

Coming to College Hungry: How Food Insecurity Relates to Amotivation, Stress, Engagement, and First-Semester Performance in a Four-Year University

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Abstract

This exploratory inferential, single-university study (N=700) joined institutional, external, and survey data to examine how first-year students' food insecurity links to non-cognitive attributes, first-semester performance, and persistence. Regressions indicate LGBTQ, multi-racial, international, transfer, and first-generation students exhibit increased food insecurity. Food insecurity linked with psychological distress, financial stress, amotivation, and intent to engage with peers but not to faculty, staff, and academic engagement. Food insecurity is also associated with lower first-semester grade point average and credits earned. Findings strengthen limited evidence that food insecurity links to both college students' experience and outcomes, suggesting groups of already-underserved students may need immediate support to ease food insecurity. The 6-item United States Department of Agriculture food security scale should become a standard part of arrival at college to help universities provide early support.

Keywords: student development; first-year students; food security; non-cognitive attributes; performance and persistence

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For decades, K-12 researchers and policymakers have focused on food insecurity, finding that food insecure students exhibit more distress, experience increased health and behavioral issues, are less engaged, and achieve at lower levels than food secure students (Alaimo et al., 2001). Higher education researchers and institutions have lagged in understanding food insecurity among college students (Cady, 2014). Noting this gap, researchers have begun to conduct descriptive studies to capture the extent of food insecurity that students face and to identify which observed factors correlate with college student food insecurity (Broton et al., 2018; Martinez et al., 2017). National surveys indicate that for two-year institutions, 54% of students report *any* degree of food insecurity; while in four-year institutions, 48% of students report *any* degree of food insecurity and 22% report the highest level (Goldrick-Rab et al., 2018). Concomitantly, limited peer-reviewed published studies illustrate correlations between food insecure students' non-cognitive attributes (Mukigi & Brown, 2018) and academic outcomes (Collier et al., 2020; Patton-López et al., 2014). Food insecurity is increasingly a focus for institutional dialogue and sometimes programming, but practitioners and policymakers currently have minimal information about how food insecurity relates to student non-cognitive attributes, behaviors, and ultimately performance-related outcomes. Our research extends what is known about who reports food insecurity and how food insecurity links to university student motivation, stress, engagement, and first-semester outcomes by examining the following research questions:

1. What demographic factors correlate with food insecurity intensity?
2. Does food insecurity link to amotivation, financial stress, and psychological distress?
3. When controlling for student demographics and non-cognitive attributes, does food insecurity relate to incoming college students' intent to engage?
4. When controlling for student demographics and non-cognitive attributes, does food insecurity relate to first-semester performance and to persistence?

Better information on what groups of students experience food insecurity, how food insecurity relates to non-cognitive characteristics, and how food insecurity relates to academic outcomes can inform the design of college and university programming to alleviate campus food insecurity.

Literature Review

Defining Food Insecurity in the U.S.

Most U.S. households (87%) are food secure, meaning most American households have immediate access to “enough food for an active, healthy life” (U.S. Department

of Agriculture, 2018). However, 13% still struggle, with 6.3 million households (5% of U.S. households) experiencing the highest degree of struggle: *very low food security*. Very low food secure households report consistent worries about having enough food and not having money to replenish food. The U.S.'s National School Lunch Program serves children in primary and secondary education to supplement basic food needs, which are correlated with development, health, motivation, and academic performance (Faught et al., 2017; Maroto et al., 2015).

Food Insecurity and College Students

During the same time that researchers documented food insecurity's connections with K-12 students' non-cognitive behaviors, health, and academic performance, postsecondary education was expanded to serve more lower- to middle-socioeconomic status (SES) students – primarily through the Higher Education Act of 1965 (Cervantes et al., 2005) and subsequent reauthorizations. As many less economically- and socially-advantaged students flowed into postsecondary education, systems and institutional actors have been slow to comprehend and respond to these students' needs, especially income-based and basic needs (Goldrick-Rab, 2016).

College student food insecurity is substantially more prevalent than was previously imagined (Gaines et al., 2014; Hagedorn & Olfert, 2018). National survey research and meta-analytic synthesis across institutional studies of food insecurity align on estimates that almost half of the students attending four-year institutions are experiencing *any degree* of food insecurity, with 13% experiencing marginal security, 14% low security, and 22% very low security (Goldrick-Rab et al., 2018). The extent of food insecurity is staggering, as is the typical severity.

Although the prevalence of food insecurity is increasingly studied in the college setting, most studies do not also examine much about which student groups experience greater food insecurity or how food insecurity relates to student experiences and outcomes. Across 12 studies included in a literature review and a meta-analysis of postsecondary food insecurity research in the United States, only a minority examined the predictors of food insecurity. Four studies examined differences by race, three found that students living with their parents were more food secure than students living on or off-campus by themselves, and two found that students who were financially independent or working 20+ hours per week were more likely to be food insecure (Mukigi & Brown, 2018; Nazmi et al., 2018).

In decades-late emulation of K-12 work, researchers and practitioners have pivoted away from considering only academic readiness and toward investigating how socio-economic and non-cognitive factors impact engagement and performance (see Bowman et al., 2019). Researchers have examined a broad range of non-cognitive factors' impacts on student behavior, performance, and persistence (see Solanki et al., 2020), with varied results for constructs including but not limited to: motivation (Warden & Myers, 2017), peer-engagement and faculty and staff relationships (Brooman & Darwent,

2014), psychological distress (Qamar et al., 2014), and financial distress (Lim et al., 2014). Furthermore, prior studies explored how demographic and economic factors predict non-cognitive concepts, but typically compared students with and without ‘financial need’ rather than examining more granular distinctions within need (see Bean, 2005; Boatman & Long, 2016; Bowman et al., 2019). Until recently, researchers and practitioners were missing an explicit understanding of college students’ basic needs.

Studies including college student food insecurity have generally not made connections to students’ non-cognitive attributes and or connections to student engagement. Therefore, a more comprehensive look at multiple non-cognitive and behavioral measurements should prove valuable in helping researchers, institutional policymakers, and staff better understand the descriptive attributes of incoming students. Likely, a more informed understanding can provide important policy and practice context as universities generate interventions that consider how food insecurity relates to psycho-social and performance-related outcomes.

Guiding Framework

Our data collection was conceptually guided by Tinto’s (1993) *Framework of Student Departure* in that we used this widely popular model as a roadmap to guide which non-cognitive attributes and behaviors we should capture. Succinctly summarized, the framework suggests that the combination of students’ pre-entry attributes (e.g., prior achievement, race, and financial support) is correlated to college-related motivation, which influences social and academic engagement. Students who can successfully socially/academically integrate have college-related motivations reinforced, which then results in stronger academic performance and ultimately persistence. Guided by Tinto, we captured students’ levels of amotivation, cognitive engagement, and intent to engage with peers, faculty, and staff. We also chose Tinto’s framework for this study due to the inclusion of *incongruence*: the failure of institutions to meet students’ needs creates a lack of fit between students and the institutions they attend (Tinto, 1993). Contemporary trends illustrate that the postsecondary system and institutions have a long way to go to align with the needs of less advantaged students; nationally, low-SES (12%) and middle-SES (28%) students earn Bachelor’s degrees in six years at significantly lower rates than high-SES students, 60% of whom graduate in the same period (Kena et al., 2016).

Tinto has long been adamant that incongruence results from institutions failing to meet the explicit needs of the students who depart, and that departures do not generally stem from students’ inability to fit into the campus (Tinto, 2006). We agree that student departures generally indicate that institutions have failed to recognize

and adapt to student needs.¹ Incongruence could alternatively be phrased as a student feeling excluded from their ‘institutional habitus’ (Thomas, 2002). Qualitative research confirms that food insecure college students feel insufficiently supported by their institution (Meza et al., 2018). We intend this research to inform institutional stakeholders on how food insecurity links with students’ non-cognitive attributes, social adjustment, and performance; with the substantive goal of informing policy responses that better match the needs of students who are not high-SES.

Subsequent researchers have exposed gaps in Tinto’s (1993) framework, most notably in how Tinto minimizes pre-entry attributes (Bean, 1980; 2005) or situates these attributes as direct influences on motivation but not directly linked to engagement, academic performance, cognitive development, or persistence (Braxton et al., 2014). In part, due to lacking strong definitions of the pre-entry characteristics, the model has been critiqued for an inability to more strongly gauge cultural and racial influences on incongruence (Cerezo & Chang, 2013) or to be more generalizable to non-university institutions like community colleges (Cabrera et al., 1993). With issues noted, the study’s site institution is aligned with the type of university the model favors. Furthermore, the model is one of the most universally cited and has brought to the field a common understanding of concepts that may lead toward student performance and persistence and remains a valuable, if imperfect, guidepost on which non-cognitive factors may be relevant to student success (Braxton et al., 2014).

Due to the aforementioned gaps, although we modeled our survey instrument after Tinto’s (1993) foundational work, our analyses were empirically guided by a recent model generated by Bowman and associates (2019) which we refer to as the Bowman Model. The Bowman model is borne from a recent study that aimed to test how non-cognitive factors, directly and indirectly, influence first-year college persistence. The Bowman model was generated with a large sample of over 10,000 students enrolled at 16 institutions with variation across features (like enrollment); the authors argued these factors provide strength to the causal model. Overall, the model illustrated that students’ incoming (to college) financial means, non-cognitive attributes, and social adjustment (engagement) are significant influences on college GPA and first-to-second year retention. More specific to our study, the Bowman model also illustrated that financial means² impact first-year students’ non-cognitive attributes, social adjustment, commitment to the institution, college GPA, and persistence (Bowman et al., 2019). Follow-up testing of the Bowman model illustrated the structure’s robustness and that

1 Our approach is not inconsistent with framing of Alaimo (2005) used in several food insecurity studies. This framework focuses on food management decisions, which places more blame on food insecure students than we deem appropriate, but food security status can be improved not just through self-reliant measures but also through institutional support. Our alignment with the Alaimo (2005) framing is in the need for increased institutional support for food insecure students.

2 Financial Means as measured in the Bowman Model is a measurement of financial stress.

including food security within the financial means variable influenced measurements of social adjustment, and first-year college performance and persistence (Collier et al., 2020). The Bowman model provided us the rationale for why we should conduct additional analyses between financial means, in this case, food security, and students' non-cognitive attributes and social behaviors. An important note is that we did not explicitly test the Bowman model, as at the time of constructing this manuscript, we did not have access to persistence into a second year of college (nor was testing Bowman one of our research questions). However, we believe our descriptive study provides valuable information to researchers and practitioners.

Methodological Approach

Site and Sample

This study was conducted at Western Michigan University (WMU)³ as part of an ongoing campus-wide success initiative, called Success at WMU, at this four-year, predominantly White, urban-placed, high-research institution.⁴ The team was granted access to institutional data for all incoming (beginning and transfer) fall 2018 students. Each of these students was invited to engage with the survey, with a mixed incentive structure. The first seven participants to complete the survey were provided a \$20 gift card; the next hundred completers were awarded \$10 gift cards. All completers were automatically enrolled in a lottery-style drawing where students were offered gift cards worth up to \$100(4). To encourage participation, students were offered another \$1,500 worth of smaller amounts of gift cards ranging from \$50 to \$10. Survey data were collected in September 2018, with $N=700$ (15% population response rate) useable survey profiles, with less than 20 other students beginning the survey but not finishing it. First-semester performance and persistence data were collected at the end of January 2019, past the institutional census date to ensure accurate persistence rates. See Table 1 for sample descriptive statistics.

Compared to the population of incoming students, our respondent sample is statistically higher-performing determined by high school GPA (3.52 vs. 3.36), has a higher percentage of female students (62% vs. 49%), and a higher percentage of persons of color (38% vs. 32%). However, the respondent sample is statistically similar in permanent residency adjusted gross income (AGI; \$68,000 vs. \$72,000), residency urbanicity percentage (83% vs. 82%), and high school free and reduced lunch (FRL) percentage (31% vs. 30%).

3 We have IRB approval to identify the institution.

4 This institution enrolls about 100 Kalamazoo Promise students per cohort; however, we have a limited sample ($N=25$) of these students in this sample and do not examine them separately.

Table 1. Respondent Sample Percentages and Means

Variable	%	Variable	Mean
Female	61.7	High School GPA	3.52
LGBTQ	14.6	Residency AGI	\$69,796.00
African American/Black	9.7	High School FRL %	31.31
Latinx	10.9	Fall '18 College GPA	3.23
Two or More Races	4.8	Fall '18 Credits Earned	15.73
American Indian/Alaskan Native	0.3	Survey Constructs	
Asian	3.8	Amotivation	1.61
Hawaiian	0.1	Peer-Group Engagement	3.90
International Student	7.6	Faculty Interactions	4.28
Transfer Student	27.1	Staff Interactions	4.20
Have Children	1.0	Cognitive Engagement	4.15
First Generation	43.3	Financial Stress	2.99
Self-Affirm Pell	32.6	Psychological Distress	2.56
Fall '18 Probation Status	8.3	Conscientiousness	3.83
Enrollment into Spring '19	92.6		
Food Security			
High	57.7		
Marginal	13.9		
Low	18.0		
Very Low	10.4		

Data Sources

Administrative data. Institutional Research provided the following data: demographics (race/ethnicity, gender, age, international status, transfer status), prior academic achievement (high school GPA), college performance (term GPA, term credits earned, and spring enrollment), high school code, and zip code of permanent home address. To generate proxies for family financial data,⁵ we accessed Zip Code Tabulation Area (ZCTA, U.S. Census Bureau, n.d.), Statistics of Income database (SOI, U.S. Internal Revenue Service, n.d.), and Common Core of Data (CCD, U.S. Department of Education, n.d.) data. Using these databases, we respectively joined the urbanicity percentages and average AGI to permanent resident zip codes, and the FRL percentages of the high schools.

⁵ Citing federal regulations, the Financial Aid Office was unwilling to provide to us any financial indicators—even after the students consented to allow for the use of those data in this study.

Survey. The 68-item instrument was developed specifically for our data collection and combined several validated scales or subscales. To supplement institutional data and further strengthen financial proxies, we also added individual items that allowed participants to self-report: (1) gender, (2) sexuality, (3) Pell receipt, (4) number of children, and (5) highest level of guardian(s) education. For parental education, if neither guardian had a Bachelor's degree we coded a variable denoting first-generation status. Next, the instrument used 10 previously-validated scales to capture non-cognitive measurements. Means were calculated based on available responses if one question was skipped (or two, for the larger scales). This produced scale means for all 700 surveys for each psychosocial construct except food insecurity.

Motivation and Focus. First, we used a subscale in the Academic Motivation Scale for college students (AMS-C) to capture levels of amotivation (Vallerand et al., 1992). Amotivation is a perceived lack of autonomy or control, coupled with a lack of focus and of understanding of why one is engaged in a task or working towards a specific goal (Ryan & Deci, 2000). In this instance, amotivation is framed as lacking autonomy in college or not seeing the benefit of working towards degree attainment. Prior research has demonstrated that amotivation is negatively correlated with extrinsic motivation, suggesting students with elevated levels of amotivation are less able to identify behaviors that lead to achieving a goal (Collier et al., 2019). Additionally, amotivation was negatively correlated with engagement and college GPA (Warden & Myers, 2017) and positively linked with stopping out (Collier et al., 2019). The strong reliability in our study sample, $\alpha=.85$, aligns with the reliability found in prior research ($\alpha=.88$, Vallerand et al., 1992).

We then used a subscale from the Big Five Inventory-2 Short form to gauge conscientiousness (Soto & Oliver, 2017). Conscientiousness is the degree to which individuals exhibit focus, show organization, and are goal-oriented (Komarraju et al., 2011). Whereas previous studies usually examine the Big Five together, connections of the omitted four traits to college student performance are mixed. However, conscientiousness often predicts positive learning outcomes and college persistence (Beattie et al., 2018; Komarraju et al., 2011). The scale was reliable in our sample ($\alpha=.76$), though at a lower value than in previous research ($\alpha=.83$; Soto & Oliver, 2017).

Intent to Engage (Social Adjustment). To measure students' intent to engage, we employed peer-group interaction and faculty interaction scales (Pascarella & Terenzini, 1980), and a staff interaction scale created by modifying the faculty interaction scale changing the term "faculty" to "staff". Student engagement should be examined as a multi-dimensional construct consisting of academic and social interactions (Gunuc & Kuzu, 2015; Kuh et al., 2007). The examination of students' interactions with peers and the construction of peer social networks has long been a focus of student performance and persistence scholars. The more time and effort students dedicate to developing quality relationships with peers, the greater sense of belonging and comfort they will typically possess, which should translate into higher academic performance and increased chances to persist (Strayhorn, 2008). Peer-group interactions widely influence

college students' intellectual growth, conceptualizations of self, and identification of behaviors that lead to academic success (Astin, 1993). The peer-group interaction scale was reliable at $\alpha=.86$ in our sample, which is consistent with prior research ($\alpha=.84$, Pascarella & Terenzini, 1980).

Often, the relationships students have with faculty and with staff are lumped together. Because of the evolving roles of faculty and staff, we opted to examine the intensity of students' intent to engage with each group separately, as they may differently relate to students' experiences and performance. Institutional decisions to hire increased part-time and adjunct faculty have arguably diminished faculty's role in student engagement and success (Kezar & Maxey, 2014). Concurrently, institutions became more reliant on student services and academic affairs staff to fill the void (Sandeen & Barr, 2014). As most positions within student affairs focus on identifying and serving students' needs, staff are well-positioned to build strong student relationships and advocate for institutional adaptation to suit student's needs (Quaye & Harper, 2014). Stronger relationships with staff have been linked with increased college GPA and a lower likelihood of stopping-out (Collier et al., 2019). However, relationships with faculty remain important to student performance and persistence (Tinto, 2006). The faculty interaction scale was reliable at $\alpha=.85$ in our sample, as in prior research ($\alpha=.85$; Pascarella & Terenzini, 1980). The staff interaction scale—which does not have prior reliability, because we created it by replacing “faculty” with “staff” in the items for faculty engagement—was reliable at the same level of $\alpha=.85$ in our sample.

Intent to Engage (Academic Readiness). The remaining engagement scale captures students' self-perceived cognitive engagement (Gunuc & Kuzu, 2015). Cognitive engagement measures students' attitudes and considerations towards their learning, indicating a degree of readiness to meet the academic challenges of college. Cognitive engagement is correlated to attending and engaging in class (Gunuc & Kuzu, 2015), as well as to increased engagement with peers and institution staff, and lower amotivation (Collier et al., 2019). The cognitive engagement scale is reliable at $\alpha=.85$ for this study, slightly lower than previously found ($\alpha=.91$; Gunuc & Kuzu, 2015).

Psychological Distress and Financial Stress. Additionally, we used the Kessler K-6 psychological distress scale (Kessler et al., 2002) to gauge students' general mental well-being. The K-6 was reliable at $\alpha=.88$ in our sample, consistent with prior research ($\alpha=.93$; Kessler et al., 2002). Researchers and institutional staff have become increasingly interested in and reactive to college students' mental well-being (Chessman & Taylor, 2019), with good reason, as earlier studies illustrate increased psychological distress is linked with lowered help-seeking behaviors (Ryan et al., 2010) and lower academic performance (Stallman, 2011).

Another element of distress we measured was financial, using Lim et al.'s (2014) financial stress scale ($\alpha=.83$), reliable in this study at $\alpha=.89$. Financial need and associated stressors are dominant sources that students cite as influencing engagement, performance, and persistence (Breier, 2010; Goldrick-Rab, 2016; Robb et al., 2012).

Financial stress is not necessarily correlated with the quantity of debt one possesses. Often, students envision financial stress connected with the *idea* of debt and not debt relative to a comparative, quantitative standard. Students who enter college with less economic capital often experience systematic discrimination based on social class (Langhout et al., 2006), and the financial stress these students experience shapes their ideas of who belongs at what type of institution (Ostrove & Long, 2007). Similar to psychological distress (see Chessman & Taylor, 2019), financial stress is tied with reduced self-efficacy, reduced help-seeking behaviors, and retreating from social and academic engagement (Lim et al., 2014).

Food Security. Finally, we used the USDA short food security scale (U.S. Department of Agriculture Economic Research Service, 2012) which is often employed by researchers examining college student food insecurity (see Goldrick-Rab et al., 2018; Nikolaus et al., 2020). The scale is reliable in this study at $\alpha=.88$. Scoring for this scale is based on the number of affirmative responses, and the categorizations are as follows: 0 = *High Food Security*, 1 = *Marginal Security*, 2-4 = *Low Security*, 5-6 = *Very Low Food Security*. The USDA (2018) considers those with Marginal Security to be food secure; the categorization illustrates anxiety over the amount of food available but limited changes to diet or food intake. Due to the distress and anxiety students may experience, we included “marginal security” in reports of *any* degree of food insecurity, but also report categories of severity. In our regressions, food security is measured by the four labeled bins and not a 0-6 affirmative scale.

Analytic Strategy

We employed multivariate linear regressions using ordinary least squares (OLS) to explore observable characteristics that predict non-cognitive measures, and how both observables and non-cognitive constructs predict performance. Before engaging these regressions, we generated a correlation matrix (Table 2) to see whether survey constructs or our financial proxies were collinear. Although arguments remain as to the appropriate cut off-point related to coefficients, a widely accepted point is at $r=.80$ (Licht, 1995)—which none of our variables breach. However, the correlation between faculty and staff interactions is very close ($r=.77$). While the connection between interaction with faculty and staff remains strong, for reasons we listed above—in that these institutional employee groups are unique and may serve students in different ways—we opted to keep both in the regressions. The conceptual model for each outcome (continuous or binary) is:

$$Y = \beta_0 + \beta_1 F_1 + \beta_2 \mathbf{A} + \beta_3 \mathbf{B} + \beta_4 \mathbf{C} + \varepsilon$$

where \mathbf{A} is a matrix of student characteristics, F is food insecurity, \mathbf{B} represents psychological distress and financial stress, and \mathbf{C} is a motivation (present in models predicting other psychosocial constructs). We use OLS in all cases, meaning that the binary outcomes are analyzed in the linear probability model (LPM) rather than in logistic or probit regression. We do this so that the coefficient for our single binary outcome is

comparable to the coefficients for our 11 continuous outcomes. The LPM is positively regarded because coefficients are easily interpreted as probabilities (Gomila, 2020; Hellevik, 2009), it is less sensitive to omitted variables, and allows for easier coefficient comparison across models and samples (Mood, 2009). LPM coefficients only differ by a little from marginal effects in logit or probit models with the same covariates (Holm et al., 2015); as a result of its combination of advantages, the LPM is in increasingly common use (Breen et al., 2018).

Missing Data. We dealt with missing data on covariates by using missing flags (also called the dummy variable adjustment method). That is, we created a new binary variable where cases not missing responses were coded with 0=not missing, and responses missing on the pertinent covariate were coded 1=missing on the new variable. Then, we generated a copy of the original variable in which missing values were replaced with zero values (after confirming that the missingness was at random). The dummy variable adjustment method is a common method for dealing with missing data and is beneficial for retaining sample size (Allison, 2002, 2010; Puma et al., 2009). Furthermore, this technique can be widely found in published education and higher education-focused research (Adamecz-Völgyi et al., 2020; Crawford & Erve, 2015; Fitzpatrick, 2019; Marcenaro-Gutierrez et al., 2016; Whitaker et al., 2019).

Table 3 presents models for outcomes of food insecurity, financial stress, and psychological distress, with student characteristics as predictors. Table 4 presents models in which food insecurity is a predictor for outcomes of amotivation, conscientiousness, and engagement. Table 5 reports models of how student demographics and psychosocial variables correlate to fall 2018 college GPA, fall 2018 credits earned, and enrollment into the spring 2019 semester. Although the outcome of being enrolled in the spring 2019 semester is binary, recall that we apply a linear regression method so that coefficients are more consistent with the rest of our models (which have continuous outcome variables). Our sensitivity analyses using logit and probit models produced similar estimates and aligned conclusions.

Findings & Discussion

Descriptively, 42% of participants reported experiencing *any* degree of food insecurity, with 18% reporting “Low” and 10% “Very Low” food security. Our overall responses mirror those found by Goldrick-Rab et al. (2018), who found 48% of students in four-year institutions report *any* food insecurity. However, a lower percentage of respondents indicated having “Very Low” security (10% vs. 22%). Our participants, on average, hail from neighborhoods with median family incomes around \$70,000, noticeably higher than national (\$60,336) and state (\$54,909) means (U.S. Census Bureau, 2018)—which may explain why a lower percentage of our sample experienced the harshest level of food insecurity.

Table 2: Correlation Matrix (Pearson's Correlation)

1: Food Insecurity																						
2: First Generation	.17																					
3: Pell Affirmation	.16	-.21																				
4: Amotivation	.15	-.02	.00																			
5: Conscientiousness	-.05	-.06	-.06	-.12																		
6: Financial Stress	.40	.21	.20	.09	-.05																	
7: Psychological Distress	.23	.04	.06	.24	-.10	.39																
8: Cognitive Engagement	.04	-.02	.00	-.25	.51	.02	-.09															
9: Peer Group Interaction	-.18	-.09	-.07	-.20	.21	-.12	-.22	.34														
10: Faculty Interaction	-.09	-.02	-.02	-.18	.22	-.02	-.04	.38	.39													
11: Staff Interaction	-.06	-.03	-.03	-.15	.21	-.04	-.02	.35	.41	.77												
12: High School GPA	-.15	-.13	.02	-.05	.00	-.05	.01	.05	.05	.07	.05											
13: Fall Credit Attempted	-.17	-.14	.01	-.04	-.03	-.12	-.01	.03	.11	.07	.06	.34										
14: H.S. Free-Reduced Lunch %	.14	.05	.10	.00	-.01	.14	.07	.01	-.06	-.01	.01	.02	-.13									
15: Zip Code AGI	-.13	-.03	-.07	.05	-.05	-.15	-.01	-.07	.06	-.01	-.07	-.06	.10	-.52								
16: Zip Code Urbanicity %	.06	-.01	.02	.01	-.02	.06	-.01	.07	-.04	-.07	-.04	-.07	.00	.04	.05							

Note. Bolded coefficients are statistically significant at $p \leq .05$

Additionally, 29% of respondents reported knowing where the campus supports to ease food insecurity are. Yet, just 3% of participants indicated using any campus or community supports.⁶ The gap between awareness and uptake is endemic to food insecurity (Zein et al., 2018). Here, stakeholders could potentially be more proactive in informing students about campus and community supports—like campus Invisible Need pantries or emergency grants—and encouraging students to connect with financial aid representatives to explore whether they would qualify for Supplemental Nutrition Assistance Program (SNAP) or other governmental benefits. Potentially, a targeted nudging campaign helping food insecure students seek out supports that are already in place could be valuable, as similar interventions have influenced student behavior regarding financial aid processes (Castleman & Page, 2016)⁷ and exploratory evidence from a random assignment study suggests that email nudges *may* help ease first-year students' food insecurity (Fitzpatrick et al., 2021).⁸

In many respects, our findings align with theoretical and empirical predictions, but the sections below provide important nuance. Historically-marginalized groups show elevated food insecurity, but at different levels based on observable student characteristics. Food insecurity negatively predicts several—but not all—of the other amotivation, stress, and engagement measures. Food insecurity and amotivation both relate to lower GPA and credits earned, but not to persistence.

Predictors of Food Insecurity

Students from historically less advantaged groups show higher food insecurity.⁹ Being first-generation ($B=.22$), identifying as LGBTQ ($B=.26$), being a transfer student

6 We recognize that 3% is about what would be expected from two unconditional probabilities, with 10% of students experiencing very low food security and 29% of students aware of campus resources. However, (a) campus food resources could help students experiencing low food security and even marginal food security, (b) ideally, campus resources should reach all students experiencing at least low food security, and (c) 3% represents a distressingly low uptake rate when 42% of students report *any* degree of food insecurity.

7 Sara Goldrick-Rab, Lindsay Page, Bruce Sacerdote, Benjamin Castleman, and Neil Seftor presented early findings to the Society of Research Educational Effectiveness (SREE) national conference in 2019 of nudges for food-related supports, similar to our suggestion. However, presenters asked that attendees not cite the early findings. We present this information to readers so that future researchers and practitioners may seek out the eventual publicly-available paper.

8 The authors expressed strong caution regarding these findings given the use of imputed data – therefore we emphasize “*may*.”

9 Note that we replicate some outcome analyses with food security instead operationalized as a 4-level categorical variable (i.e., 3 dummy variables). Those results are consistent in their conclusions. Example point estimates are discussed in the First-Semester College Performance and Persistence subsection.

($B=.39$), an international student ($B=.53$), or of Two or More Races ($B=.57$) all correlated with increased food insecurity in regressions. These coefficients mean a difference of about a quarter to a half a level (on average) on the USDA scale, e.g., 22-57% of the difference between marginal and low or between low and very low food security (because the standard deviation on the food insecurity scale is 1.08, the point estimates are not too dissimilar from effect sizes). We are unsurprised at the relationship between food insecurity and first-generation student status, noting the breadth of studies illustrating the socioeconomic hurdles first-generation students usually face (Goldrick-Rab, 2016) and national findings illustrating a higher percentage of first-generation students experience food insecurity (Goldrick-Rab et al., 2018). This finding remains an important reminder that while postsecondary institutions have welcomed many first-generation students—who constitute 43% of this study's sample—institutional understanding of these students' situations and needs seemingly remains insufficient. Further study of the relationship between first-generation college students and food insecurity is needed. We are unable to conclude whether the lack of relationship between having one or more children and (elevated or decreased) food insecurity is indicative of, e.g., the success of non-University programs targeting maternal and infant health such as the Women, Infants, and Children special supplemental nutrition program (WIC), or another reason; this group also showed relatively large variation in their reported food insecurity.

Next, our study was fortunate in that 15% of our sample self-identified as LGBTQ. Given the LGBTQ community's well-documented struggles with food insecurity (and financial stress; Badgett et al., 2013), our aligned finding in the higher education context was new but unsurprising. As researchers continue to explore who experiences food insecurity in college, outreach to LGBTQ students may be important, and, for practitioners, more resources (such as food or food grants/subsidizes) should be diverted to institutional units explicitly serving LGBTQ students.

Concerning transfer students' elevated food insecurity, without institutional data on where transfer students flowed into WMU from, we are unable to ascertain whether these students enrolled into WMU from a community college or another four-year institution. Given that community college students are generally from lower-SES families and are more likely first-generation, as compared to students enrolled in four-year institutions (Ma & Baum, 2016), the type of originating institution likely matters when examining food insecurity in transfer students. Transferring between institutions is a pathway commonly traveled by less advantaged students (Goldrick-Rab & Pfeffer, 2009). Descriptively, compared to non-transfer students, transfer students in our sample attended high schools with higher FRL% (33% vs. 29%, $p<.001$). FRL is a proxy for both academic and economic (dis)advantages (Domina et al., 2018). Moreover, a greater percentage self-reported Pell eligibility (41% vs. 31%, $p=.02$) and reported having children (29% vs. 12%, $p<.001$). Compared to non-transfers, transfer students were less academically and financially advantaged in high school, reported being less advantaged in their first semester of college, and a higher percentage were

responsible for children; which, altogether may help explain our findings that these students need additional, immediate support in four-year institutions.

Next, the finding that students identifying as two or more races experience greater food insecurity aligns with a limited but growing body of research on differing types of disadvantage in the transition into college (Klasik, 2012). Earlier peer-reviewed research found that being a student of color correlated with increased food insecurity (see Broton et al., 2018; Morris et al., 2016). Our analyses bring complexity to this framing, as we found no significant correlations with the remaining racial groupings. Possibly, the lack of significant correlations related to other race categories and food insecurity in this study could be because of the inclusion of financially-related proxies not found in previous studies. Arguably, we have stronger student proxies than the Morris and associates' (2016) paper who relied on only self-reported binary responses of receiving support from parents/guardians. Potentially, African American, Latinx, Native, Asian, or other racial minority students may not experience elevated food insecurity *net of* first-generation status, Pell eligibility, home neighborhood urbanicity, and average AGI, high school GPA, and high school FRL. Although Broton et al. (2018) obtained particularly useful individual student-level data from the FAFSA (e.g., expected family contribution [EFC], dependent status), their analyses do not shed light on differences among racial minority groups, as they collapsed racial minorities into a single group. To be noted, our sample sizes for American Indian/Alaskan Native and Hawaiian students are limited to the point where many researchers would drop these students from the models. However, we felt the inclusion of these groups were warranted for two core reasons: (1) they deserve unique representation and consideration, rather than having their experiences dis-included from our analyses and (2) while we cannot say much about these groups, their inclusion may help others identify future trends, including in meta-analytic estimates aggregating findings for these under-studied groups.

Finally, supporting emergent research (Zein et al., 2018), our model illustrates that being an international student ($B=.53$) correlated with higher food insecurity. International students come to U.S. campuses facing a variety of financial and social disadvantages and their needs are often not well understood (Lee & Rice, 2007; Poyrazli & Grahame, 2007). These students often remain underserved, despite having dedicated international student services units on many campuses (Collier & Hernandez, 2016). In conjunction with Zein and associates (2018), our findings illustrate that the food insecurity of international students should be a pressing concern for campuses and international student service units, requiring more attention from the research community. Given that international students show food insecurity a half-category greater than their peers, it may be appropriate for institutions to implement programming or at least outreach specific to this population.

Table 3: Linear Regressions Predicting Food Insecurity, Financial Stress, and Psychological Distress

	Food Insecurity		Financial Stress		Psychological Distress	
	B	S.E.	B	S.E.	B	S.E.
Food Insecurity			.31***	.04	.15***	.04
Female	.05	.08	.31***	.07	.24***	.07
LGBTQ	.26*	.10	.31**	.09	.69***	.09
African American/Black	.22	.15	-.07	.14	.10	.12
Latinx	.02	.13	.14	.12	-.02	.11
Two or More Races	.57**	.19	.11	.17	.36*	.15
American Indian/Alaskan Native	.23	.73	1.06	.66	.62	.59
Asian	-.01	.21	-.13	.18	-.12	.16
Hawaiian	2.01+	1.05	.60	.95	.96	.84
International Student	.53**	.20	-.26	.18	.09	.16
Transfer Student	.39***	.10	.14	.14	.10	.12
Have Children	-.21	.23	-.12	.21	-.44*	.18
First Generation	.22*	.09	.23**	.08	.03	.07
Pell Affirmation	.19+	.10	.15+	.09	-.01	.08
High School GPA			.00	.07	.06	.06
FRL%	.00	.00	.00	.00	.00	.00
Home AGI	-.00	.00	-.00	.00	.00+	.00
Urbanicity	.00	.00	.00	.00	.00	.00
Constant	.57	.30	2.28	.38	2.19	.33
Adjusted R ²	.09		.22		.17	
N	700		700		700	

Note.

+ $p \leq 0.10$, * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Food Insecurity-Psychosocial Relationships

Next, we examined food insecurity's relationships with students' non-cognitive attributes. Aligning with prior suppositions of college student food insecurity (Cady, 2014; Patton-López et al., 2014), Table 3 reveals that food insecurity correlated with increased financial stress ($B=.31$) and psychological distress ($B=.15$). Food insecurity's connection to financial stress and psychological distress are expected but still important findings, as both non-cognitive factors are related to students exhibiting lower self-efficacy, help-seeking behaviors, motivation, and desire to engage (Lim et al., 2014; Ryan et al., 2010). Moreover, financial needs and associated stressors are widely cited by students for stopping out of college (Goldrick-Rab, 2016).

Furthermore, as shown in Table 4, when controlling for financial stress and psychological distress, food insecurity was a significant predictor of amotivation ($B=.08$). Guided by prior K-12 studies, we would expect to see this correlation (Cady, 2014). Given that the magnitude of this relationship is just over 0.10 standard deviations on the amotivation scale, and that food insecurity is malleable whereas amotivation is relatively fixed, our findings emphasize the importance of food insecurity as an avenue for ameliorating amotivation. However, many higher education studies explore motivation-related concepts divorced from basic needs measures (Beattie et al., 2018; Yeager & Walton, 2011). With multiple causal models indicating that a maintained focus and intention to persist to degree influences persistence (Bowman et al., 2019; Cabrera et al., 1993) and descriptive research illustrating links between amotivation and performance (Warden & Myers, 2017), correlations between food insecurity and amotivation should mean that students who are food insecure early in their time at college may be more likely to stop-out. Therefore, food insecurity represents an immediate threat to first-year students' success—as recently confirmed using structural equation modeling by Collier et al. (2020).

We found food insecurity ($B= -.05$) and psychological distress ($B= -.16$) negatively linked to students' intent to engage with peers—but not with faculty or staff, or in perceptions of being ready to engage academically. These findings displayed in Table 4 lend further credibility to Cady's (2014) suppositions that collegiate food insecurity would relate to students being less able to socially adjust—but only for peer-group engagement. Retreating from peer-group interactions is problematic, as doing so may limit students' intellectual growth, understanding of the informal cultures of the institution, and general comprehension of navigating college (Collier et al., 2019; Kuh et al., 2007; Strayhorn, 2008)—and it is an influential factor of first-year performance and persistence (see Bowman et al., 2019). While the retreat of food insecure students from peer engagement is concerning, food insecurity is not correlated with completely shying away from other important elements of social adjustment. We perceive the non-significant correlation between food insecurity and faculty and staff interaction as an encouraging finding, signaling that institutional employees should be well-positioned to help food insecure students, with whom they should still be able to build strong relationships.

Similarly, the lack of a relationship between food insecurity and cognitive engagement is hopeful, as food insecure students signal a persistent readiness to academically engage—which should mean they are just as likely as food secure students to come to classes (Gunuc & Kuzu, 2015) and that these students are likely to remain in (physical or virtual) proximity to instructors who could potentially help. There has been a recent movement for instructors to include a basic needs statement on syllabi (Berman, 2017), that emanated from Goldrick-Rab's (2017) suggestion. Given that food insecure students appear just as likely as food secure students to engage with academic materials and in class, the inclusion of this (or a similar) basic needs statement may be one proactive and low-touch way for faculty to help ease students' food insecurity—and could help build stronger relationships between faculty and students.

Our descriptive findings are critically important in understanding how deep the tendrils of food insecurity permeate students' distress, motivation, and social adjustment. Moreover, the prevalence of relationships that we find aligns with the overall conclusions of the Bowman paper: both that non-cognitive attributes are influenced by financial stress (here superseded by the narrower measure of food insecurity) and that non-cognitive attributes and pre-arrival traits matter to college success. Overall, our results also signal that stabilizing students' food insecurity could ease students' mental distress and bolster motivation and elements of social adjustment.

First-Semester College Performance and Persistence

Finally, in what we believe to be the third contribution to the limited but growing peer-reviewed literature, we consider how food insecurity relates to first-semester academic outcomes and persistence into the spring semester. Table 5 reveals that controlling for prior performance, student characteristics, and non-cognitive attributes, food insecure students show lower fall 2018 GPA ($B = -.07$), lower fall 2018 credits earned ($B = -.52$), and marginally-significant decreased fall to spring retention ($B = -.02$, presented as a beta for comparability with our other estimates because this is our only binary outcome). Therefore, our findings illustrate a relationship between food security and college students' early performance.

Our study produces a different and deeper understanding of the relationship between college student food security and college performance, as we did not make a binary cut-off point for GPA, such as found in Patton-López et al. (2014) who examined only a binary outcome of a GPA of 3.1 or higher. Further, our study also did not generate a binary food secure/insecure binary categorization. Martinez et al. (2017) started with the same USDA scale as we did but collapsed the "low" and "very low" food security buckets into a binary variable, finding the 40% of students meeting their definition of food insecurity to average lower college GPA ($B = -.08$). For both cases, we believe that collapsing these variables was sub-optimal, as valuable information was lost. Our study analyzes the categories as defined by the USDA and finds the same magnitude coefficient between *each level* of food insecurity status. Students with marginal food insecurity are still experiencing some instances of food insecurity, which our study suggests are not the same as students with high food security.

To be certain in our assertion that students with marginal food security are different than those with high security, we replicated our models with food security in respective categorizations (marginal, low, and very low security) using high food secure students as the reference group. We found students with marginal food security were significantly correlated with lower fall GPA ($B = -.23$), fewer fall credits earned ($B = -.60$), and a non-significant lower chance of persistence ($B = -.01$). Therefore, we encourage future studies to not collapse the categories into a binary outcome. By not just replicating the link between food insecurity and lower GPA that Martinez et al. (2017) found, but furthermore showing that more acute food insecurity relates to yet lower GPAs, our work emphasizes the importance of alleviating food insecurity to close first-semester performance gaps.

Table 4: Predicting Amotivation, Conscientiousness, and Engagement

	Amotivation		Conscientiousness		Peer Group Engagement		Faculty Interaction		Staff Interaction		Cognitive Engagement	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Food Insecurity	.08*	.03	-.01	.02	-.05*	.02	-.03	.02	-.02	.02	.03+	.02
Female	-.29***	.06	.13**	.05	.08	.05	.01	.05	.05	.05	.07+	.04
LGBTQ	.17*	.08	-.12+	.06	-.01	.06	.08	.06	.05	.06	.04	.05
African American/Black	.14	.11	.00	.09	-.22*	.08	-.05	.08	-.02	.09	.02	.07
Latinx	.09	.10	-.11	.08	-.01	.07	-.06	.07	-.02	.08	-.13*	.06
Two or More Races	.19	.14	-.08	.11	-.20+	.11	.04	.10	.03	.11	-.15+	.08
American Indian/Alaskan Native	-.65	.54	-.45	.43	-.42	.41	-.13	.39	-.52	.42	-.04	.33
Asian	.20	.15	-.28*	.12	.03	.12	.13	.11	.13	.12	-.01	.09
Hawaiian	.23	.77	.09	.61	-.67	.59	.69	.55	.52	.60	.18	.47
International Student	-.05	.15	.18	.11	.06	.11	.05	.10	.00	.11	.12	.09
Transfer Student	.18	.11	.07	.09	-.40***	.08	.07	.08	-.01	.09	.03	.07
Have Children	-.12	.17	-.02	.13	-.36**	.13	-.16	.12	-.17	.13	-.23*	.10
First Generation	-.08	.07	-.05	.05	-.06	.05	.02	.05	-.01	.05	-.01	.04
Pell Affirmation	-.05	.07	-.02	.06	.05	.05	.00	.05	-.02	.06	.00	.04
Amotivation			-.06+	.03	-.10***	.03	-.12***	.03	-.11***	.03	-.14***	.02
Financial Stress	.00	.03	-.01	.03	.03	.03	.01	.02	-.01	.03	.01	.02
Psychological Distress	.19***	.04	-.05	.05	-.14***	.03	-.01	.03	.01	.03	-.05*	.02
High School GPA	-.05	.06	.05	.18	-.03	.04	.06	.04	.04	.05	.05	.04
FRL%	.00	.00	.00	.00	.00	.00	.00	.00	-.00	.00	.00	.00
Home AGI	.00	.00	-.00	.00	.00	.00	.00	.00	-.00+	.00	-.00	-.00
Urbanicity	.00	.00	.00	.00	-.00	.00	.00	.00	-.00	.00	.00	.00
Constant	1.40	.33	3.93	.26	4.94	.25	4.43	.24	4.53	.26	4.45	.20
Adjusted R ²	.09		.04		.15		.03		.01		.09	
N	700		700		700		700		700		700	

Note.
 + $p \leq 0.10$
 * $p \leq 0.05$
 ** $p \leq 0.01$
 *** $p \leq 0.001$

Table 5: Predicting Fall GPA, Credits Earned, and Fall to Spring Retention

Variable	Fall '18 GPA		Fall '18 Credits Earned		Fall to Spring Retention	
	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>	<i>B</i>	<i>S.E.</i>
Food Insecurity	-.07*	.03	-.52*	.23	-.02+	.02
Female	.30***	.06	.17	.50	.03	.03
LGBTQ	.12	.08	.01	.63	.02	.04
African American/Black	-.62***	.106	-1.30	.87	-.07+	.14
Latinx	-.15	.093	-.90	.76	.01	.11
Other Persons of Color	-.10	.099	-.71	.81	-.05	.12
International Student	.38*	.163	-.15	1.33	.13*	.18
Transfer Student	.30**	.108	-.72	.88	.06	.14
First Generation	-.07	.160	-1.25*	.51	-.10***	.08
Pell	-.01	.063	.10	.55	.02	.08
Amotivation	-.04	.04	-.11	.31	.00	.02
Conscientiousness	.05	.055	-.26	.45	-.01	.06
Financial Stress	-.02	.031	-.02	.26	-.01	.04
Psychological Distress	.01	.037	.20	.30	-.01	.04
Cognitive Engagement	.32***	.075	1.03+	.61	.04	.09
Peer Group Engagement	-.05	.056	-.07	.46	-.03	.06
Faculty Interactions	-.20*	.082	-.17	.67	-.03	.10
Staff Interactions	.08	.075	.41	.61	.04	.10
High School GPA	.34***	.060	4.87***	.45	-.00	.07
Term Credits Attempted	.02**	.01	.09***	.32	.00	.01
High School FRL%	-.06***	.00	-.00	.02	.00	.00
Zip Code AGI	.01	.00	.00	.01	.00	.00
Urbanicity Percentage	-.00	.00	.00	.01	.00	.00
Constant	.65	.46	-2.40	3.72	.64	.25
Adjusted R ²	.26		.30		.05	
N	693		693		693	

We do not yet know if food insecurity would be a significant predictor of students' performance during second semester or regarding the traditional measurement of first-year retention (fall-to-fall enrollment). However, in totality, our findings illustrate the absolute necessity for institutions to capture incoming students' basic needs *immediately* upon students' arrival and respond to students who report food insecurity. If institutions became more proactive in addressing food insecurity, underserved students may experience stronger first-semester performance and potentially persistence. Based

on the observed relationships in this study, addressing food insecurity would likely positively impact other non-cognitive attributes (e.g., lower amotivation and psychological distress). Therefore, meeting students' basic needs at the beginning of college might create direct and indirect improvement in performance and persistence.

Limitations

Although this study furthers the conversation about food insecurity's relationship to college students' non-cognitive attributes and early performance and persistence, it remains subject to several notable limitations. First, this study was conducted at a single institution and may not be easily translatable to dissimilar institutions. Also, the financial aid department at WMU strongly guards financial aid data, which precluded access to any financial aid-related variables. We, therefore, used multiple proxies in our analyses including self-reports of Pell eligibility and level of education of guardian(s), as well as using high school-level FRL and neighborhood data. We were, relatedly, unable to assess whether we experienced non-response bias due to lowest-income students having less available time or less reliable internet access for responding. Our respondent sample was similar to the population on its community-level income measures, but may have differed on individual-level income measures. In combination, the neighborhood variables may serve as strong proxies. More data like EFC, unmet need, and/or loans assumed would be extraordinarily helpful for this type of research (see for example Broton et al., 2018).

Second, several of our models have low adjusted R^2 statistics. For example, models predicting conscientiousness, faculty interaction, and staff interaction all have R^2 at .05 or below. Our study is not unique in this limitation, as recently-published research illustrates similar issues when examining students' non-cognitive attributes and behaviors (see Fosnacht et al., 2018; Graham et al., 2018). The low R^2 values indicate that most of the variance on these non-cognitive characteristics relates to characteristics that are not accounted for by high school performance, institutional and demographic data, high school and neighborhood data, or other non-cognitive factors. Although not ideal, these models are helpful for future researchers, because we have uncovered some elements within available data that do correlate to these outcomes and have unearthed that non-cognitive elements often captured in this type of research may not be impactful to the outcomes examined. Subsequent work will need to identify what characteristics that we did *not* examine relate to variation in students' conscientiousness, faculty interaction, and staff interaction.

Future Research

We believe that our descriptive analysis provides new and valuable information from which future research should be developed. First, we need more information on who *comes* to campus with food insecurity so that proactive interventions can be generated. Given our findings, we hope this study will encourage others to start capturing students'

food insecurity early in students' first semester of college. Furthermore, researchers and practitioners could team up to generate and test the effects of a nudging campaign that may help students engage with supports that could help ease food insecurity—like Invisible Need, on or off-campus food pantries, or financial aid. Lastly, researchers may wish to examine whether and to what extent faculty with basic needs statements are able to help ease food insecurity—and whether that nudge can, in fact, strengthen faculty interactions.

Conclusion

Our analyses provide a multifaceted snapshot of students entering their first semester at a large, predominantly White, regional public university. Findings illustrate that meeting students' basic needs is important, as even students at a high-research university that draws from more-advantaged neighborhoods experience relatively high rates of food insecurity. Food insecurity, combined with the extremely low rate at which students make use of campus resources, emphasizes the importance of programs that reach out to students to immediately identify food insecurity and actively support food insecure students. Additionally, given the prevalence of food insecurity throughout postsecondary education, our analyses illuminate important implications for practice at other institutions. Particularly, we found that food insecurity has relationships with not only financial and psychological stress, but also with intent to engage with peers and amotivation. These relationships imply that interventions aimed at improving engagement and college performance that *ignore* basic needs are less likely to succeed or generate strong impacts.

Universities have not positioned their food insecure students—the nearly 50% of students nationwide that are likely to be experiencing decreased engagement, elevated stress, increased amotivation, and lower performance—to experience success within university-based treatments that assume basic needs are already met. Our study strengthens a growing body of evidence that higher education policymakers cannot assume that students' basic needs are met. Institutions have existing social and service networks for populations that our, and other, research has identified as being at elevated risk of food insecurity. Colleges and universities should consider embedding both information about existing food assistance programming and new programming into those existing channels. These mechanisms could serve, for instance, LGBTQ students, international students, and multi-racial students. Food insecurity is a mutable construct and easy to measure. Therefore, we propose institutions employ the 6-item Food Insecurity (USDA, 2012) scale with all students at the start of fall semester. Potentially, the scale could be employed between the time students are admitted and classes start and promoted by units that specifically identify the students our study suggests would experience elevated higher food insecurity and for on-campus students, leveraging housing staff to encourage participation. This brief scale can identify students at risk of lowered motivation, social adjustment, and performance, who could then be provided (differentiated) targeted supplemental supports.

Potentially, institutions could use text or email-based nudges to help food insecure students find on-and-off-campus supports like Invisible Need or enroll in federal government programs, such as SNAP (see Fitzpatrick et al., 2021)—which goes woefully underutilized by qualifying college students (U.S. Government Accountability Office, 2018). These interventions could also be supported through campus-wide encouragement of instructors including a basic needs statement on syllabi and other low-touch (and low-cost) suggestions such as similar statements on banners or on websites of student service units that serve student groups that exhibit increased food insecurity—such as first-generation, LGBTQ, and international students. Although interventions can and should be adapted to institutional context and student needs, our findings suggest the 6-item food security scale should become a standard part of arrival at college.

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