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Examining the role of financial factors, resources and skills in predicting food security status among college students

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Abstract

The prevalence of food insecurity among college students has received little attention in academic literature, despite previous studies suggesting increased risk and potentially high rates of food insecurity among students. Additionally, the combined effects of financial and food management skills and resources have not been considered when examining student food security. A sample of 557 undergraduate students at a large, public university in the southeastern United States was surveyed to assess food security and its risk factors. Data were analysed based on sociodemographic characteristics, food security status, select financial factors, cooking self-efficacy and food management resources and skills. Prevalence of food insecurity among this sample of students was approximately 14%, comparable to national estimates. Results from probit regression analyses suggested that food security status was significantly associated with food resource adequacy. The model also highlighted the importance of several financial factors, including financial independence, familial financial support, receipt of financial or food assistance, budgeting behaviours, credit card ownership and exogenous shock. These data provide insights into the nature of food insecurity on a large college campus and fill a significant gap in the current literature by addressing relevant financial factors. The data are particularly salient due to two factors facing students at the sampled university during the period of study: (1) uncertain economic climate at the national and local level; and (2) the local area was recently affected by a significant natural disaster. Such data are useful to student affairs personnel who may wish to provide resources to assist students who are at risk for food insecurity.

Introduction

In the United States (US), food insecurity 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' (Anderson, 1990, p. 1560). Results from the 2011 Current Population Survey indicated that 14.9% of households in the US were food insecure (Coleman-Jensen *et al*., 2012). The 2009–2011 prevalence of food insecurity in Alabama was above the national average at 18.2% (Coleman-Jensen *et al*., 2012). The food security status of individuals and households exists along a spectrum of severity, ranging from no problems acquiring food (food secure), to adjustments in quality of the foods consumed by the individual (e.g. canned fruits and vegetables instead of fresh produce), and at the most extreme form of food insecurity, a decrease in the quantity of food consumed (Kendall *et al*., 1995; Kempson *et al*., 2002; McLaughlin *et al*., 2003).

Food insecurity negatively impacts academic performance, mental and social health, dietary choices and overall health status among adolescents and young adults (Kleinman *et al*., 1998; Murphy *et al*., 1998; Rose, 1999; Alaimo *et al*., 2001; Jyoti *et al*., 2005; Nord and Prell, 2007). Food assistance programmes such as the US Supplemental Nutrition Assistance Program (SNAP, formerly known as Food Stamps) are available to low-income individuals. Whereas research has suggested that individuals' food insecurity risk management capabilities are enhanced when participating in food assistance programmes (Hamelin *et al*., 2011), many college students are not eligible for these programmes. Within the general population, food insecurity has been associated with poverty status, low asset accumulation (i.e. wealth), unemployment, limited access to food assistance programmes, poor food accessibility due to transportation issues or neighbourhood food limitations, low educational attainment, mental and physical health status of household members, tobacco and substance abuse,

and high costs associated with housing, transportation and healthcare (Rose, 1999; Alaimo, 2005; Nord and Prell, 2007; Armour *et al*., 2008; Gorton *et al*., 2010; Coleman-Jensen *et al*., 2012). Whether these factors are associated with the food security status of college students is unknown.

Young adults between the ages of 18–25 are in a state of transition from adolescence to adulthood, and are often categorized as emerging adults (Worthy *et al*., 2010). These individuals are experiencing changes in physical activity and food-related behaviours while also adapting to life away from home (Worthy *et al*., 2010). One concerning feature of this sub-population is greater instability in terms of their relationships, emotions, cognitive development and finances (Worthy *et al*., 2010).

Financial risk factors

College student credit card use and student loan debt have received increased attention in recent years. Numerous studies have highlighted the increasing amount of debt accrued over the course of a college career (Draut, 2005; Chaker, 2009; Sallie Mae, 2009). Much of this debt comes in the form of student loans, but students utilize other sources of funding, including credit cards (Baum *et al*., 1998). A large percentage of students own credit cards (Sallie Mae, 2009), using these cards for a variety of reasons and with varying degrees of responsibility (Robb and Pinto, 2010; Robb, 2011).

From a food security standpoint, credit cards present advantages and disadvantages. Possession of a card may provide access to much needed funds in the event of an unexpected financial emergency, and thus may assist in the purchase of necessity items such as food. However, if the need for liquidity in the form of credit cards is not balanced by income from other sources, inability to meet debt obligations may have a strong adverse impact on future finances and increase the risk for food insecurity.

Debt-accruing behaviours may be closely linked to trends in college pricing and overall costs associated with attending college. The average net price of college increased in 2012–2013; the third year in a row for such an increase (Baum and Ma, 2012). Hughes *et al*. (2011) reported that nearly 22% of college students borrowed money to purchase food. However, current research lacks exploration of the effects of credit card use for the purchase of necessity items, such as food. Cards may present a reasonable short-term solution, but inability to meet debt obligations may further destabilize financial and food security status in the long run.

Food management risk factors

Some have suggested that a lack of food management skills can also increase risk for food insecurity (Anderson and Swanson, 2002; Alaimo, 2005; Mercille *et al*., 2012). Emerging adults often lack knowledge, skills and resources required for basic food preparation (Byrd-Bredbenner, 2004; Larson *et al*., 2006; Clifford *et al*., 2009). These factors combined may effectively increase their risk for food insecurity. Larson *et al*. (2006) reported that many young adults believed they possessed inadequate cooking skills, money to buy food and time to prepare food. Students who lack these skills may purchase more costly convenience foods or ready prepared foods more often. However, the relationship between adequacy of emerging adults' food preparation skills and resources and their food security status is largely unknown.

Prevalence of post-secondary food insecurity

Despite the wealth of research related to student finances and debt, food insecurity among college students has only recently received attention in research and policy agendas. Whereas there is documentation of increasing presence and usage of food banks on college campuses in North America (Ferguson, 2004; Rondeau, 2007; Powers, 2012), only a few studies have assessed food security on a college campus. US studies have suggested that 21–59% of college students experience some form of food insecurity (Chaparro *et al*., 2009; Freudenberg *et al*., 2011; Hughes *et al*., 2011; Patton-López *et al*., 2014). For example, 21% of the student population at the University of Hawai'i at Mānoa was food insecure, and another 24% was marginally food secure or at risk for food insecurity (Chaparro *et al*., 2009). In Australia, Hughes *et al*. (2011) reported that approximately 25% of students were food insecure.

These investigations have utilized various food security assessment metrics, and they included a limited analysis of demographic and socioeconomic characteristics as they related to food security. Chaparro *et al*. (2009) reported that students living on their own (not with relatives) were at increased risk of food insecurity, whereas Hughes *et al*. (2011) indicated that receipt of financial aid was associated with food insecurity. A recent study from Patton-López *et al*. (2014) associated employment and low income with increased food insecurity. The literature lacks a clear picture of overall student debt, income provided through student loans, additional financial support (family) or employment income as related to food security status within this population. There is also limited consideration of the relationship between food security and the combined effects of food and financial management skills.

Theoretical framework

Predictors of food insecurity among college students are unknown. However, previous research has focused on the food management decisions made by individuals living in the general population and specifically in low-income households. The conceptual model of food insecurity proposed by Alaimo (2005), pictured in Fig. 1, served to outline causes, or risk factors, followed by experiences associated with food insecurity, as well as coping mechanisms and potential consequences. Specifically, within the model, poverty and financial hardship, unemployment, and poor food/cooking skills increase risk for food insecurity. Food security status can be improved through self-reliant measures (e.g. optimization of food resources via knowledge and skill) and/or institutional support, such as participation in food assistance programmes (Alaimo, 2005).

Purpose

Given the risk factors identified by Alaimo (2005) and the few findings with college students (Meldrum and Willows, 2006; Chaparro *et al*., 2009; Hughes *et al*., 2011; Patton-López *et al*., 2014), Fig. 2 suggests a simplified model of potential

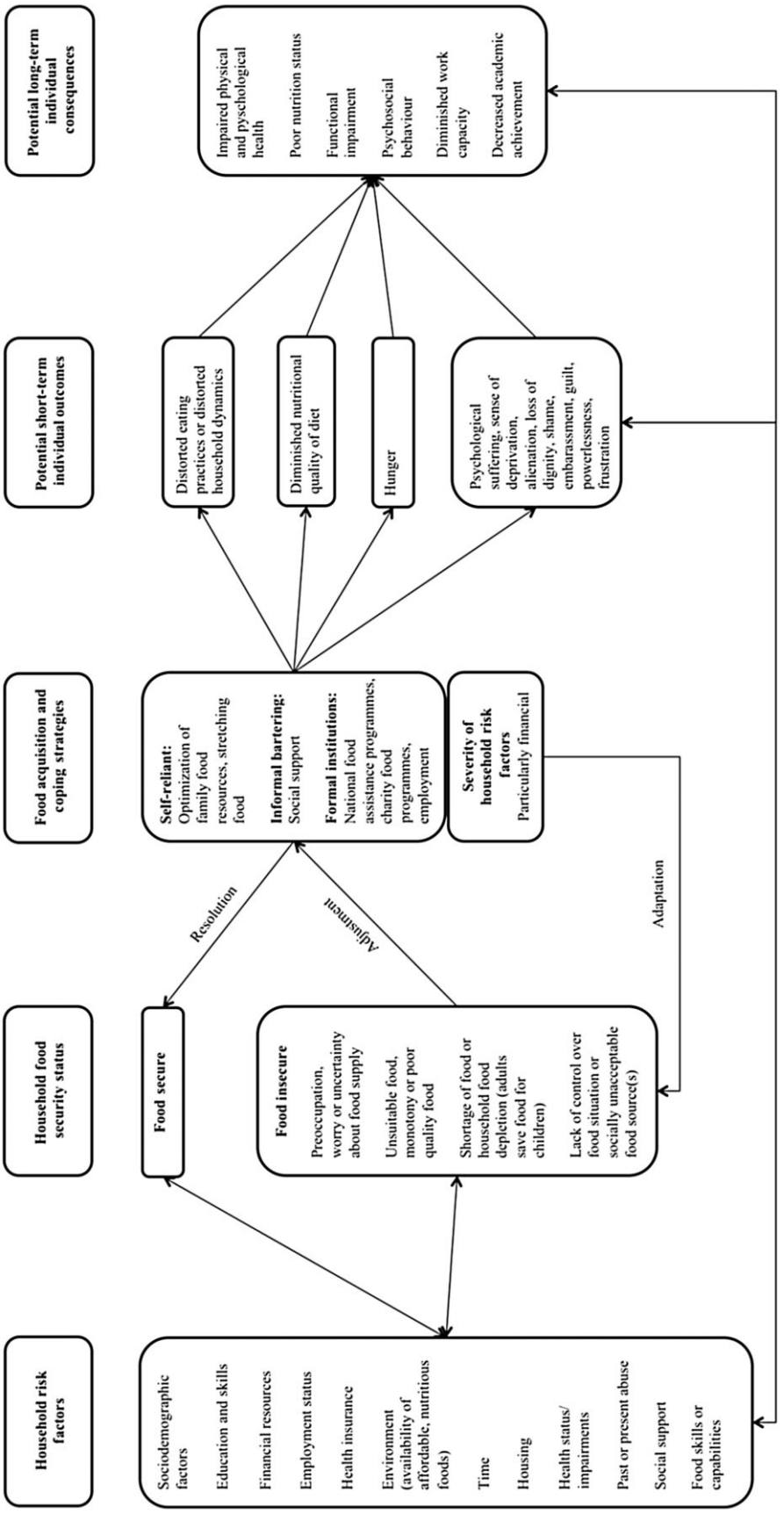

Figure 1 Adapted conceptual model of food insecurity (Alaimo, 2005, p. 285).

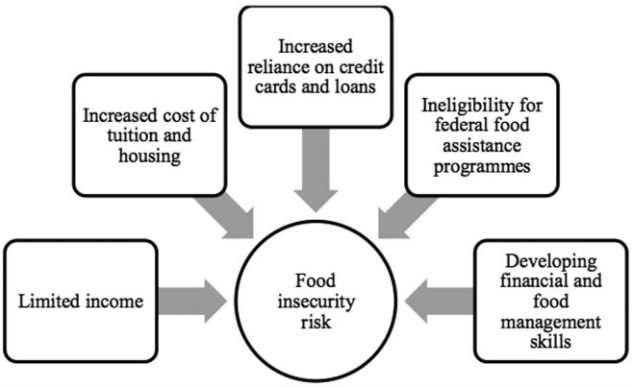

Figure 2 Student-specific risk factors for food insecurity.

student-specific risk factors. Additionally, at the time of study, the surrounding area had recently been impacted by a severe Tornado. Given increases in rates of food insecurity following natural disasters (Rose, 1999; Flores *et al*., 2005; Andrews and Nord, 2009) and the uncertainty of student food assistance, the need for such research is further highlighted.

The purpose of this study was to assess the prevalence of food insecurity on a large, public college campus in the southeastern US, and to examine the relationship between food insecurity and potential risk factors such as student financial income, familial financial support, student debt, credit card ownership, financial shocks, food and financial management skills and resources and other key sociodemographic factors.

Methods

Sample

The present study was approved by the University of Alabama Institutional Review Board. Data were collected September–November 2011 via in-class survey of students at the University of Alabama. A sample pool of sophomore-, junior- and senior-level courses was selected from the fall course catalogue, which were categorized by academic division, department and course level. Independent study and research courses as well as freshman- and graduate-level courses were excluded. Classes were randomly selected from each of the three course levels within all academic divisions.

Instructors were invited via email to allow enrolled students to complete the self-administered, paper-and-pencil survey distributed by trained undergraduate research assistants during designated class periods. Following two attempts, non-responsive instructors were replaced with another randomly selected course from the same division-level group within the sampling frame. In addition, several courses were selected via convenience sampling. Eligible participants were returning sophomores, juniors and seniors 19–25 years of age. The sample was limited to returning students in an effort to capture responses of students enrolled after the Tornado. Freshmen and graduate students, part-time students and pregnant students were excluded to provide a sample that was more representative of the traditional college experience, similar to Chaparro *et al*. (2009).

Measures

The survey was designed to assess food security status, food management skills and resources, demographic information and financial resources. Sociodemographic items were drawn from the 2007–2008 National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2010) and supplemented by additional, student-specific questions about residence, class standing and meal plan participation.

The US Household Food Security Module measures a variety of conditions and behaviours that can serve as an indicator for the presence and severity of food insecurity (Bickel *et al*., 2000). The 2008 10-item Adult Food Security Survey Module (AFSSM), included in Table 1, was used to classify food security into one of the following four groups based on the number of affirmative answers: high food security (no food access problems), marginal food security (anxiety over household food shortages), low food security (reduced diet quality and variety) and very low food security (reduced food intake and/or disrupted eating patterns). Low food security and very low food security groups were further collapsed into a food insecure category, as is common in the food security literature, given the generally small numbers of very low food secure individuals (Dinour *et al*., 2004; Coleman-Jensen *et al*., 2012). All items were scored in accordance with the Guide to Measuring Household Food Security and classified in accordance with the recommendations by the US Department of Agriculture (USDA) Economic Research Service (ERS) (USDA ERS, 2013). Table 2 provides the definitions for each food security category and corresponding scores.

The survey included two measures designed to assess self-efficacy, or confidence, towards cooking and perceived food resource and skill adequacy (Larson *et al*., 2006; Clifford *et al*., 2009). Using previously validated items from Clifford *et al*. (2009), students rated their confidence in their abilities to follow a recipe, to cook a nutritious meal, to cook a meal in a short amount of time and to cook a nutritious meal without spending a lot of money. Responses were ranked on a 5-point Likert-type scale from 'not at all confident' (1) to 'extremely confident' (5) and summed to create a cooking self-efficacy score (range 4–20) (Cronbach's $\alpha = 0.82$). Participants also rated their resources for preparing food, including cooking skills, money to buy food, time available to prepare food, appliances for food preparation and food selection in area stores on a 4-point Likert-type scale ranging from 'very inadequate' (1) to 'very adequate' (4) (Cronbach's $\alpha = 0.80$) (Larson *et al*., 2006). Answers were summed to create a resource adequacy score (range 5–20). (Individual items for cooking self-efficacy and resource adequacy scales are provided in Table 3.)

Students provided data on their dependent status and the presence of any other financial support they received from family members or in the form of loans, including student loans and financial aid. Credit card ownership was also assessed, as well as the existence of any other personal debt independent of financial aid or credit card debt. Other items included budgeting behaviours (expense tracking), use of any government- or charity-based food assistance and the presence of any adverse financial or health-related circumstances within the past 12 months (e.g. death or disablement of a primary earner or family member, other serious familial health issues, changes in employment status, income reduction and Tornado-related losses). Students with any

Table 1 Adult Food Security Survey Module

Item	Potential responses	Response score
'I worried whether my food would run out before I got money to buy more.' Was that often true, sometimes true or never true for you in the last 12 months?	Often true	1
	Sometimes true	1
	Never true	0
'The food that I bought just didn't last, and I didn't have money to get more.' Was that often true, sometimes true or never true for you in the last 12 months?	Often true	1
	Sometimes true	1
	Never true	0
'I couldn't afford to eat balanced meals.' Was that often true, sometimes true or never true for you in the last 12 months?	Often true	1
	Sometimes true	1
	Never true	0
In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes	1
	No	0
(If yes) How often did this happen?	Almost every month	1
	Some months, but not every month	1
	Only 1 or 2 months	0
In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?	Yes	1
	No	0
In the last 12 months, were you very hungry but didn't eat because there wasn't enough money for food?	Yes	1
	No	0
In the last 12 months, did you lose weight because there wasn't enough money for food?	Yes	1
	No	0
In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?	Yes	1
	No	0
(If yes) How often did this happen?	Almost every month	1
	Some months, but not every month	1
	Only 1 or 2 months	0

Table 2 Classification and prevalence of household food security

Food security status	Cumulative response score	USDA definition	Collapsed food security categories	Sample frequency *n* (%)
High food security	0	No food access problems or limitations	High food security	332 (65.74)
Marginal food security	1–2	Anxiety over food sufficiency or shortage of food in the house, with little or no indication of changes in food intake	Marginal food security	102 (20.20)
Low food security	3–5	Reduced quality, variety or desirability of diet	Food insecurity	71 (14.06)
Very low food security	>5	Disrupted eating patterns and reduced food intake		

Adapted from Bickel *et al.* (2000), Chaparro *et al.* (2009) and United States Department of Agriculture Economic Research Service (2013).

affirmative responses to any adverse circumstances were classified as having experienced an exogenous shock.

Data analysis

Undergraduate research assistants entered survey data into a Microsoft Access database. All entries were checked for accuracy by a graduate research assistant and imported into Statistical Analysis Software (SAS) (version 9.2, 2008, SAS Institute Inc., Cary, NC, USA), which was used for all other data management activities and statistical analyses. Descriptive statistics were calculated to examine sample demographics. Analysis of variance (ANOVA) and chi-square analyses were used to examine the relationship between food security and select sample demographic and financial characteristics. Drawing from previous literature, the relationship between food security and the aforementioned financial and food management factors was further examined using probit regression analysis. The model can be described as follows:

$$FSS = a + b1FR + b2SE + b3X + e$$

Table 3 Cooking self-efficacy and resource adequacy scales

Question	Item	Potential responses	Response score
Which best describes your confidence in completing each of the tasks listed?	I can cook a nutritious meal.	Extremely confident	5
	I can cook a meal in a short amount of time.	Very confident	4
	I can cook a nutritious meal without spending a lot of money.	Moderately confident	3
	I can follow a recipe.	Not very confident	2
		Not at all confident	1
Rate your skills or resources.	Cooking skills	Very adequate	4
	Money to buy food	Adequate	3
	Appliances for food preparation	Inadequate	2
	Food selection in local stores	Very inadequate	1
	Time available to prepare food		

Retrieved and scored according to Clifford *et al.* (2009) and Larson *et al.* (2006) respectively.

where FSS = food security status; FR = select financial factors; SE = self-efficacy related to food tasks and skills; X = selected demographic variables; a = intercept; bi = regression coefficient (i = 1 . . . n); and e = error term.

Results

Surveys were administered in 16 classrooms. Five hundred ninety-eight surveys were returned (an 87.4% response rate) and 557 students met the inclusion criteria for the present study. Food security status of the sample is presented in Table 2. The majority of students reported high food security, although 20.02% experienced anxiety about their food supply and 14.06% had experienced altered food intake within the previous year due to resources limitations (8.91% low food security, 5.15% very low food security).

Table 4 presents the frequencies of select demographic and financial characteristics of the sample, as well as characteristics distribution, by food security status. In relation to the larger student population, there was overrepresentation of female students and seniors, although other significant factors such as race/ethnicity and meal plan participation were fairly representative of the broader student body. The prevalence of financial independence, family financial support, receipt of financial aid, expense tracking, debt accrual and experience with exogenous shocks differed by food security status in bivariate analyses.

Initial analyses also suggested differences in the food management scales by food security status, displayed in Table 5. Most participants reported relatively high cooking self-efficacy and perceived their food-based resources to be fairly adequate. One-way ANOVA indicated that significant differences existed in terms of food security based on cooking self-efficacy ($P = 0.029$) and perceived resource adequacy ($P < .0001$). Post hoc testing indicated that high food secure students reported significantly higher cooking self-efficacy when compared with their marginally food secure and food insecure peers ($P \leq 0.05$). Both high and marginally food secure students perceived greater resource adequacy when compared with their food insecure counterparts ($P \leq 0.05$). Results from the multivariate model are presented in Table 6.

As expected, many variables had a strong impact on the likelihood of being food insecure. *Ceteris paribus*, students who received financial aid ($P = 0.011$), some form of food assistance ($P = 0.003$) or who were financially independent ($P = 0.001$) were at significantly greater risk for food insecurity. Similar results were noted for students who actively budgeted ($P = 0.001$) or who had experienced an exogenous economic shock within the past year ($P < 0.001$). Conversely, the presence of familial financial support ($P = 0.01$) or alternative financing, such as credit cards ($P = 0.007$), was negatively associated with food insecurity. Additionally, individuals scoring higher on the measure of resource adequacy, but not cooking self-efficacy, were less likely to be food insecure ($P = 0.001$).

Discussion

The prevalence of food insecurity in the present study was lower than the 18% reported for the state of Alabama and the 21–59% reported in previous studies (Chaparro *et al.*, 2009; Freudenberg *et al.*, 2011; Hughes *et al.*, 2011; Coleman-Jensen *et al.*, 2012; Patton-López *et al.*, 2014). However, food insecurity among the current sample is reflective of the larger US population (Coleman-Jensen *et al.*, 2012). Although students do not seem to be at increased risk for food insecurity compared with the general public, these data are still of concern given the relative lack of food assistance available to college students and the potential to create persistent financial instability throughout the course of a college career.

Students were asked to assess their food security status using the last 12 months as a reference point. Thus, the prevalence rate may reflect the impact of a recent natural disaster, specifically the Tornado that devastated areas surrounding the campus. Lack of effective controls (i.e. pre-disaster data) limits authors' ability to analyse this event specifically, although the broader financial impacts of such an event on student food security should be captured in the comprehensive measure of exogenous shocks. Approximately 42% of students surveyed had experienced some form of exogenous shock, which was associated with increased risk for food insecurity. The exact nature of the exogenous shock was unknown. However, the data suggest that many students do not have adequate emergency resources or support following unanticipated income shocks or expenses, which may increase the risk of food insecurity. This further emphasizes the need to examine the range of resources, financial and otherwise, available to college students.

Table 4 Select sample characteristics, by food security status

Characteristic	Sample *n* (%)	High food security *n* (row %)	Marginal food security *n* (row %)	Food insecurity *n* (row %)
Gender				
Male	135 (24.24)	72 (62.07)	24 (20.69)	20 (17.24)
Female	422 (75.76)	261 (66.84)	78 (20.05)	51 (13.11)
Race/ethnicity***				
White	457 (82.19)	292 (69.52)	79 (18.81)	49 (11.67)
Other	99 (17.81)	40 (47.62)	22 (26.19)	22 (26.19)
Marital status				
Never married	546 (98.20)	324 (65.32)	102 (20.56)	70 (14.11)
Other	10 (1.80)	7 (87.50)	0 (0.00)	1 (12.50)
Children in the home				
Yes	35 (6.38)	18 (62.07)	8 (27.59)	3 (10.34)
No	514 (93.62)	309 (65.88)	94 (20.04)	66 (14.07)
Class standing				
Sophomore	99 (18.07)	66 (73.33)	18 (20.00)	6 (6.67)
Junior	284 (33.76)	105 (61.67)	35 (20.59)	30 (17.65)
Senior	548 (48.18)	155 (65.40)	49 (20.68)	33 (13.92)
Meal plan participation				
Yes	157 (28.19)	89 (61.81)	33 (22.92)	22 (15.28)
No	400 (71.81)	243 (67.31)	69 (19.11)	49 (13.57)
Food assistance programme participation				
Yes	54 (9.69)	14 (28.57)	17 (34.69)	18 (36.73)
No	503 (90.31)	318 (69.74)	85 (18.64)	53 (11.62)
Financially independent***				
Yes	69 (12.41)	21 (34.43)	17 (27.87)	23 (37.70)
No	487 (87.59)	310 (69.98)	85 (19.19)	48 (10.84)
Annual income				
≤ $20 000	370 (71.84)	210 (62.31)	75 (22.26)	52 (15.43)
> $20 000	145 (28.16)	88 (68.22)	22 (17.05)	19 (14.73)
Familial financial support***				
Yes	490 (87.89)	306 (68.64)	94 (21.03)	47 (10.51)
No	67 (12.03)	26 (44.83)	8 (13.79)	24 (41.38)
Financial aid***				
Yes	244 (44.04)	112 (51.85)	51 (23.61)	53 (24.54)
No	310 (55.96)	218 (76.22)	50 (17.48)	18 (6.29)
Credit card				
Yes	252 (45.49)	166 (70.64)	39 (16.60)	30 (12.77)
No	302 (54.51)	165 (61.57)	62 (23.13)	41 (15.30)
Tracks expenses**				
Yes	202 (36.40)	104 (58.76)	36 (20.34)	37 (20.90)
No	353 (63.60)	227 (69.42)	66 (20.18)	34 (10.40)
Debt***				
Yes	44 (8.26)	12 (34.29)	12 (34.29)	11 (31.43)
No	489 (91.74)	306 (67.70)	86 (19.03)	60 (13.27)
Exogenous shock***				
Yes	234 (42.16)	104 (50.49)	54 (26.21)	48 (23.30)
No	321 (57.84)	227 (76.43)	48 (16.16)	22 (7.41)

Note: Statistically significant differences in food security status among subgroups within each of the selected characteristics at $^{**}P < 0.01$, $^{***}P < 0.001$. Data in the first column are calculated from the total *n* of 557, but may represent missing sociodemographic and financial information. Data in food security status columns are reflective of any additional missing food security information.

Limited financial resources were included as risk factors in Alaimo's conceptual model of food security (Alaimo, 2005) and have often been considered primary causes of food insecurity (Rose, 1999; Gorton *et al*., 2010; Holben, 2010). Students at risk for food insecurity were financially independent and were not receiving any form of financial support from family members. Chaparro *et al*. (2009) also reported that financially independent students were more likely to be food insecure. This is not entirely surprising as many financially independent students may have fewer resources to rely on, relative to dependent students.

Table 5 Food management scores, by food security status

Food management scale	Sample mean (of 20)	High food security mean (SD)	Marginal food security mean (SD)	Food insecurity mean (SD)
Cooking self-efficacy	15.88 (3.21)	16.06 (3.10)[ab]	16.17 (3.41)[a]	15.01 (3.09)[b]
Resource adequacy	15.46 (2.78)	15.93 (2.93)[c]	15.06 (2.46)[d]	14.19 (2.34)[cd]

Note: Means with the same superscript letter are significantly different from one another at $P \leq 0.05$.

Table 6 Results of probit analysis

Effect (modelled)	Estimate (SE)	95% confidence limits	
Gender (male)	0.03 (0.15)	–0.27	0.33
Race/ethnicity (racial/ethnic minorities)	–0.13 (0.19)	–0.50	0.24
Children in the home (no)	–0.29 (0.26)	–0.80	0.22
Class standing (sophomore)	0.03 (0.09)	–0.15	0.21
Food assistance (no)**	0.63 (0.21)	0.21	1.05
Campus meal plan participation (no)	0.16 (0.14)	–0.12	0.44
Annual income	–0.12 (0.15)	–0.41	0.18
Dependence status** (financially dependent)	0.59 (0.19)	0.23	0.96
Familial support (no)*	–0.51 (0.19)	–0.90	–0.12
Exogenous shock (no)***	0.49 (0.13)	0.24	0.76
Budget behaviours (no)**	0.43 (0.13)	0.17	0.69
Financial aid (no)*	0.35 (0.14)	0.08	0.62
Debt (no)	0.33 (0.23)	–0.11	0.78
Credit card ownership (no)**	–0.35 (0.13)	–0.61	–0.10
Cooking self-efficacy score	–0.02 (0.02)	–0.06	0.02
Resource adequacy score***	–0.09 (0.03)	–0.14	–0.04
n observations = 429			

*Statistically significant at $P < 0.05$; **Significant at $P < 0.01$; ***Significant at $P < 0.001$.

Reception of financial aid was positively associated with food insecurity, indicating that this variable may be considered as a signal of overall need (i.e. those who do not use financial aid are at an advantage in terms of overall resource availability). The same may also be true regarding receipt of food assistance and budgeting behaviours. However, it might alternatively signal that current levels of financial aid are inadequate to support students financially. In an investigation of financial insecurity among students receiving financial aid, Meldrum and Willows (2006) demonstrated costs for a nutritionally adequate diet often exceeded allocated funds from the Canadian Student Loans Program for food each month, at times by $100. Therefore, improving financial and food management skills alone may be insufficient strategies to ensure dietary adequacy and food security among students receiving aid.

Nearly 10% of students indicated that they or someone in their household had received federal governmental food assistance programmes or food from charitable outlets in the previous 12 months. While student food assistance needs are largely unknown, this is higher than the 7% reported by Chaparro *et al*. (2009). Among US households, food assistance programmes serve as a safety net and are generally thought to improve food insecurity (Bickel *et al*., 2000). In line with Alaimo's model (2005), food assistance can serve as a coping strategy used to increase food security. Therefore, increased food assistance may help explain the lower prevalence of food insecurity found among the current sample compared with the rate among students in Hawaii (Chaparro *et al*., 2009). However, as with financial aid, probit results could reflect need among already food insecure participants, or results could suggest potentially inadequate food assistance for this population. Because the majority of participants that received food assistance were using government food programmes, participation may be reflective of only those students living with eligible recipients. The rate may also reflect support received following the Tornado normally unavailable to students.

Whereas effective financial management skills, including budgeting behaviours, are expected to result in greater financial (and food) security, increased cognizance and more conscious expense tracking may be skill-based, self-reliant forms of coping if food insecurity is present (Alaimo, 2005). Students who reported a degree of budgeting behaviour (i.e. tracked expenses) were more likely to indicate being food insecure. The association between budgeting behaviour and food security status has been mixed, as some research has indicated a decreased risk of food insecurity among adults who budget (Gundersen and Garasky, 2012), whereas others supported the present findings among college students (Hughes *et al*., 2011).

Results from the present study suggested that the possession of a credit card had the opposite effect of student loan debt, as credit card ownership is associated with lower likelihood of being food insecure. This may indicate that the presence of a credit card offers students an alternative in times when they may be financially stressed. Even temporary changes in household finances could allow for adaptation and a delay in consequences associated with food insecurity (Alaimo, 2005). To the extent that this is true, these data raise another issue of concern, as any expenditure that is covered by the use of credit must necessarily be repaid in the future. (Student loans and other sources of debt may not impose

the same relative immediacy in repayment schedules that may exist with credit cards.) Having to rely on a credit card once to get through a rough financial period is not necessarily a problem. However, if food insecurity is a recurring issue, credit cards may simply be delaying the inevitable financial crisis. The present data do not provide sufficient information to explore the role of credit cards in more detail. However, 45% of participants owned a credit card and data suggest that a significant proportion (ranging from 14% to 37% in previous studies) of students may be classified as financially-at-risk based on their credit card use behaviours (Lyons, 2004; Pinto and Mansfield, 2006; Robb and Pinto, 2010).

Alaimo's framework (2005) suggests that limited food skill could serve as a risk factor and that efficient food management could serve as a coping mechanism among food insecure households. Based on this model and prior research, the present study included measures of cooking self-efficacy and perceived resource adequacy (Larson *et al*., 2006; Clifford *et al*., 2009; Mercille *et al*., 2012). Mercille *et al*. (2012) reported that increased self-efficacy for preparation of healthful foods was associated with decreased risk of food insecurity among Aboriginal Canadian women. However, in the same study, self-efficacy for general food preparation, produced from a scale comparable to the measure used in the present study, was not significantly associated with food security status (Mercille *et al*., 2012). Similarly, cooking self-efficacy was not related to food security in multivariate analysis of the present study.

As perceived food resource adequacy increased, the likelihood of reporting food insecurity decreased. This contrasts data from Hughes *et al*. (2011) that suggested no significant differences in cooking and preparation skills or in cooking and storage facilities between food secure and food insecure students. The resource adequacy scale from Larson *et al*. (2006) used in this study assessed cooking skills and food-based resources such as time, money, food selection in local stores, cooking equipment and food storage. This broader range of factors includes known risk factors for food insecurity identified by Alaimo (2005) and highlights concepts through which food security risk can be further explored. For example, previous research has suggested that students living with their parents are at decreased risk for food insecurity compared with other, more traditional on- or off-campus student housing (Chaparro *et al*., 2009). Cooking and food storage resources, thus food resource adequacy, may vary by place of residence. Therefore, living situation, including investigation of on- and off- campus arrangements, is a factor that warrants further exploration in future research.

Results indicate lower rates of food insecurity when compared with previous studies of college populations (Chaparro *et al*., 2009; Hughes *et al*., 2011). However, neither of the previous studies developed a clear picture of overall student debt, income provided through student loans, additional financial support (family) or employment income. It is possible that food insecurity in this population is largely the result of financial constraints and/or lack of financial and food management skills. The relationship between financial and food management skills and food insecurity in this population needs further exploration.

Despite being the factor most often considered as a primary cause of food insecurity (Rose, 1999; Alaimo, 2005; Gorton *et al*., 2010; Holben, 2010), income was not significantly associated with food insecurity in the present study. Among Australian college students, Hughes *et al*. (2011) reported associations between low income and increased risk of food insecurity. The lack of significance in the present analysis may be due to a number of factors. The income measure included was fairly straightforward, but it is possible that the measure was not sensitive enough to capture differences among the population sampled. US poverty measures associated with food insecurity are dependent on the number of people who live in a household and share in the expenses. Such data were not obtained for this population. It is also possible that other financial factors (such as credit card debt, financial aid, financial independence, etc.) provide a more accurate reflection of available resources among student populations.

Previous research indicates a strong association between race/ethnicity and food security status (Chaparro *et al*., 2009; Coleman-Jensen *et al*., 2012). The data suggest that racial/ethnic minorities are at increased risk of food insecurity (with Chaparro *et al*., 2009 reporting ethnicity as the strongest predictor of food insecurity among students in Hawaii). Whereas race/ethnicity was significantly associated with food security in the initial stages of analysis (chi-square), race/ethnicity was not significant in the final multivariate analysis. This result may suggest that student financial factors play a greater role in the risk of food insecurity than demographic characteristics.

Present findings are subject to a number of limitations. First, data are cross-sectional, thus authors can only speak to existing associations among the data. Second, there is potential for strong selection bias in the sample. Only 23.9% of instructors contacted allowed the survey to be distributed in their classrooms. Thus, not all academic divisions were represented, and half ($n = 8$) of the courses sampled were selected using convenience sampling. However, seven of the eight academic divisions were represented, and various course levels were surveyed within most divisions on campus. Finally, results may not be easily generalizable to other campus populations, or college students in general. Despite these limitations, these data contribute to the student food security literature by addressing previously unexamined relationships between food management skills and selected financial factors.

Conclusions

The present study addressed food security status among a unique population that is subject to a high number of potential risk factors. Focusing specifically on financial and food management aspects of Alaimo's conceptual model of food insecurity (Alaimo, 2005) provided insights into factors that are particularly important when identifying students who are food insecure or at risk of becoming food insecure. Campus food security has received little attention in the past, despite the fact that previous studies suggest potentially high rates of food insecurity (Chaparro *et al*., 2009; Hughes *et al*., 2011). It is important to assess the degree to which this is a larger problem, given that high rates of food insecurity have far reaching implications for college students in terms of their long-term physical and financial health, as well as their academic success.

Post-secondary education is largely viewed as a means through which students can improve human and social capital (Hughes *et al*., 2011), and higher levels of education are associated with decreased food insecurity (Coleman-Jensen *et al*., 2012). However, in light of trends in higher education costs and fiscal limitations on the part of federal and state governments, student

food insecurity is a problem that is likely to grow in prevalence as costs continue to surpass available grant and loan support.

Food insecurity experienced during college years may create or exacerbate reliance on income support via financial aid, loans or credit cards. Such activity may generate debt that can undermine the expected socioeconomic benefits of a college degree. High levels of borrowing, even at effectively low interest rates, may also have significant implications for those entering the workforce and trying to establish a household in the near future. Lacking from the present study is the ability to ascertain whether debt related behaviours are driven by food insecurity or a lack of careful decision making on the part of naïve market participants. If the behaviour is truly based on a lack of resources, it would entail a slightly different policy response (i.e. better resources on or near campus coupled with possible modifications to loan/grant/support programmes) than if the problem is irresponsible financial decision making (i.e. education/training).

These data should prove useful to student affairs personnel. If food insecurity is indeed an issue for a significant number of college students, such data may help identify actions that can be taken on campus or in the larger community to improve conditions for those students who are food insecure or at risk of being food insecure. In line with the Alaimo framework (Alaimo, 2005), such institutional measures will be necessary when national food and nutrition support is inaccessible and when self-reliant opportunities to increase food security are limited. Continued investigation of the prevalence of food insecurity in a variety of student populations is warranted. Such data are necessary in order to assess the true magnitude of the problem, further identify risk factors and inform effective solutions.

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References

Alaimo, K. (2005) Food insecurity in the United States: an overview. *Topics in Clinical Nutrition*, **20**, 281–298.

Alaimo, K., Olsen, C.M. & Frongillo, E.A. (2001) Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. *Pediatrics*, **108**, 44–53.

Anderson, K. & Swanson, J. (2002) Rural Families – Welfare Reform & Food Stamps. Policy Brief, Cornell University, Ithaca, NY.

Anderson, S.A. (1990) Core indicators of nutritional state for difficult-to-sample populations. *The Journal of Nutrition*, **120** (11S), S1559–S1560.

Andrews, M. & Nord, M. (2009) Food insecurity up in recessionary times. *Amber Waves*, **7**, 32–36.

Armour, B.S., Pitts, M. & Lee, C.W. (2008) Cigarette smoking and food insecurity among low-income families in the United States, 2001. *American Journal of Health Promotion*, **22**, 386–390.

Baum, S. & Ma, J. (2012) Trends in College Pricing: 2012. College Board Advocacy & Policy Center. [WWW document]. URL http://trends.collegeboard.org/college-pricing (accessed on 9 July 2013).

Baum, S., Saunders, D. & New England Education Loan Marketing Corporation (1998) *Life after Debt: Results of the National Student Loan Survey*. Nellie Mae, Braintree, MA.

Bickel, G., Nord, M., Price, C., Hamilton, W. & Cook, J. (2000) *Guide to Measuring Household Food Security, Revised 2000*. United States Department of Agriculture, Food and Nutrition Service, Office of Nutrition, Analysis and Evaluation, Washington, DC.

Byrd-Bredbenner, C. (2004) Food preparation knowledge and attitudes of young adults. *Topics in Clinical Nutrition*, **19**, 154–163.

Centers for Disease Control and Prevention. (2010) National Center for Health Statistics. Survey Questionnaires, Examination Components and Laboratory Components 2007–2008. [WWW document]. URL http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/questexam07_08.htm (accessed on 15 July 2013).

Chaker, A.M. (2009) Students borrow more than ever for college. *The Wall Street Journal*, September 4. [WWW document]. URL http://online.wsj.com/article/SB10001424052970204731804574388682129316614.html#prinode (accessed on 9 July 2013).

Chaparro, M.P., Zaghloul, S.S., Holck, P. & Dobbs, J. (2009) Food insecurity among college students at the University of Hawai'i at Mānoa. *Public Health Nutrition*, **12**, 2097–2103.

Clifford, D., Anderson, J., Auld, G. & Champ, J. (2009) Good grubbin': impact of a TV cooking show for college students living off campus. *Journal of Nutrition Education and Behavior*, **41**, 194–200.

Coleman-Jensen, A., Nord, M., Andrews, M. & Carlson, S. (2012) *Household Food Security in the United States in 2011*. US Department of Agriculture Economic Research Service, Washington, DC. Economic Research Report ERR-141.

Dinour, L.M., Bergen, D. & Yeh, M.C. (2004) The food insecurity–obesity paradox: a review of the literature and the role food stamps may play. *Journal of the American Dietetic Association*, **107**, 1952–1961.

Draut, T. (2005) *Strapped: Why America's 20- and 30-Somethings Can't Get Ahead*. Doubleday, New York.

Ferguson, M. (2004) Campus Hunger Count 2004: Food banks emerge in response to student hunger. Canadian Association of Food Banks and the Canadian Alliance of Student Associations. [WWW document]. URL http://www.thinkeducation.ca/documents/campus_hunger_count.pdf (accessed on 7 December 2005).

Flores, M., Khwaha, Y. & White, P. (2005) Food security in the protracted crises: building more effective policy frameworks. *Disasters*, **29**, S25–S51.

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. Campaign for a Healthy CUNY, New York, NY.

Gorton, D., Bullen, C.R. & Mhurchu, C.N. (2010) Environmental influences on food security in high-income countries. *Nutrition Reviews*, **68**, 1–29.

Gundersen, C.G. & Garasky, S.B. (2012) Financial management skills are associated with food insecurity in a sample of households with children in the United States. *The Journal of Nutrition*, **142**, 1865–1870.

Hamelin, A.M., Mercier, C. & Bédard, A. (2011) Needs for food security from the standpoint of Canadian households participating and not participating in community food programmes. *International Journal of Consumer Studies*, **927**, 58–68.

Holben, D.H. (2010) Position of the American Dietetic Association: food insecurity in the United States. *Journal of the American Dietetic Association*, **110**, 1368–1377.

Hughes, R., Serebryanikova, I., Donaldson, K. & Leveritt, M. (2011) Student food insecurity: the skeleton in the university closet. *Nutrition and Dietetics*, **68**, 27–32.

Jyoti, D.F., Frongillo, E.A. & Jones, S.J. (2005) Food insecurity affects school children's academic performance, weight gain and social skills. *The Journal of Nutrition*, **135**, 2831–2839.

Kempson, K.M., Palmer-Keenan, D., Sadani, P.S., Ridlen, S. & Scotto-Rosato, N. (2002) Food management practices used by people with limited resources to maintain food sufficiency as reported nutrition educators. *Journal of the American Dietetic Association*, **102**, 1795–1799.

Kendall, A., Olson, C.M. & Frongillo, E.A. (1995) Validation of the Radimer/Cornell measures of hunger and food insecurity. *The Journal of Nutrition*, **125**, 2793–2801.

Kleinman, R.E., Murphy, M., Little, M., Pagano, M., Wehler, C.A., Regal, K. & Jellinek, M.S. (1998) Hunger in children in the United States: potential behavioral and emotional correlates. *Pediatrics*, **101**, e3. [WWW document]. URL http://pediatrics.aappublications.org/content/101/1/e3.full.html (accessed on 11 August 2011).

Larson, N.I., Perry, C.L., Story, M. & Sztainer, D. (2006) Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association*, **106**, 2001–2007.

Lyons, A.C. (2004) A profile of financially at-risk college students. *The Journal of Consumer Affairs*, **38**, 56–80.

McLaughlin, C., Tarasuk, V. & Kreiger, N. (2003) An examination of at-home food preparation activity among low-income, food insecure women. *Journal of the American Dietetic Association*, **103**, 1506–1512.

Meldrum, L.A. & Willows, N.D. (2006) Financial insecurity in university students receiving financial aid. *Canadian Journal of Dietetic Practice and Research*, **67**, 43–46.

Mercille, G., Receveur, O. & Potvin, L. (2012) Household food insecurity and Canadian Aboriginal women's self-efficacy in food preparation. *Canadian Journal of Dietetic Practice and Research*, **73**, 134–140.

Murphy, J.M., Wehler, C.A., Pagano, M.E., Little, M., Kleinman, R.E. & Jellinek, M.S. (1998) Relationships between hunger and psychosocial functioning in low-income American children. *Journal of the American Academy of Child and Adolescent Psychiatry*, **37**, 163–170.

Nord, M. & Prell, M. (2007) Struggling to feed the family: what does it mean to be food insecure? *Amber Waves*, **5**, 32–39.

Patton-López, M.M., López-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**, 209–214.

Pinto, M.B. & Mansfield, P.M. (2006) Financially at-risk college students: an exploratory investigation of student loan debt and prioritization of debt repayment. *NASFAA Journal of Student Financial Aid*, **36**, 22–32.

Powers, L. (2012) Campus food banks help students through tough times. USA Today, February 26. [WWW document]. URL http://usatoday30.usatoday.com/news/education/story/2012-02-26/campus-food-banks/53259836/1 (accessed on 9 July 2013).

Robb, C.A. (2011) Financial knowledge and credit card behavior of college students. *Journal of Family and Economic Issues*, **32**, 690–698.

Robb, C.A. & Pinto, M.B. (2010) College students and credit card use: an analysis of financially at-risk students. *College Student Journal*, **44**, 823–835.

Rondeau, K. (2007) Hunger on campus: understanding food insecurity in post-secondary students. Alberta Centre for Active Living. [WWW document]. URL http://www.centre4activeliving.ca/publications/research-update/2007/jun-hunger.pdf (accessed on 15 July 2013).

Rose, D. (1999) Economic determinants and dietary consequences of food insecurity in the United States. *The Journal of Nutrition*, **129**, S517–S520.

Sallie Mae. (2009) How undergraduate students use credit cards. Sallie Mae's National Study of Usage Rates and Trends. [WWW document]. URL http://salliemae.com/about/news_info/research/credit_card_study (accessed on 10 January 2010).

United States Department of Agriculture Economic Research Service. (2013) Food security in the U.S.: Survey Tools. [WWW document]. URL http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#.UeG0G1OE4m1 (accessed on 13 July 2013).

Worthy, S.L., Jonkman, J. & Blinn-Pike, L. (2010) Sensation-seeking, risk-taking, and problematic financial behaviors of college students. *Journal of Family and Economic Issues*, **31**, 161–170.