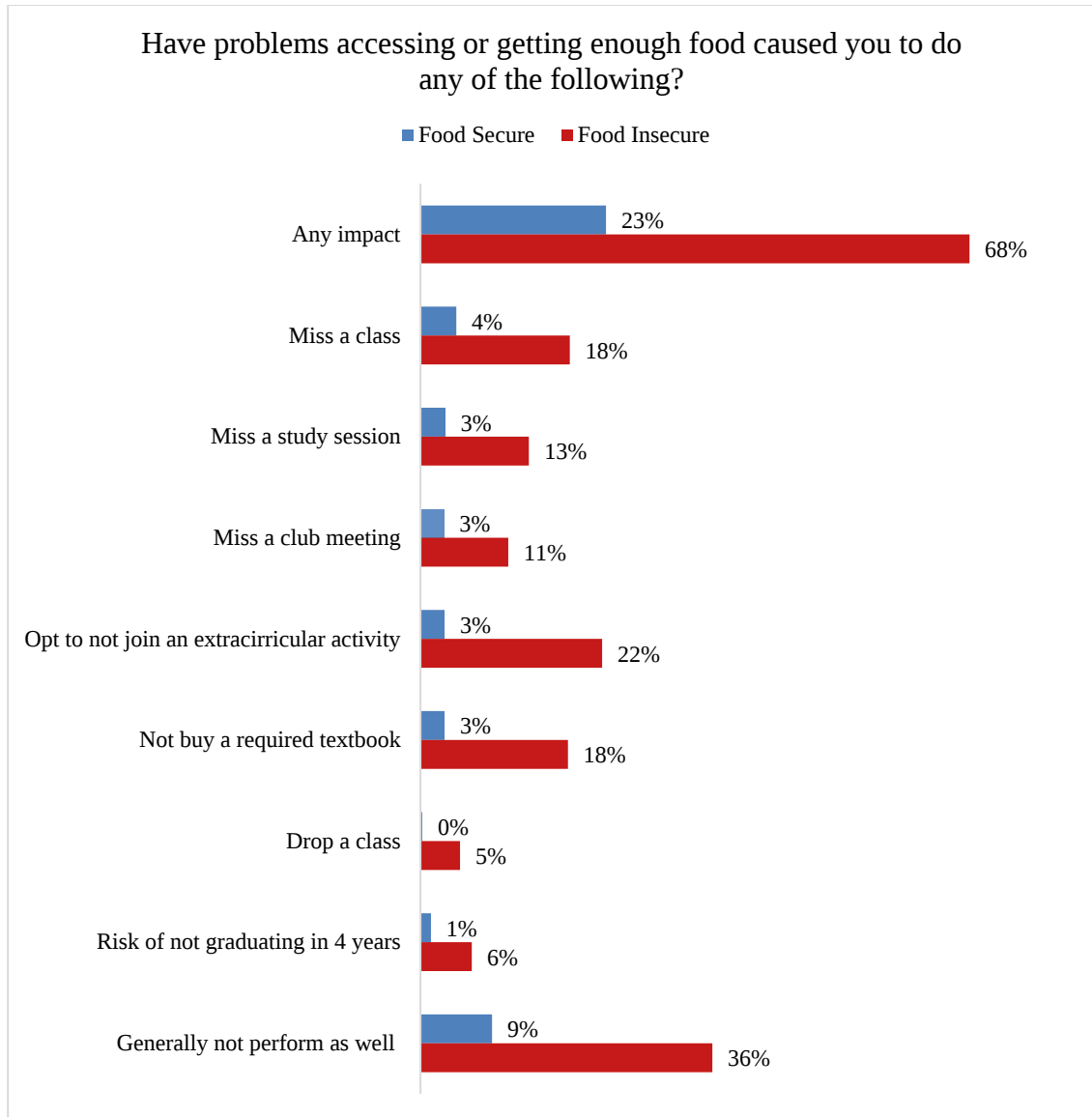


Figure 4: The specific perceived impacts on education caused by problems accessing or getting enough food

Descriptive statistics of the perceived academic impacts students reported experiencing due to problems accessing food broken down by food insecurity status ($n = 1,236$). Students could select all that apply.

Students had the option of writing in their own responses in the “other” category. “Other” responses ($n = 31$) generally included: increased stress, depression, or anxiety that made it hard to perform well academically ($n = 6$); not perform as well in athletics as they otherwise could have ($n = 1$); decreased physical health that made it difficult to perform well academically ($n = 4$); working more hours to make enough money for food that impacted students’ ability to perform well academically ($n = 3$).

These “other” responses reveal limited qualitative data regarding the impact of food insecurity on academic performance. One student wrote: “I prioritize school over food. So [sic] it's the other way around. I'd rather spend money on a required textbook and starve.” Another wrote: “[h]unger causes stress, anxiety, and moodiness that effect social interactions. This can making [sic] networking more difficult.” Another student noted: “[t]hese things were even harder when I was an undergrad. I rarely bought books, and I frequently waited for people to leave supplies in classrooms so I could use their project supplies.” One student reported that trouble accessing food “has left [them] depressed and anxious in worrying about family not getting sufficient to eat [sic].” Other responses included: “I work full time so I miss out on a lot;” “[g]o to sleep hungry. This happened two years ago;” and, “it has made it so I cannot focus in class for sure.” The need for more qualitative research regarding student food insecurity and its impact on academic performance is discussed in the sections to follow.

A multivariate logistic regression was performed to explore the effect food insecurity has on academic performance. After controlling for race/ethnicity, gender, degree type, and nontraditional, first-generation, and LGBTQ status, food insecure students were: 31% more likely than food secure students to report missing a class due

to problems accessing food; 31% more likely to miss a study session; 29% more likely to miss a club meeting; 39% more likely to opt to not join an extracurricular activity; 35% more likely to not buy a required textbook; 41% more likely to drop a class; 26% more likely to be put at risk of not graduating in four years; and 33% more likely to not perform as well as they otherwise may have. All results were statistically significant ($p < 0.01$) (see Table 8). Overall, food insecure students were 36% more likely than food secure students to indicate that problems accessing enough food had some kind of impact on their education ($p < 0.01$).

Variable ($n = 1,219$)	β_L	β_{LP}	p value
Any impact	1.923545	0.361405	<0.01
Miss a class	1.532546	0.313948	<0.01
Miss a study session	1.484586	0.307187	<0.01
Miss a club meeting	1.351568	0.287303	<0.01
Opt to not join an extracurricular activity	2.262081	0.392578	<0.01
Not buy a required textbook	1.857249	0.354278	<0.01
Drop a class ³	2.524237	0.411434	<0.01
Risk of not graduating in 4 years	1.167136	0.256933	0.019
Generally not perform as well	1.685325	0.334081	<0.01

Table 8: Coefficients of how food insecurity effects academic performance

Food insecurity's Beta-L and Beta-LP coefficients regarding variables measuring impacts on academic performance. This regression controlled for variables: gender, race/ethnicity, nontraditional, first-generation, LGBTQ, and degree level. When financial aid variables were included in the regression, the coefficients were virtually unchanged.

³The regression for "drop a class" omitted black students and degree level from the equation, because both variables predicted success perfectly (i.e., no black or graduate students selected this outcome). For this regression, $n = 1,017$.

Two statistical tests were also performed to examine the effects of food insecurity on student self-reported GPA ($n = 1,128$): a t -test and multivariate linear regression were run with GPA as a continuous dependent variable. Both tests suggest that food insecurity negatively affects GPA at a statistically significant level ($p < 0.01$).

The two-sample t -test was performed to examine if there was a statistically significant difference between the mean GPA of food insecure students and food secure students. The test found the mean reported GPA of food secure students to be 3.56, and the mean GPA of food insecure students to be 3.39. The difference between the two means, 0.17, was significant ($p < 0.01$).

According to literature in this area, a number of other socioeconomic variables are also strongly correlated with academic underperformance in addition to food insecurity (Gordon et al., 2016; Lacour et al., 2011). To account for this, a multivariate linear regression was performed to explore the effect food insecurity has on GPA while holding socioeconomic variables constant (see Table 9).

Variable (<i>n</i> = 1,111)	<i>Without Financial Aid Variables</i>		<i>With Financial Aid Variables</i>	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Food insecurity	-0.092347	<0.01	-0.066975	0.03
Asian	-0.088614	0.12	-0.065620	0.23
Black or African American	0.230110	0.37	0.414290	0.13
Hispanic or Latinx	-0.093056	0.07	-0.054230	0.28
Nonresident	-0.021989	0.74	0.020986	0.75
Two or more races	-0.036136	0.65	-0.038454	0.61
Unknown or other	-0.038776	0.78	-0.010598	0.94
Female	0.027199	0.39	0.015844	0.61
Nontraditional	-0.062620	0.17	0.002364	0.96
First generation	-0.150630	<0.01	-0.105604	<0.01
LGBTQ	0.051605	0.19	0.051707	0.18
Undergraduate	-0.290892	<0.01	-0.348551	<0.01
Merit-based aid			0.241728	<0.01
Need-based aid*			-0.021903	0.53
Loans			-0.086808	<0.01
Parental aid			0.013014	0.71
Constant	3.821296	<0.01	3.741850	<0.01

Table 9: Relationship between GPA and food insecurity

Multivariate logistic regression examining the effect food insecurity has on GPA, holding all displayed variables constant. *Need-based aid included need-based grants and scholarships, Pell Grants, and work study.

When controlling for race/ethnicity, gender, degree type, nontraditional, first-generation, and LGBTQ status, food insecurity was still negatively associated with a 0.09-point decrease in GPA ($p < 0.01$). When financial aid variables were added to the equation, food insecurity still causes a 0.07-point reduction in GPA.

Discussion

Discussion of Results

This study contributes to the growing body of literature regarding student food insecurity, and supports the notion that food insecurity on college campuses exists at a rate well above the national one.

The overall 52% food insecurity rate among UO students falls within the range of rates identified in similar peer-reviewed studies (14-59%). In accordance with past studies, there was no statistically significant difference in food insecurity rates between males and females at the UO. The higher rates of food insecurity observed among first-generation, black, and Hispanic students are also consistent with previous studies. To the researcher's knowledge, no other college student-focused studies consider food insecurity rates among LGBTQ students. The higher rates of food insecurity observed in this study among LGBTQ-identifying students follows trends of national studies, however (Brown, Romero & Gates, 2016).

An unexpected finding of this study was the sizeable percentage of students that were not classified as food insecure by the FSSM, but still reported experiencing barriers to eating healthy meals or reported that problems accessing food had negatively impacted their education. This suggests that students may have poor nutritional status as a result of non-economic factors, such as time, knowledge, and cultural barriers. These students' food access issues, because they are not a result of economics situations, are not captured by the USDA model but are still of concern: poor nutritional status among students—due to economic or non-economic reasons—may negatively impact health

and academic success. Future qualitative data may be helpful to better understand the complex contributing factors to student food access in general.

Study Limitations and Biases

The data suggests that significant student food insecurity exists at the University of Oregon. However, the degree to which the results are accurate requires a level of scrutiny that previous studies of this nature as a whole do not adequately address, most specifically in terms of measurement biases. This section discusses the study's limitations and potential sources of bias, and explores the extent to which they may have impacted my results.

Overall, this study is limited because the cross-sectional nature of it can only explore correlations and associations, not causal relationships. Another limitation is that student income and expenditures are not assessed in this study, although financial aid receipt and first-generation student status may serve as adequate proxies for students' financial situations.

The study at hand is likely affected by both selection and measurement biases. Selection biases in this study include: the absence of random sampling, nonresponse bias, voluntary response bias, and sample under- and over-coverage bias. Measurement bias includes the disputed ability of the USDA food security module to accurately depict food security levels, especially when applied to populations experiencing unique economic situations such as college students.

Selection Biases

This study sample was not random. Random sampling means that the selection of sample unit is based entirely on chance and every element of the population has a

known, non-zero probability of being selected. Due to a lack of resources available to me as a student—i.e., not having direct access to a comprehensive student listserv—the most effective way to distribute the survey to as many students as possible was by asking other entities with access to student listservs to distribute the survey link on my behalf. This eliminated the possibility of obtaining a random sample.

The absence of random sampling in this study gives way to another possible source of bias: voluntary response bias, or self-selection bias. The study's recruitment materials were presented in a way that made it obvious that exploring student food access and insecurity were the goals of the study. Students voluntarily took the survey (as required by IRB regulations), so it is possible that students experiencing food insecurity were more apt to participate in the study, especially since the study's content was obvious. This may have resulted in an overestimation of food insecurity prevalence.

This possible source of overestimation is observed in the study performed by the UC system. The study employed two FSSM surveys: one was solely inquiring into student food insecurity, while the other had the same questions embedded in a survey about student health at large. The food insecurity prevalence in the former was 45%, but 38% in the latter, a statistically significant difference in results ($p < 0.01$). This may reveal that a possible sample bias occurred due to the fact food insecure students would be more apt to participate in a survey advertised as such, whereas a survey about general student health would attract a less biased sample.

The logical inverse of this possible self-selection bias is that of food secure students may have opted to not participate in my research because they do not see it as pertaining to them: nonresponse bias. Another form of nonresponse bias that may have

affected study results is that students experiencing food insecurity and economic hardship may have less time or ability to participate in my survey. I attempted to bypass this by offering a monetary incentive to taking my survey, but perhaps some students in economic crisis did not have the means to even open the email containing my survey link. This form of nonresponse bias would have resulted in an underestimation of the food insecurity rate.

This study is also limited by its low response rate of 7%. As observed in Tables 1-4, studies that disseminated surveys in-class produced the highest response rates and the lowest food insecurity rates. In contrast, studies that disseminated their surveys via email or utilized in-person recruitment methods such as tabling generally produced lower response rates and higher student food insecurity rates, most likely because these latter forms were more vulnerable to self-selection bias. This observation suggests that student food insecurity rates may be significantly affected by dissemination method and response rate. If true, this study's low response rate and dissemination method would have contributed to an overestimation of student food insecurity.

I speculate that the 52% student food insecurity rate this study presents is overestimated due to the discussed forms response bias. However, regardless of overestimation, the demographic correlates of food insecurity and its effect on academic performance likely hold true and are unaffected by response bias.

Measurement Biases

The USDA FSSM and its subsets are the standard when measuring the general population's food security levels, and using these measurements for all food security-related research is beneficial because it creates a field of comparable results. However,

college students exist in a unique financial situation that may render the USDA's modules unfit to accurately measure this population. College students as a whole receive several sources of income that the general population may not: student loans, grants and scholarships, and parental financial aid. However, they also must pay significant tuition costs, and the academic demands of being a student may limit their working ability. Students' unique and complex financial situations may make it difficult to assess food insecurity levels.

Another important consideration is college students' ability to accurately assess their economic situation. From my own experience as an undergraduate student at the University of Oregon, I have on various occasions witnessed my peers express that they are "broke," even though they had previously told me that their parents pay their tuition, rent, and either a partial amount or the full amount of their grocery bill. Overestimation of financial constraint may be the social norm.

Students' self-reported economic barriers to accessing food may also be inflated due to the fact that the practice of budgeting may be a new concept to them. College is many students' first time experiencing either partial or full financial independence, a transition that may cause some to overestimate their poverty level considering that for some, all bills (including grocery bills) had been paid for by parents or legal guardians beforehand.

This possible source of measurement bias may be most apparent when considering that 55% of students living in residence halls, and thus enrolled in a mandatory meal plan, were identified as being food insecure. I speculate that some students are forced to enroll in a more restrictive meal plan due to finances and may be

skipping or cutting the size of their meals to make their point allowance last them through the week. That being said, as someone who lived in these residence halls and had a meal plan, I am skeptical that over half of students enrolled in a meal plan are truly food insecure.

I assume that for some students, the transition from having food readily available and free when living with parents to independently budgeting weekly meal plan points in the residence halls may cause them to feel food insecure relative to the food situation they were accustomed to at home. Furthermore, college may be some students' first experience budgeting their own food costs. They may possess poor budgeting skills, causing them to cite not having enough money to buy food. However, abiding to a budget does not constitute food insecurity.

This specific example, as well as general observations I have made as an "in-group" member of the study population, cause me to wonder if perhaps some students may exaggerate their financial situation, thus inflating the overall food insecurity rate. In this instance, qualitative research would be useful to determine to what extent the USDA FSSM accurately reflects students' economic situations and food insecurity levels. Overall, however, I surmise that response bias would contribute to an overestimation of this study's food insecurity rate more so than measurement bias.

Recommendations for Future Research

For future studies, I recommend gathering more specific financial data from students to better illustrate how economic situations relate to food insecurity. Examining this relationship closely is important considering how college students exist in a unique economic situation compared to the average adult population: students must

pay tuition and have limited incomes, but also have access to loans, grants, scholarships, parental aid. Capturing data pertaining to housing insecurity would also help us better understand students' financial situations. I also recommend including survey questions regarding the effect food insecurity has on mental and physical health in college student populations.

I believe future studies of this nature would benefit from supplemental qualitative research. As discussed, I speculate that the combination of factors inhibiting college students from consuming the foods they need to be healthy and successful is more complex than just economics. Qualitative data would help us better understand the major barriers of student success, monetary and otherwise.

To obtain a less biased survey sample, I recommend administering food insecurity surveys as supplements to more general health or student wellness surveys. Ideally, universities would administer a mandatory annual survey regarding the student experience in general and include a section assessing food insecurity. When administering mandatory, campus-wide surveys is possible, the next best way to maximize response rate and thus study accuracy would be to administer the survey in classes as opposed to inviting students to participate via email. Implementing longitudinal studies would also be beneficial to understanding student food insecurity, and help identify what causal relationships may exist.

Conclusion

This study's results indicate that food insecurity is prevalent among students at the University of Oregon at a rate substantially greater than the national, state, and county average (52% compared to 12.7%, 16.1%, and 16.5%, respectively). Literature suggests that experiencing food insecurity may adversely affect students' wellbeing in terms of mental and physical health and academic performance; this study's findings support the previously-identified negative correlation between food insecurity and academic success, but do not lend further insight into how food insecurity is correlated with health.

This study offers new information regarding student food insecurity, as well as additional insight into how this issue may be associated with academic success. The results support previous claims that black, Hispanic, first-generation, and undergraduate students experience food insecurity at rates higher than their peer counterparts, and that food insecurity is negatively correlated with academic success. Expanding on past research parameters, this study's results introduce how international and LGBTQ students may be at greater risk of experiencing food insecurity.

To what extent the results of the present study are accurate is subject to both response and measurement biases and requires further investigation. However, even if the general food insecurity rate may be overestimated, the demographic correlates of food insecurity are likely unaffected by response bias. Qualitative data as a supplement to this study may provide more comprehensive insight into the student food insecurity situation at the University of Oregon, as well as insight into whether the USDA Adult

FSSM is a valid measure of food insecurity when applied to a college student population considering college students' unique economic situation.

This study gathered a key piece of information that was not analyzed due to my general capacity limitations and time constraints: students' addresses. As discussed, 28% of food insecure students cited a lack of physical proximity to affordable grocery stores as a barrier to accessing healthy foods, and thus location may be another factor influencing food insecurity. Conducting a spatial analysis examining the association of student housing location and food insecurity level could reveal interesting information and is a subject I aim to explore in the future.

My survey collected other data that have not yet been analyzed: students' majors, commute time and main mode of transportation used to go grocery shopping, and coping mechanisms students use to address food insecurity. I plan to publish my research in an academic journal in the near future, so I may investigate the correlation between these addition variables and food insecurity at a later point. I will also make my raw data available to any UO personnel who would like to analyze it.

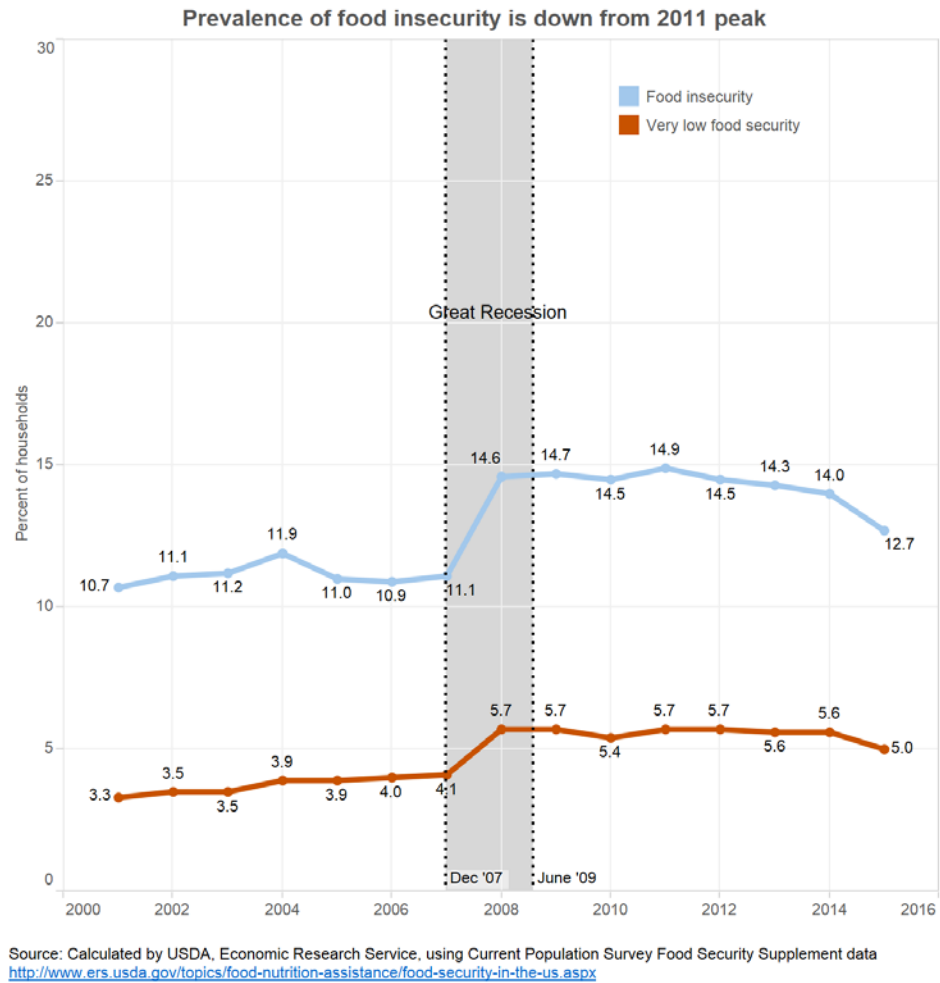
To my knowledge, this is the largest student food insecurity study conducted at a single university to date. Despite several limitations and potential sources of bias, this study offers unprecedented insight into the prevalence, correlates, and academic consequences of food insecurity at the UO.

Even if the overall food insecurity rate is overestimated due to the discussed forms of bias, this study illuminates that food insecurity does indeed exist on the UO campus; certain demographics more susceptible to experiencing it; and food insecurity significantly impacts academic performance. Accessing food must not be a limiting

factor to student success and wellbeing. It is my intention that this study will contribute to the understanding of food insecurity as a student issue, and be of use as we take strides to eradicate student food insecurity and thus assist students in reaching their full potential in school and beyond.

Appendices

Appendix A



(Coleman-Jenson et al., 2016)

Appendix B

The Core Food Security Module, consisting of eighteen questions (listed below), is designed to assess a household's food security level and examines the households' children's level of food security in addition to its adults. If a household does not have children present, only the first ten questions are administered. The Adult FSSM is a subset of the CFSM, using the first ten questions and is reworded to reflect individual experiences, not those of a household. The six-item Short Form FSSM is a subset of the Adult FSSM with the intention of being utilized when participant response burden should be minimized due to the nature of the study. The Short Form FSSM uses questions two through seven of the CFSM. The Youth FSSM is essentially the Adult FSSM, but the language is modified to be readable at a 12-year-old level.

USDA Core Food Security Module (CFSM)

1. "We worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?
2. "The food that we bought just didn't last and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?
3. "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?
4. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough money for food? (Yes/No)
5. (If yes to question 4) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (Yes/No)

7. In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (Yes/No)

8. In the last 12 months, did you lose weight because there wasn't enough money for food? (Yes/No)

9. In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

10. (If yes to question 9) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

(Questions 11-18 asked only if the household included children age 0-17)

11. "We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?

12. "We couldn't feed our children a balanced meal, because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?

13. "The children were not eating enough because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?

14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food? (Yes/No)

15. In the last 12 months, were the children ever hungry but you just couldn't afford more food? (Yes/No)

16. In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food? (Yes/No)

17. (If yes to question 16) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

18. In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

(Coleman-Jenson et al., 2016, p. 3)

Appendix C

UO Student Food Access Survey

You are invited to participate in a research study about student food access. First, please read the following statement of informed consent, which explains the survey and your rights as a study participant.

Statement of Informed Consent:

The purpose of this study is to explore the prevalence, correlates, and academic consequences of food access among University of Oregon students. You were selected as a possible participant because you are a student at the University of Oregon or are enrolled in the American English Institute. If you agree to participate in this study, you will be asked to complete a 5-10 minute online survey consisting of about 30 questions.

There are no reasonable foreseeable or expected risks of participating in this research. The benefit of participation is contributing to the growing field of literature surrounding student food access.

You may enter a drawing to receive the following reimbursement: a \$10 gift card to Whole Foods Market Eugene. 40 participants will be randomly drawn in March; with an expected sample size of 500-1,000 participants, the chance of winning a gift card is 4-8%.

Your answers to the survey will not be connected to your name, email address, or any other identifiable information. In any sort of report we may publish or raw data we may make available to other researchers, we will not include any information that will make it possible to identify a participant. Research records will be kept in a locked file. All electronic information will be coded and secured using a password protected file. Access to the records will be limited to the researchers; however, please note that regulatory agencies, the Institutional Review Board, and internal University of Oregon auditors may review the research records.

Your participation is voluntary. If you choose not to participate, it will not affect your current or future relations with the University. You are free to stop filling out the survey at any time, for whatever reason. Doing so will not jeopardize your grades nor risk loss of present or future faculty/school/University relationships.

The researcher conducting this study is Kiara Kashuba, an undergraduate student in the Department of Planning, Public Policy and Management and the Robert D. Clark Honors College. For questions or more information concerning this research you may contact her at kkashuba@uoregon.edu. Her faculty advisor is Dr. Laura Leete, who can be contacted at leete@uoregon.edu. If you have any questions about your rights as a research subject,

you may contact: Research Compliance Services, University of Oregon at (541) 346-2510 or ResearchCompliance@uoregon.edu

Your decision to continue with this survey indicates that you have read and understand the information provided above, that you willingly agree to participate, that you may withdraw your consent at any time and discontinue participation without penalty, that you have received the opportunity to print a copy of this form, and that you are not waiving any legal claims, rights, or remedies.

By clicking "I agree" below, you give your consent to participate in this research.

- ☐ I agree with the statement of informed consent and I would like to take the survey.
- ☐ I decline to participate.

Screener Question

In the last 30 days, were you enrolled as a University of Oregon student?
(Including AEI students)

- ☐ Yes
- ☐ No
- ☐ I was, but I had to withdraw from the term

Part A: Food Access

“The food that I bought just didn’t last, and I didn’t have money to get more.”

In the last 30 days, was that often, sometimes, or never true for you?

- ☐ Often true
- ☐ Sometimes true
- ☐ Never true
- ☐ Don't know

“I couldn’t afford to eat balanced meals.”

In the last 30 days, was that often, sometimes, or never true for you?

- ☐ Often true
- ☐ Sometimes true
- ☐ Never true
- ☐ Don't know

In the last 30 days, how often, if ever, did you cut the size of your meals or skip meals because there wasn't enough money for food?

- ☐ Almost every day
- ☐ Some days but not every day
- ☐ Only 1 or 2 days
- ☐ Never
- ☐ Don't know

In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money for food?

- ☐ Yes
- ☐ No
- ☐ Don't know

In the last 30 days, were you ever hungry but didn't eat because there wasn't enough money for food?

- ☐ Yes
- ☐ No
- ☐ Don't know

What factors, if any, prevent you from eating healthy, balanced, and nutritious meals?
Check all that apply.

- ☐ Cost of healthy food
- ☐ I could afford healthy food, but choose to spend my money on other things
- ☐ I could afford healthy food, but I prefer other kinds of food
- ☐ Lack of knowledge to prepare healthy meals
- ☐ Lack of time to prepare healthy meals
- ☐ Lack of knowledge to shop for healthy food
- ☐ Lack of time to shop for healthy food
- ☐ There are no affordable grocery stores that are easy for me to get to
- ☐ Dining halls don't offer enough affordable healthy options
- ☐ Dining halls' hours of operation conflict with my schedule
- ☐ Other: _____
- ☐ None, or not applicable

What is your main mode of transportation when you go grocery shopping?

- ☐ Walking
- ☐ Biking
- ☐ Driving
- ☐ Public transportation
- ☐ Other: _____
- ☐ Not applicable, I do not go grocery shopping

What is your one-way commute time (in minutes) when you go grocery shopping?

Please enter the closest cross streets of where you live as a UO student (e.g. “15th and Mill”). *This data is confidential and will be used to assess students' physical proximity to grocery stores. If you do not wish to answer, leave blank.*

Part B: Food Assistance Methods

Which of the following, if any, do you use to address limited food access? *Check all that apply.*

- ☐ Government assistance, such as WIC or SNAP benefits (Food Stamps, EBT, or Oregon Trail Card)
- ☐ Student Food Pantry on E. 19th Avenue
- ☐ Other food pantry or food bank
- ☐ Grow own food (such as in your own garden or Urban Farm class)
- ☐ Attend events offering free food
- ☐ Other: _____
- ☐ None, or not applicable

Part C: Impacts on Education

In your opinion, do you feel that problems accessing or getting enough food have had an impact on your education?

- ☐ Yes
- ☐ No

Have problems accessing or getting enough food caused you to do any of the following?
Check all that apply.

- ☐ Miss a class
- ☐ Miss a study session
- ☐ Miss a club meeting
- ☐ Opt not to join an extracurricular activity
- ☐ Not buy a required textbook
- ☐ Drop a class
- ☐ Put you at risk of not graduating in four years
- ☐ Not perform as well in your academics as you otherwise could have
- ☐ Other: _____
- ☐ None

What is your most recent cumulative GPA? *If unsure, please provide an estimate.*

Part D: Demographics

What is your major? *Please enter in code form, e.g. "ENVS" for Environmental Studies, "HPHY" for Human Physiology, "EC" for Economics, etc.*

- ☐ Major code: _____
- ☐ Second major code (if applicable): _____
- ☐ I am undeclared

What is your gender identity?

- ☐ Female
- ☐ Male
- ☐ Prefer to self-describe: _____

Do you identify as part of the LGBTQA3+ community?

- ☐ Yes
- ☐ No

What is your racial or ethnic identification? *Check all that apply.*

- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Black or African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White
- ☐ Other, or prefer to self-describe: _____

What is your geographic origin?

- ☐ In-state
- ☐ Out-of-state
- ☐ International, from: _____

What is your academic class standing?

- ☐ Freshman or 1st year student
- ☐ Sophomore or 2nd year student
- ☐ Junior or 3rd year student
- ☐ Senior or 4th year student
- ☐ 5th year student or beyond
- ☐ Graduate student

What is your academic enrollment status?

- ☐ Full-time
- ☐ Part-time

Select all of the following statements that apply to you. *This is to determine if you are a nontraditional student. If none of the following statements apply to you, select "None of the above statements apply to me."*

- ☐ I was over the age of 24 at the time I began working toward my first bachelor's degree
- ☐ I am married, divorced, or in a domestic partnership
- ☐ I work full-time
- ☐ I have children and/or family members to support
- ☐ I am returning to or starting college after a break
- ☐ I am a veteran of the armed forces
- ☐ I have independent financial status
- ☐ I have transfer admission status
- ☐ None of the above statements apply to me

What is your age?

What is the highest level of education completed by either of your parents or legal guardians?

- ☐ High School or less
- ☐ Associate's Degree
- ☐ Bachelor's Degree
- ☐ Graduate Degree or higher
- ☐ Don't know

Which of the following financial aid do you receive to help pay tuition/living expenses?
Check all that apply.

- ☐ Aid from parents/relatives
- ☐ Pell Grant
- ☐ A merit-based grant or scholarship
- ☐ A need-based grant or scholarship
- ☐ Government loan (e.g. Stafford, Perkins, etc.)
- ☐ Private loan (e.g. bank)
- ☐ Work-study
- ☐ Other: _____
- ☐ None

In the last 30 days, what was your living situation? *Check all that apply.*

- ☐ On-campus university housing with meal plan (residence halls)
- ☐ University housing without meal plan (e.g. Spencer View, Graduate Village, etc.)
- ☐ Cooperative living situation (e.g. sorority or fraternity chapter house, Campbell Club, the Lorax, etc.)
- ☐ Off-campus, alone or with roommates
- ☐ Off campus, with parents, relatives, or legal guardians
- ☐ Homeless (includes residing in a shelter, automobile, abandoned building, friend's couch, other place not meant for regular, long-term housing, etc.)
- ☐ Other: _____

In the last 30 days, were you employed?

- ☐ Yes
- ☐ No

(If "Yes" was selected in previous question)

On average, how many hours per week did you work?

Gift Card Drawing

Do you wish to participate in a drawing to receive a \$10 gift card to Whole Foods Market Eugene?

- ☐ Yes
- ☐ No

(If "Yes" was selected in previous question)

Please enter your name and email address to be included in a drawing for a \$10 gift card to Whole Foods Market Eugene.

This information will not be associated with the previous data you provided.

Gift card recipients will be notified via email in late March.

First Name: _____

Last Name: _____

Email: _____

Bibliography

- Alaimo, K. (2005). Food Insecurity in the United States: An Overview. *Topics in Clinical Nutrition*, 20(4), 281-298.
- Alaimo, K., Olson, C., & Frongillo, E. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. *Pediatrics*, 108(1), 44-53.
- Alajmi, T. (2016, September 9). *Paradox of the Traditional Student: An Examination of the Damaging Misconceptions of the Traditional College Student*. Speech presented at Food Insecurity in Higher Education in Portland State University, Portland.
- Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease*, 6(3), A105.
- Blumberg, S., Bialostosky, K., Hamilton, W., & Briefel, R. (1999). The effectiveness of a short form of the household food security scale. *American Journal of Public Health*, 89(8), 1231-4.
- Bruening, Brennhof, Van Woerden, Todd, & Laska. (2016). Factors Related to the High Rates of Food Insecurity among Diverse, Urban College Freshmen. *Journal of the Academy of Nutrition and Dietetics*, 116(9), 1450-1457.
- Byrd-Bredbenner, C. (2004). Food Preparation Knowledge and Attitudes of Young Adults: Implications for Nutrition Practice. *Topics in Clinical Nutrition*, 19(2), 154-163.
- Cady, Clare L. (2014). Food Insecurity as a Student Issue. *Journal of College and Character*, 15(4), 265-271.
- Cafiero, C., Melgar-Quinonez, H., Ballard, T., & Kepple, A. (2014). Validity and reliability of food security measures. *Annals of the New York Academy of Sciences*, 1331(1), 230-248.
- Carnevale, A., Smith, N., & Strohl, J. (2013). *Recovery: Projections of Jobs and Education Requirements Through 2020*. Washington D.C.: Georgetown University Public Policy Institute.
- Chaparro, M. Pia, Sahar S. Zaghloul, Peter Holck, and Joannie Dobbs. "Food Insecurity Prevalence among College Students at the University of Hawai'i at Mānoa." *Public Health Nutrition* 12.11 (2009): 2097-103. Web.
- Crutchfield, R. (2016). *Serving Displaced and Food Insecure Students in the CSU*. Long Beach, CA: California State University.

- Dubick, J., Matthews, B., & Cady, C. (2016, October). Hunger on Campus: The Challenge of Food Insecurity for College Students. Retrieved October 16, 2016, from <http://www.cufba.org/>
- Dynarski, S. & Scott-Clayton, J. (2013). Financial Aid Policy: Lessons from Research. *The Future of Children* 23(1), 67-91. Princeton University. Retrieved April 18, 2017, from Project MUSE database.
- Eisenberg, D., Gollust, S., Golberstein, E., & Hefner, J. (2007). Prevalence and Correlates of Depression, Anxiety, and Suicidality Among University Students. *American Journal of Orthopsychiatry*, 77(4), 534-542.
- Espinoza, A. (2013). *Assessing Differences in Food Security Status Among College Students Enrolled at a Public California State University Campus* (Unpublished master's thesis). California State University, Fresno. Retrieved October 10, 2016, from Fresno State Digital Repository.
- Evans, B. (2016). Homeless and Hungry in College. *Change*, 48(1), 26-29.
- Farahbakhsh, J., Ball, G., Farmer, A., Maximova, K., Hanbazaza, M., & Willows, N. (2015). How do Student Clients of a University-based Food Bank Cope with Food Insecurity? *Canadian Journal of Dietetic Practice and Research: A Publication of Dietitians of Canada = Revue Canadienne De La Pratique Et De La Recherche En Di  t  tique: Une Publication Des Di  t  tistes Du Canada*, 76(4), 200-3.
- Farahbakhsh, J., Hanbazaza, M., Ball, G., Farmer, A., Maximova, K., & Willows, N. (2017). Food insecure student clients of a university-based food bank have compromised health, dietary intake and academic quality. *Nutrition & Dietetics*, 74(1), 67-73.
- Feeding America. (2015). Food Insecurity in Lane County. Retrieved April 20, 2017, from <http://map.feedingamerica.org/county/2014/overall/oregon/county/lane>
- Food Agriculture Organization of the United Nations. Commodity Policy Projections Service. Commodities Trade Division. (2003). *Trade reforms and food security: Conceptualizing the linkages*. Rome: Commodity Policy and Projections Service, Commodities and Trade Division, Food and Agriculture Organization of the United Nations.
- Food Empowerment Project. (2017). Food Deserts. Retrieved February 10, 2017, from <http://www.foodispower.org/food-deserts/>
- Freudenberg, N., Manzo, L., Jones, H., Kwan, A., Tsui, E., & Gagnon, M. (2011). Food Insecurity at CUNY: Results from a Survey of CUNY Undergraduate Students (Rep.). The Campaign for a Healthy CUNY.

- Fu, M., Cheng, L., Tu, S., & Pan, W. (2007). Association between unhealthful eating patterns and unfavorable overall school performance in children. *Journal of The American Dietetic Association*, 107(11), 1935-1943.
- Gaines, A., Robb, C., Knol, L., & Sickler, S. (2014). Examining the role of financial factors, resources and skills in predicting food security status among college students. *International Journal of Consumer Studies*, 38(4), 374-384.
- Gallegos, Danielle, Ramsey, Rebecca, & Ong, Kai Wen. (2014). Food Insecurity: Is It an Issue among Tertiary Students? *Higher Education: The International Journal of Higher Education and Educational Planning*, 67(5), 497-510.
- Goldrick-Rab, S., Anderson, Drew M, & Kinsley, Peter. (2016). *Paying the price: College costs, financial aid, and the betrayal of the American dream*. Chicago; London: The University of Chicago Press.
- Goldrick-Rab, S., Richardson, J., & Hernandez, A. (2017). Hungry and Homeless in College: Results from a National Study of Basic Needs Insecurity in Higher Education. Wisconsin HOPE Lab.
- Gordon, M., & Cui, M. (2016). The Intersection of Race and Community Poverty and Its Effects on Adolescents Academic Achievement. *Youth & Society*, Youth & Society, 04/27/2016.
- Gundersen, C., & Kreider, B. (2009). Bounding the effects of food insecurity on children's health outcomes. *Journal of Health Economics*, 28(5), 971-983.
- Gundersen, C., & Ziliak, J. (2015). Food Insecurity and Health Outcomes. *Health Affairs*, 34(11), 1830-1839.
- Gundersen, C., Engelhard, E., & Waxman, E. (2014). Map the Meal Gap. *Applied Economic Perspectives and Policy*, 36(3), 373-386.
- Gundersen, C., Kreider, B., & Pepper, J. (2011). The Economics of Food Insecurity in the United States. *Applied Economic Perspectives and Policy*, 33(3), 281-303.
- Hanbazaza, M., Ball, G., Farmer, A., Maximova, K., & Willows, N. (2016). Filling a Need: Sociodemographic and Educational Characteristics Among Student Clients of a University-Based Campus Food Bank. *Journal of Hunger & Environmental Nutrition*, 11(4), 569-577.
- Holt-Gimenez, E. (2012, May 02). We Already Grow Enough Food For 10 Billion People — and Still Can't End Hunger. *Huffington Post*. Retrieved April 20, 2017, from http://www.huffingtonpost.com/eric-holt-gimenez/world-hunger_b_1463429.html

- Hughes, R., Serebryanikova, I., Donaldson, K., & Leveritt, M. (2011). Student food insecurity: The skeleton in the university closet. *Nutrition & Dietetics*, 68(1), 27-32.
- Jones, A., Ngure, F., Peltó, G., & Young, S. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition (Bethesda, Md.)*, 4(5), 481-505.
- Kiener, R. (2013). Future of Public Universities. *CQ Researcher*, 23(3), 53-80.
- Kingkade, T. (2012, August 29). Pell Grants Cover Smallest Portion of College Costs in History as GOP Calls for Cuts. *Huffington Post*. Retrieved April 20, 2017, from http://www.huffingtonpost.com/2012/08/27/pell-grants-college-costs_n_1835081.html
- Kleinman, Murphy, Little, Pagano, Wehler, Regal, & Jellinek. (1998). Hunger in children in the United States: Potential behavioral and emotional correlates. *Pediatrics*, 101(1), E3.
- Krugman, P. (2012, March 12). Building A Caste Society. *The New York Times*. Retrieved April 20, 2017, from <https://krugman.blogs.nytimes.com/2012/03/12/building-a-caste-society/>
- Lacour, Misty, & Tissington, Laura D. (2011). The Effects of Poverty on Academic Achievement. *Educational Research and Reviews*, 6(7), 522-527.
- Lee, J., & Frongillo Jr., E. (2001). Factors Associated with Food Insecurity Among U.S. Elderly Persons. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 56(2), S94-S99.
- Leete, L., & Bania, N. (2010). The effect of income shocks on food insufficiency. *Review of Economics Of The Household*, 8(4), 505-526.
- Lipuma, & Horacek. (2016). College Student's Meal Management and Fast Food Ordering Behaviors. *Journal of Nutrition Education and Behavior*, 48(7), S95-S96.
- Maroto, Maya E., Anastasia Snelling, and Henry Linck. "Food Insecurity Among Community College Students: Prevalence and Association with Grade Point Average." *Community College Journal of Research and Practice* 39.6 (2014): 515-26. Web.
- Maroto, Maya E., Snelling, Anastasia, & Linck, Henry. (2015). Food Insecurity among Community College Students: Prevalence and Association with Grade Point Average. *Community College Journal of Research and Practice*, 39(6), 515-526.
- Martinez, S. M., Maynard, K., & Ritchie, L. D. (2016). Student Food Access and Security Study. University of California Global Food Initiative.

- Meldrum, L., & Willows, N. (2006). Food insecurity in university students receiving financial aid. *Canadian Journal of Dietetic Practice and Research: A Publication of Dietitians of Canada = Revue Canadienne De La Pratique Et De La Recherche En Di  t  tique : Une Publication Des Di  t  tistes Du Canada*, 67(1), 43-6.
- Micevski, D., Thornton, L., & Brockington, S. (2014). Food insecurity among university students in Victoria: A pilot study. *Nutrition & Dietetics*, 71(4), 258-264.
- Mirabitur, E., Peterson, K., Rathz, C., Matlen, S., & Kasper, N. (2016). Predictors of college-student food security and fruit and vegetable intake differ by housing type. *Journal of American College Health: J of ACH*, 64(7), 555-64.
- Morris, Smith, Davis, & Null. (2016). The Prevalence of Food Security and Insecurity Among Illinois University Students. *Journal of Nutrition Education and Behavior*, 48(6), 376-382.e1.
- Mui, Y. Q., & Khimm, S. (2012, May 28). College dropouts have debt but no degree. *The Washington Post*. Retrieved April 20, 2017, from https://www.washingtonpost.com/business/economy/college-dropouts-have-debt-but-no-degree/2012/05/28/gJQAnUPqwU_story.html?utm_term=.1499ebe2793e
- Murphy, Wehler, Pagano, Little, Kleinman, & Jellinek. (1998). Relationship Between Hunger and Psychosocial Functioning in Low-Income American Children. *Journal of the American Academy of Child & Adolescent Psychiatry*, 37(2), 163-170.
- Nellum, C. (2015, June 29). Fighting Food Insecurity on Campus. *Higher Education Today*. Retrieved April 20, 2017, from <https://www.higheredtoday.org/2015/06/29/fighting-food-insecurity-on-campus/>
- Odland, S. (2012, March 24). College Costs Out of Control. *Forbes*. Retrieved April 20, 2017, from <https://www.forbes.com/sites/steveodland/2012/03/24/college-costs-are-soaring/#327813381f86>
- Patton-L  pez, M. M., L  pez-Cevallos, D. F., Cancel-Tirado, D. I., & Vazquez, L. (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of nutrition education and behavior*, 46(3), 209-214.
- Pinstrup-Andersen, P. (2009). Food security: Definition and measurement. *Food Security*, 1(1), 5-7.
- Price, T. (2003). Rising College Costs. *CQ Researcher*, 13(42), 1013-1044.

- Saul, S. (2016, June 22). Food Pantries Address a Growing Hunger Problem at Colleges. *The New York Times*. Retrieved April 20, 2017, from https://www.nytimes.com/2016/06/23/education/food-pantries-address-a-growing-hunger-problem-at-colleges.html?_r=0
- Schakner, B. (2016, May 12). Colleges beginning to address the issue of student hunger. *Pittsburgh Post-Gazette*. Retrieved April 20, 2017, from <http://www.post-gazette.com/news/education/2016/03/07/Colleges-beginning-to-address-the-issue-of-hunger/stories/201603040052>
- Silva, M., Kleinert, W., Sheppard, A., Cantrell, K., Freeman-Coppadge, D., Tsoy, E., Pearrow, M. (2015). The Relationship Between Food Security, Housing Stability, and School Performance Among College Students in an Urban University. *Journal of College Student Retention: Research, Theory & Practice*, Journal of College Student Retention: Research, Theory & Practice, 12/14/2015.
- Sparks, A., Bania, N., & Leete, L. (2011). Comparative Approaches to Measuring Food Access in Urban Areas: The Case of Portland, Oregon. *Urban Studies*, 48(8), 1715-1737.
- United Nations, Food and Agriculture Organization. (2015). *FAO Statistical Pocketbook 2015 World Food and Agriculture*. FAO.
- United States Department of Agriculture. (2017). Food Security in the U.S. Retrieved March 4, 2017, from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/>
- United States Department of Agriculture. (2016). Definitions of Food Security. Retrieved March 4, 2017, from <https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security/>
- Wall-Bassett, Nasrallah, Owens, & Smith. (2011). An Assessment of College Student Awareness of Diet Tools, Recommendations for Food Intake, and Food Access and Availability. *Journal of Nutrition Education and Behavior*, 43(4), S24.
- World Food Conference. (1975). Report of the World Food Conference, Rome, 5-16 November, 1974. New York: United Nations.
- Wunderlich, G., Norwood, Janet L., & National Research Council. Panel to Review U.S. Department of Agriculture's Measurement of Food Insecurity Hunger. (2006). *Food insecurity and hunger in the United States: An assessment of the measure*. Washington, DC: National Academies Press.