

## The Long-Term Effect of Food Insecurity During College on Future Food Insecurity



Cindy W. Leung, ScD, MPH,<sup>1</sup> Noura Insolera, PhD, MA,<sup>2</sup> Alicia J. Cohen, MD, MSc,<sup>3,4,5</sup>  
Julia A. Wolfson, PhD, MPP<sup>6</sup>

**Introduction:** Food insecurity has been associated with adverse health and academic outcomes among college students. However, little is known about the long-term impacts of experiencing food insecurity during college. This study examines the impacts of college food insecurity (measured from 1999 to 2003) on future food insecurity (measured from 2015 to 2017) and whether this association differs by economic independence during college.

**Methods:** Data came from 1,508 participants in the Panel Study of Income Dynamics, the longest-running and nationally representative panel survey. Household food security was assessed using the 18-item U.S. Household Food Security Survey Module during college enrollment in 1999–2003 and again during adulthood in 2015–2017. Generalized linear models were used to examine the impacts of college food insecurity on food insecurity in adulthood, adjusting for individual- and family-level sociodemographic characteristics. Data analysis was conducted in 2020–2021.

**Results:** After multivariable adjustment, college food insecurity was associated with an increased prevalence of food insecurity in adulthood (prevalence ratio=1.45, 95% CI=1.16, 1.81). This association was more pronounced among students who were economically independent from their parents during college (prevalence ratio=2.23, 95% CI=1.27, 3.90).

**Conclusions:** Food insecurity during college is associated with a higher prevalence of food insecurity in early to middle adulthood, particularly among economically independent students. Given the seemingly cyclical nature of food insecurity over the life course, policies are needed to alleviate food insecurity during the critical college years.

*Am J Prev Med* 2021;61(6):923–926. © 2021 American Journal of Preventive Medicine. Published by Elsevier Inc. All rights reserved.

### INTRODUCTION

Food insecurity, a condition of limited access to nutritious food, is a critical issue for college students' health and well-being.<sup>1,2</sup> Recent studies have shown unprecedented levels of food insecurity on college campuses, with under-represented minorities, low-income students, and first-generation students at higher risk.<sup>3,4</sup> This disparity in food insecurity has been attributed to the changing demographics of college students over the past decades because more young adults have had the opportunity to pursue a college education.<sup>2</sup>

Recent studies find that college students experiencing food insecurity have poorer health and psychosocial outcomes and have lower academic achievement than their food-secure peers.<sup>5–10</sup> Most research to date has been

cross-sectional; few studies have examined the longitudinal implications of college food insecurity. In a study of

From the <sup>1</sup>Department of Nutritional Sciences, School of Public Health, University of Michigan, Ann Arbor, Michigan; <sup>2</sup>Institute for Social Research, University of Michigan, Ann Arbor, Michigan; <sup>3</sup>Providence VA Medical Center, Providence, Rhode Island; <sup>4</sup>Department of Family Medicine, Brown Alpert Medical School, Brown University, Providence, Rhode Island; <sup>5</sup>Department of Health Services, Policy, & Practice, Brown School of Public Health, Brown University, Providence, Rhode Island; and <sup>6</sup>Department of International Health, Johns Hopkins Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland

Address correspondence to: Cindy W. Leung, ScD, MPH, Department of Nutritional Sciences, School of Public Health, University of Michigan, 1415 Washington Heights, SPH I, Ann Arbor MI 48109. E-mail: [cindyleung@post.harvard.edu](mailto:cindyleung@post.harvard.edu)

0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2021.05.038>

university freshmen, concurrent food insecurity more strongly predicted dietary behaviors and mental-health outcomes than past food insecurity.<sup>11</sup> Another longitudinal study found that poorer psychosocial health mediated the association between food insecurity and academic performance.<sup>12</sup> To date, no study has prospectively examined the impacts of college food insecurity on food insecurity in early/middle adulthood.

Using longitudinal data from a nationally representative household panel study, this study examines the long-term impacts of experiencing food insecurity during college on food insecurity in early/middle adulthood. The differences in this association by economic independence during college are also investigated.

## METHODS

The Panel Study of Income Dynamics (PSID) is the longest-running household panel survey designed to be representative of the U.S. population. Begun in 1968, data on sociodemographic and health characteristics were collected annually through 1997 and biennially thereafter.<sup>13</sup>

For this study, a balanced panel was created of 1,508 individuals aged 16–29 years, who enrolled in  $\geq 1$  year of college between 1999 and 2003, remained in the sample through follow-up (2015–2017), and had information on food security status at both time-points. Individuals who were not economically independent by 2015–2017 ( $n=66$ )—defined as those holding the position of Reference Person/Spouse/Partner of their own PSID household—were excluded from the analytic sample because their food security status in 2015–2017 would not reflect their own reports. Sensitivity analyses were also conducted, including those individuals not economically independent by 2015–2017.

The primary exposure of interest was food security status measured between 1999 and 2003 concurrent with the participant's college enrollment (i.e., college food insecurity). Food security status was reported using the 18-item U.S. Household Food Security Survey Module (HFFSM).<sup>14</sup> College food insecurity was classified as having a score  $\geq 1$  on the HFFSM during 1999–2003. PSID participants who were economically independent during college completed their own food security assessments ( $n=301$ ). For PSID participants who were not economically independent during college, food security status was reported by the householder of their family unit (i.e., parent/caregiver;  $n=1,207$ ).

The primary outcome was food security status measured in 2015–2017 (i.e., food insecurity during adulthood) using the HFFSM. Individuals were categorized as food insecure if they had a score  $\geq 1$  on the HFFSM in 2015 or 2017.

Covariates included age (continuous), sex (male/female), race/ethnicity (non-Hispanic White/other), economic independence (yes/no), and income-to-needs ratio (continuous) during college. Models also adjusted for parental educational attainment (college attainment/no college attainment) and childhood receipt of Supplemental Nutrition Assistance Program (SNAP) benefits (ever/never).

The PSID longitudinal survey weights were applied to all analyses to account for sample attrition and clustering and to generate nationally representative estimates. Descriptive statistics were

used to compare the distributions of sociodemographic characteristics by college food insecurity status. Multivariable generalized linear models were used to estimate the prevalence ratios (PRs) for adult food insecurity in relation to college food insecurity. Stratified analyses investigated the differences in the primary association by economic independence. All statistical tests were 2-sided; significance was considered at  $p<0.05$ . Statistical analyses were performed using Stata/SE, version 12.1, in 2020–2021.

## RESULTS

The overall prevalence of college food insecurity was 14.9%. Students who were food insecure had lower household incomes than students who were food secure in college and were more likely to be non-White, to have lower parental educational attainment, and to have received SNAP during childhood ( $p<0.01$ ) (Table 1).

Among college students, food insecurity was associated with a 45% higher prevalence of food insecurity in adulthood (PR=1.45, 95% CI=1.16, 1.81), after adjusting for sociodemographic characteristics (Table 2). The association between college food insecurity and adult food insecurity was more pronounced among students who were economically independent of their parents during college (PR=2.23, 95% CI=1.27, 3.90). This association was attenuated among students who were economically dependent during college (PR=1.19, 95% CI=0.86, 1.64). Sensitivity analyses, including individuals not economically independent by 2015–2017, were substantively unchanged.

## DISCUSSION

This study utilizes nationally representative data from a longitudinal panel study to examine the cyclical nature of food insecurity during college and adulthood. Among students who were economically independent during college, experiencing food insecurity during college was associated with a  $>2$ -fold greater likelihood of experiencing food insecurity in adulthood. This association may be mediated by the experience of social exclusion<sup>15,16</sup> or greater academic disruption,<sup>5,12,17</sup> both of which could impact future employment patterns and earnings. These results are concerning given the rising trends in economic independence and food insecurity among college students today<sup>1,2</sup> and the health consequences of food insecurity in adulthood.<sup>18</sup>

In past decades, federal programs have allowed more individuals to pursue a college education. Unfortunately, these programs fall short of covering the comprehensive costs of college, leading to disproportionate levels of food insecurity among students. Thus, experiences of food insecurity may hinder the impact of a college education to promote upward socioeconomic mobility.<sup>19</sup>

**Table 1.** Descriptive Characteristics During College Among 1,508 PSID Individuals Stratified by College Food Insecurity (1999–2003)

Characteristics	All PSID participants (N=1,508), n (%)	Food secure (n=1,107), n (%)	Food insecure (n=401), n (%)	p-value
Age, mean (SD)	21.6 (3.2)	21.6 (3.1)	21.7 (3.9)	0.79
Income-to-needs ratio, mean (SD)	5.2 (4.6)	5.7 (4.6)	2.1 (1.7)	<0.0001
Sex				0.58
Male	612 (44.7)	496 (45.1)	116 (42.6)	
Female	896 (55.3)	710 (54.9)	186 (57.4)	
Race/ethnicity				<0.0001
White	866 (74.2)	774 (78.5)	92 (49.5)	
Non-White	642 (25.8)	432 (21.5)	210 (50.5)	
Parental education attainment				<0.0001
At least 1 parent attained a college degree	600 (46.5)	545 (50.8)	55 (21.8)	
Neither parent attained a college degree	908 (53.5)	661 (49.2)	247 (78.2)	
Economically independent during college				0.004
Yes	301 (22.3)	230 (20.7)	71 (31.4)	
No	1,207 (77.7)	976 (79.3)	231 (68.6)	
Childhood SNAP participation				<0.0001
No	941 (69.1)	840 (74.8)	101 (36.8)	
Yes	567 (30.9)	366 (25.2)	201 (63.2)	

Note: Boldface indicates statistical significance ( $p < 0.05$ ).

PSID, Panel Study of Income Dynamics; SNAP, Supplemental Nutrition Assistance Program.

Given the current hardships due to the ongoing coronavirus disease 2019 (COVID-19) pandemic, temporary changes have been made to expand SNAP access and increase SNAP benefits to alleviate food insecurity among college students.<sup>20</sup> These changes need to be sustained and paired with comprehensive financial aid programs to help break this cycle of chronic food insecurity, particularly for economically independent students.

### Limitations

The strengths of this study include the prospective collection and national representativeness of the sample. There are also some limitations. First, for individuals who were not economically independent from their parents, their college food security measurement was completed by their parents and may not reflect their own food security status. Second, no measures of food

security were collected between 2005 and 2013, precluding the examination of food insecurity immediately after college. The demographics of college students in this sample may not be representative of the current college population as evidenced by the lower prevalence of college food insecurity observed in this study than in recent studies.<sup>1,4</sup> Future research should also examine the transitions between food security categories over time to better understand the changes in the severity of food insecurity in subsequent periods. Finally, it is debatable whether the HFSSM is appropriate to assess food insecurity among college students.<sup>21</sup> Future efforts should focus on examining the psychometric properties of the HFSSM for this heterogeneous population. Other limitations specific to PSID include the cumulative attrition over the study period, biennial data collection of dynamic variables

**Table 2.** Associations Between College Food Insecurity and Adult Food Insecurity by Economic Independence

College food insecurity	All PSID participants (N=1,508), PR <sup>a</sup> (95% CI)	Economically independent during college (n=301), PR <sup>a</sup> (95% CI)	Economically dependent on parents during college (n=1,207), PR <sup>a</sup> (95% CI)
Food secure	ref	ref	ref
Food insecure	<b>1.45 (1.16, 1.81)</b>	<b>2.23 (1.27, 3.90)</b>	1.19 (0.86, 1.64)

Note: Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Models adjusted for age, income-to-needs ratio, sex, race/ethnicity, parental education attainment, economic independence (except in stratified models), and childhood participation in the Supplemental Nutrition Assistance Program.

PR, prevalence ratio; PSID, Panel Study of Income Dynamics.

(e.g., income), and self-reported data from a single respondent.<sup>22</sup>

## CONCLUSIONS

Food insecurity during college is associated with food insecurity in early/middle adulthood, particularly among economically independent students. These findings underscore the need for policy interventions to alleviate food insecurity during college and potentially break the cycle of chronic food insecurity over the life course.

## ACKNOWLEDGMENTS

This work was supported by the University of Kentucky Center for Poverty Research through funding by the Economic Research Service and Food and Nutrition Service in the U.S. Department of Agriculture. In addition, CWL and JAW were supported by NIH (R00 HD084758 to CWL and K01 DK119166 to JAW), and AJC was supported by the Department of Veterans Affairs Health Services Research & Development Grant CDA 20-037.

No financial disclosures were reported by the authors of this paper.

## CREDIT AUTHOR STATEMENT

Cindy W. Leung: Conceptualization, Formal Analysis, Funding Acquisition, Writing - Original Draft; Noura Insolera: Conceptualization, Data Curation, Funding Acquisition, Writing - Reviewing & Editing; Alicia J. Cohen: Conceptualization, Funding Acquisition, Writing - Reviewing & Editing; Julia A. Wolfson: Conceptualization, Funding Acquisition, Writing - Reviewing & Editing.

## REFERENCES

- Bruening M, Argo K, Payne-Sturges D, Laska MN. The struggle is real: a systematic review of food insecurity on postsecondary education campuses. *J Acad Nutr Diet*. 2017;117(11):1767–1791. <https://doi.org/10.1016/j.jand.2017.05.022>.
- U.S. Government Accountability Office. Food insecurity: better information could help eligible college students access federal food assistance benefits. Washington, DC: U.S. Government Accountability Office. <https://www.gao.gov/assets/gao-19-95.pdf>. Published December 2018. Accessed November 7, 2019.
- University of California Office of the President. Global food initiative: food and housing security at the University of California. Oakland, CA: University of California Office of the President. [https://www.ucop.edu/global-food-initiative/\\_files/food-housing-security.pdf](https://www.ucop.edu/global-food-initiative/_files/food-housing-security.pdf). Published December 2017. Accessed November 7, 2019.
- Goldrick-Rab S, Richardson J, Schneider JA, Hernandez A, Cady C. *Still hungry and homeless in college*. Madison, WI: Wisconsin HOPE Lab. <https://hope4college.com/wp-content/uploads/2018/09/Wisconsin-HOPE-Lab-Still-Hungry-and-Homeless.pdf>. Published April 2018. Accessed November 7, 2019.
- Phillips E, McDaniel A, Croft A. Food insecurity and academic disruption among college students. *J Stud Aff Res Pract*. 2018;55(4):353–372. <https://doi.org/10.1080/19496591.2018.1470003>.
- Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student hunger on campus: food insecurity among college students and implications for academic institutions. *Am J Health Promot*. 2018;32(2):349–354. <https://doi.org/10.1177/0890117117719620>.
- Knol LL, Robb CA, McKinley EM, Wood M. Food insecurity, self-rated health, and obesity among college students. *Am J Health Educ*. 2017;48(4):248–255. <https://doi.org/10.1080/19325037.2017.1316689>.
- Mirabitor E, Peterson KE, Rathz C, Matlen S, Kasper N. Predictors of college-student food security and fruit and vegetable intake differ by housing type. *J Am Coll Health*. 2016;64(7):555–564. <https://doi.org/10.1080/07448481.2016.1192543>.
- Leung CW, Wolfson JA, Lahne J, Barry MR, Kasper N, Cohen AJ. Associations between food security status and diet-related outcomes among students at a large, public Midwestern university. *J Acad Nutr Diet*. 2019;119(10):1623–1631. <https://doi.org/10.1016/j.jand.2019.06.251>.
- Meza A, Altman E, Martinez S, Leung CW. “It’s a feeling that one is not worth food”: a qualitative study exploring the psychosocial experience and academic consequences of food insecurity among college students. *J Acad Nutr Diet*. 2019;119(10):1713–1721.e1. <https://doi.org/10.1016/j.jand.2018.09.006>.
- Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *Int J Behav Nutr Phys Act*. 2018;15(1):9. <https://doi.org/10.1186/s12966-018-0647-7>.
- Raskind IG, Haardörfer R, Berg CJ. Food insecurity, psychosocial health and academic performance among college and university students in Georgia, USA. *Public Health Nutr*. 2019;22(3):476–485. <https://doi.org/10.1017/S1368980018003439>.
- Institute for Social Research, University of Michigan. PSID main interview user manual: release 2019. Ann Arbor, MI: Institute for Social Research, University of Michigan. <https://psidonline.isr.umich.edu/data/Documentation/UserGuide2017.pdf>. Published February 2019. Accessed February 16, 2021.
- Economic Research Service, U.S. Department of Agriculture. U.S. household food security survey module: three-stage design, with screeners. Washington, DC: Economic Research Service, U.S. Department of Agriculture. <https://www.ers.usda.gov/media/8271/hh2012.pdf>. Published September 2012. Accessed February 16, 2021.
- Henry L. Understanding food insecurity among college students: experience, motivation, and local solutions. *Ann Anthropol Pract*. 2017;41(1):6–19. <https://doi.org/10.1111/napa.12108>.
- Willis DE. Feeding inequality: food insecurity, social status and college student health. *Sociol Health Illn*. 2021;43(1):220–237. <https://doi.org/10.1111/1467-9566.13212>.
- Martinez SM, Frongillo EA, Leung C, Ritchie L. No food for thought: food insecurity is related to poor mental health and lower academic performance among students in California’s public university system. *J Health Psychol*. 2020;25(12):1930–1939. <https://doi.org/10.1177/1359105318783028>.
- Laraia BA. Food insecurity and chronic disease. *Adv Nutr*. 2013;4(2):203–212. <https://doi.org/10.3945/an.112.003277>.
- Torche F. Is a college degree still the great equalizer? Intergenerational mobility across levels of schooling in the United States. *Am J Sociol*. 2011;117(3):763–807. <https://doi.org/10.1086/661904>.
- U.S. House of Representatives. Rules committee print 116-68: text of the house amendment to the senate amendment to H.R. 133. Washington, DC: U.S. House of Representatives. <https://www.congress.gov/116/cpr/HPRT42770/CPRT-116HPRT42770.pdf>. Published December 21, 2020. Accessed February 16, 2021.
- Ellison B, Bruening M, Hruschka DJ, et al. Viewpoint: food insecurity among college students: a case for consistent and comparable measurement. *Food Policy*. 2021;101:102031. <https://doi.org/10.1016/j.foodpol.2021.102031>.
- McGonagle KA, Schoeni RF. *The panel study of income dynamics: overview and summary of scientific contributions after nearly 40 years*. Ann Arbor, MI: Institute for Social Research, University of Michigan. [https://psidonline.isr.umich.edu/publications/Papers/tsp/2006-01\\_PSID\\_Overview\\_and\\_summary\\_40\\_years.pdf](https://psidonline.isr.umich.edu/publications/Papers/tsp/2006-01_PSID_Overview_and_summary_40_years.pdf). Published January 30, 2006. Accessed February 16, 2021.