

Food Insecurity Among Formerly Homeless Individuals Living in Permanent Supportive Housing

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Objectives. To assess the role of health-related factors, health care, nutrition, and socioeconomic factors in food insecurity prevalence in a sample of previously homeless adults living in permanent supportive housing.

Methods. In 2016 to 2017, we recruited and completed survey interviews with permanent supportive housing residents aged 45 years and older in Los Angeles, California (n = 237). We conducted univariable and multivariable analyses to determine the odds and covariates of low or very low food security, according to the US Department of Agriculture's definition and measure.

Results. Two thirds of residents (67%) reported low or very low food security. In the multivariable analyses, several variables were positively associated with this outcome, including accessing food aid or being late in paying bills. The odds of low or very low food security decreased by 8% for every \$100 increase in monthly income.

Conclusions. The prevalence of food insecurity in our sample exceeded rates among similarly aged low-income adults in the general population and adults who are currently homeless. This suggests that food insecurity, along with other indicators of socioeconomic disadvantage, remains a threat to health equity for formerly homeless individuals even after they transition to stable housing. (*Am J Public Health*. Published online ahead of print February 21, 2019: e1–e4. doi:10.2105/AJPH.2018.304927)

Food security, defined as a household having access to adequate nutritious and safe foods,¹ is often jeopardized by homelessness. Permanent supportive housing (PSH) refers to programs that provide a combination of subsidized housing and supportive services addressing the needs of people with histories of chronic homelessness. Although PSH has been effective in addressing homelessness in many regards, little research has explored how it might also have an impact on food insecurity.²

Given the lack of previous research, we conducted an exploratory study to examine the association of health-related factors, health care, nutrition, and socioeconomic factors with the prevalence of food insecurity among a sample of formerly homeless adults aged 45 years and older residing in PSH. This population has been characterized by premature aging and high prevalence of chronic health conditions.³ Our selection of covariates was informed by a health equity lens and research conducted with related populations (e.g., similarly aged adults who are low-income, currently homeless, or both). This

literature indicates that food insecurity is positively associated with factors and conditions including diabetes, HIV/AIDS, activities of daily living or mobility impairments, depressive symptoms, substance use, victimization, and postponed medical care, leading to emergency department use and hospitalization.^{4–7} We did not assume directionality in these relationships, recognizing that food insecurity can function as both a driver and an effect of many covariates.

METHODS

The sampling frame consisted of residents aged 45 years and older in 2 project-based

PSH programs in Los Angeles, California, recruited as part of a study on the early onset of geriatric conditions in PSH residents.⁸ The study team screened residents for eligibility and administered an informed consent process. Interested eligible residents completed a survey interview (approximately 1.5 hours) and received \$25.

Data collection occurred between December 2016 and July 2017. During recruitment, 506 residents from both sites were invited to participate, and 275 (54%) were screened for eligibility. Of the 243 residents who were deemed eligible, 237 participants completed interviews.

Measures

The survey interview encompassed the following domains: demographics, health and well-being, health care access, nutrition and food insecurity, and socioeconomic status. We measured variables by items used in previous studies and standardized measures. We assessed food security by using the US Department of Agriculture's Adult Food Security Module,⁹ which classifies respondents into 4 categories delineating high, marginal, low, and very low food security, based on a recall period of the past 12 months. We dichotomized responses as (1) high or marginal and (2) low or very low food security for the analyses, per previous research.^{5,10}

Analysis

Interviewers administered the survey individually with participants and entered responses on electronic tablets. Following data

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TABLE 1—Sample Description and Covariates of Low or Very Low Food Security in Univariable and Multivariable Models for Permanent Supportive Housing Residents (n = 237): Los Angeles, California, 2016–2017

	All Participants (n = 237), No. or Mean (SD)	High or Marginal Food Secure Participants (n = 78), No. or Mean (SD)	Low or Very Low Food-Secure Participants (n = 159), No. or Mean (SD)	Univariable Models, ^a P	Multivariable Model, ^b AOR (95% CI)
Demographic variables					
Gender					
Male	149	53	96	.28	...
Female	87	25	62	.28	...
Transgender	1	0	1
Race/ethnicity					
African American	144	46	98	.65	...
White	43	17	26	.32	...
Other race or more than 1 race	48	14	34	.82	...
Latino/Latina	39	12	27	.74	...
Age, y	57.7 (6.3)	58.6 (6.3)	57.3 (6.3)	.13	...
Health and well-being variables					
No. of physical or mental chronic health conditions	6.17 (3.8)	5.5 (3.4)	6.4 (3.9)	.06	...
Diabetes	55	13	42	.10	1.47 (0.63, 3.41)
Obesity	91	27	64	.51	...
HIV	20	10	10	.09	0.47 (0.15, 1.53)
Some ADL impairment or unable to perform	120	33	87	.07	...
Poor self-rated mobility	77	17	60	.01	1.49 (0.69, 3.22)
Cognitive impairment (MMSE score < 24)	24	7	17	.21	...
Depression (PHQ-9 score > 9)	118	28	90	<.01	1.18 (0.57, 2.41)
Any victimization (emotional, physical, or sexual)	124	31	93	<.01	1.69 (0.85, 3.34)
Substance use (past 30 d)					
Tobacco	150	49	101	.92	...
Alcohol to intoxication	53	17	36	.81	...
Marijuana	77	27	50	.63	...
Hard drugs (cocaine, heroin, or amphetamines)	38	11	27	.57	...
Health care access variables					
Has health insurance	231	75	156	.72	...
ED visit in past 12 mo	118	37	81	.58	...
Hospitalized in past 12 months	56	14	42	.15	...
Nutrition variables					
Daily fruit intake	1.35 (1.2)	1.5 (1.4)	1.2 (1.07)	.79	...
Daily vegetable intake	1.52 (1.6)	1.7 (2.3)	1.4 (1.1)	.10	0.91 (0.75, 1.10)
Self-rated eating habits (0–10; higher scores indicate better habits)	5.3 (2.4)	6.2 (2.5)	4.9 (4.5)	<.01	0.83 (0.72, 0.96)
Socioeconomic variables					
Duration of lifetime homelessness	7.9 (8.1)	6.9 (7.3)	8.4 (8.4)	.18	...
Length of time in supportive housing	4.7 (3.6)	5.2 (4.5)	4.5 (3.1)	.16	...
High-school diploma or GED or greater education	156	58	98	.05	0.47 (0.22, 0.98)
Currently employed	12	5	7	.51	...

Continued

TABLE 1—Continued

	All Participants (n = 237), No. or Mean (SD)	High or Marginal Food Secure Participants (n = 78), No. or Mean (SD)	Low or Very Low Food-Secure Participants (n = 159), No. or Mean (SD)	Univariable Models, ^a <i>P</i>	Multivariable Model, ^b AOR (95% CI)
Average total monthly income (including illicit or under-the-table resources), \$	844 (521)	1001 (752)	766 (332)	<.01	0.92 (0.86, 0.99)
Currently receiving SNAP benefits	84	24	60	.29	...
Accessed food aid in past 6 mo	142	33	109	<.01	2.94 (1.50, 5.75)
Late in paying bills at least once in past 12 mo	84	17	67	<.01	2.27 (1.10, 4.72)
Utilities shut off at least once in past 12 mo	32	7	25	.14	...

Note. ADL = activities of daily living; AOR = adjusted odds ratio; CI = confidence interval; ED = emergency department; GED = general educational development; MMSE = Mini Mental Status Exam; PHQ-9 = Patient Health Questionnaire-9; SNAP = Supplemental Nutrition Assistance Program.

^aFor univariable models, the *t* test was performed for continuous variables, and the χ^2 test was performed for categorical variables, comparing individuals in the high or marginal and low or very low food security groups.

^bFor multivariable analysis, n = 231 because of missing data. Adjusted odds ratios controlled for other covariates in the model and gender, race/ethnicity, and age.

cleaning, we calculated descriptive statistics and conducted univariable analyses (χ^2 and *t* tests) distinguishing between participants with high or marginal and low or very low food security in terms of the covariates. Given the exploratory nature of the study, we used $P < .10$ as a threshold for selecting covariates for our multivariable analysis of low or very low food security.

RESULTS

Table 1 summarizes the sample descriptors (n = 237) and analysis results. The majority of participants reported very low (41%) or low (26%) food security. No differences were noted between the low or very low (n = 159) and high or marginal (n = 78) food security groups for any of the demographic variables.

We excluded 2 variables (total number of health conditions and activities of daily living impairment) from the final multivariable model because of collinearity concerns that we detected by assessing univariable relationships between covariates. Adjusted odds ratios (AORs; controlling for all covariates in the model and gender, race/ethnicity, and age) for the multivariable model of low or very low food security are reported in the last column of Table 1. The model was significant (likelihood ratio $\chi^2 = 59.41$; $P < .001$), and Tjur R^2 was 0.25, indicative of a moderate effect size. Significant covariates included self-rated eating habits (AOR = 0.83; 95% confidence interval [CI] = 0.72, 0.96), having

a high-school education or general educational development certification (GED) or greater education level (AOR = 0.47; 95% CI = 0.22, 0.98), monthly income (AOR = 0.92; 95% CI = 0.86, 0.99), accessing food aid in the past 6 months (AOR = 2.92; 95% CI = 1.50, 5.75), or paying bills late at least once in the past 12 months (AOR = 2.27; 95% CI = 1.10, 4.72).

DISCUSSION

Two thirds of residents in our sample (67%) reported low or very low food security, a rate far exceeding the general population prevalence of 22% for low-income adults aged 40 years and older¹⁰ and also surpassing the rate of 55% reported in a recent study of currently homeless adults aged 50 years and older in Oakland, California.¹¹ Although PSH programs subsidize rent at an affordable level (typically 30% of monthly income), our findings suggest that residents often struggle to meet other expenses, including obtaining food and paying bills. The health effects of financial strain among PSH residents have received very little attention in the literature to date. Although our results are exploratory, it appears possible that food insecurity could be an unmeasured factor partially explaining the lack of definitive health gains for PSH residents across studies to date.²

Our findings should be considered in light of the study's limitations, including the fact that our sample was recruited from a single

city and was subject to selection bias, and that data were obtained through self-report. Given the study's cross-sectional design, it was not possible to determine changes over time in food security status or directionality in the relationships between variables. Future research, such as longitudinal or ethnographic studies, could help to elucidate the dynamic relationships among socioeconomic factors, health conditions, and food insecurity for PSH residents.

Public Health Implications

Implications for public health practice. The prevalence of low or very low food security in our sample and its association with receipt of food aid suggests that the traditional food aid network may be inadequate to meet PSH residents' nutritional needs. One potential solution would be to initiate a meal delivery program for food-insecure PSH residents, prioritizing those with mobility impairments. Furthermore, in our multivariable results, a \$100 increase in monthly income was associated with an 8% decrease in the odds of experiencing low or very low food security. A multipronged strategy to raise the incomes of PSH residents and therefore increase food security could include employment and job coaching and assistance applying for and managing public benefits. Lastly, although few participants were currently employed, education was negatively associated with food insecurity; this suggests that independent of employment, access to education—including financial education—could reduce food insecurity.

Implications for research. As researchers continue to probe the health outcomes associated with PSH and its cost-effectiveness, a question to consider is the potential financial impact of investments in improving food security for PSH residents. If efforts such as meal delivery programs did increase food security, we hypothesize that they would also be associated with improvements in health (e.g., reduced disease burden and symptomology) and lower rates of health care utilization, possibly leading to net cost savings.¹²

Conclusions

The results of this study add to recent research indicating that PSH residents experience health disparities, ultimately leading to premature aging and elevated mortality.³ Improving PSH residents' food access can be a pathway for advancing health equity for this population. As a growing number of formerly homeless Americans reside and age in PSH, the ability to understand and address their food security needs in effective ways is imperative for public health. *AJPH*

CONTRIBUTORS

E. A. Bowen led the writing and conceptualization of the article. J. Lahey wrote the methods and contributed to the analyses. H. Rhoades contributed to the analyses. B. F. Henwood served as principal investigator of the study and contributed to the conceptualization of the article, analyses, and implications.

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Note. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

CONFLICTS OF INTEREST

We have no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

The study was conducted in accordance with approval from the institutional review board at the University of Southern California.

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