

# EXAMINATION OF FOOD INSECURITY, SOCIO-DEMOGRAPHIC, PSYCHOSOCIAL, AND PHYSICAL FACTORS AMONG RESIDENTS IN PUBLIC HOUSING

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**Objectives:** Understanding associations between psychosocial and physical factors among those who experience food insecurity could help design effective food insecurity programs for improved cardiovascular health among low-income populations. We examined differences in psychosocial and physical factors between those who were food secure compared with food insecure among public housing residents.

**Methods:** Data were from the baseline survey of a randomized controlled trial of a weight management intervention in Boston, Massachusetts from 2016-2017. Food insecurity and psychosocial and physical factors, including perceived stress, personal problems, social support, and physical symptoms, were measured via interviewer-administered screeners.

**Results:** Mean age of the sample (N=102) was 46.5 years (SD=11.9). The majority were Hispanic (67%), female (88%), with ≤high school degree (62%). Nearly half were food insecure (48%). For psychosocial variables, those who were food insecure had higher ratings of perceived stress (adjusted mean difference 3.39, 95% CI:2.00,4.79), a higher number of personal problems (adjusted mean difference 1.85, 95% CI: 1.19, 2.51), and lower social support (adjusted mean difference -0.70, 95% CI:-1.30,-0.11) compared with those who were food secure. For physical variables, those who were food insecure had higher odds of reporting negative physical symptoms (aOR 4.92, 95% CI:1.84,13.16).

**Conclusion:** Among this sample of public housing residents, food insecurity was associated with higher stress, more personal problems, higher experiences of physical symptoms, and lower social support. *Ethn Dis.* 2021;31(1):159-164; doi:10.18865/ed.31.1.159

## INTRODUCTION

Epidemiologic data demonstrates prevalence of adverse health conditions are higher among individuals living in urban public housing developments compared with other city residents; these include self-reported diabetes and cardiovascular outcomes (heart attack, stroke, and objectively measured hypertension).<sup>1</sup> As such, interventions and policy initiatives are being sought to improve cardiovascular health among low-income, urban individuals living in public housing. The public housing setting provides a unique opportunity to intervene with low-income individuals in that they share common social and physical structures. For this reason and because there is a nationwide structure for

public housing in the United States, which could lead to the ability to scale up interventions, public housing is a setting in need of focused attention.

Food insecurity, disruption of food intake due to lack of money or other resources, is a social determinant of health associated with 10-year cardiovascular disease risk.<sup>2</sup> In 2018, 11.1% of US households were estimated to have been food insecure in the past year, with a higher prevalence among households with low incomes, with children, headed by individuals who are Black or Hispanic, and located in cities in metropolitan areas.<sup>3</sup> An estimate of food insecurity levels among public housing residents nationwide is not known; however, cross-sectional research done in select samples provides insight. For ex-

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ample, food insecurity prevalence was 38.9% among Boston public housing residents.<sup>4</sup> Programs of research have sought to identify factors that are related to food insecurity to identify, in part, intervention targets and policy initiatives to reduce food insecurity. Within the public housing context, these factors have been conceptualized as adverse life events and economic hardship that can inhibit ac-

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cess to a sufficient food supply; while promoting factors, such as social support from family or neighbors, can build cohesion and supportive networks.<sup>5</sup> Therefore, examining both types of factors: psychosocial (eg, perceptions of neighborhood disorder, personal problems, perceived stress) along with promoting factors (eg, social support) may help to explain fac-

tors related to food insecurity among low-income public housing residents.

While research has been conducted in a variety of populations to examine factors associated with food insecurity, there has been limited examination of these associations among individuals living in public housing communities. To our knowledge, associations between food insecurity and experiencing negative physical symptoms (eg, headache, muscle tension) as a result of living in public housing has not yet been investigated. Overall, information about factors associated with food insecurity could be used to inform future intervention efforts and policy initiatives targeted to public housing communities. This may be particularly true among public housing residents with overweight or obesity, since food insecurity is associated with obesity<sup>6</sup> and weight management interventions should be responsive to the presence of food insecurity among participants.

The objective of this study was to determine whether there were differences between those who were food secure compared with those who were food insecure among residents of public housing for the following factors: socio-demographic characteristics, psychosocial factors, and experiences of physical symptoms.

## METHODS

### Participants and Procedures

This study presents cross-sectional baseline survey data collected from September 2016 to December 2017 among residents in public housing developments in Boston, Massachu-

setts. Respondents were participants in a randomized controlled intervention trial focused on weight management; eligibility criteria included: resident of Boston's public housing developments, without plans to move; aged 18-65 years; BMI  $\geq 25.0$ ; no self-reported medical contraindications to physical activity; open to making lifestyle changes; not on a medically prescribed diet or in another weight loss program; ability to speak and read in English or Spanish; owner of a cell phone; willing to receive text messages; and agreed to wear an accelerometer-based device.

Recruitment occurred through mailed inserts in rent statements, posted flyers, and referrals from currently enrolled participants. Residents from any of Boston's 26 family public housing developments and participants who reported receiving a rental subsidy from the Boston Housing Authority were eligible. After conducting a screening by telephone, a research assistant made an appointment to conduct an in-person visit to verify eligibility, consent procedures, and an interviewer-administered baseline survey in either English or Spanish according to the participant's preferred language. Survey data were either recorded directly into REDCap or completed via paper-pencil surveys and then later entered into REDCap in duplicate. Participants received \$25 on a prepaid debit card at the end of the visit.

### Measures

#### *Food Security*

Food security was measured at the household level using the 6-item

subset (short form) of the 12-month Food Security Scale, which includes questions such as: “(I/we) couldn’t afford to eat balanced meals. Was that often, sometimes, or never true for you (you/your household) in the last 12 months?”<sup>7</sup> The scale is scored as: high food security, marginal food security (ie, “one or two reported indications [of food access problems], typically of anxiety over food sufficiency or shortage of food in the house”<sup>8</sup>), low food security (ie, “reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake”<sup>8</sup>), and very low food security (ie, “reports of multiple indications of disrupted eating patterns and reduced food intake”<sup>8</sup>). High and marginal food security was categorized as food secure and low and very low food security was categorized as food insecure.

#### *Socio-Demographic Variables*

Age, race/ethnicity, sex, cardiovascular factors, and other socio-demographic questions were assessed using standardized questions.

#### *Psychosocial Variables*

Stress was measured using the 4-item Perceived Stress Scale.<sup>9</sup> A sample question is: “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?” Four response options ranged from never to very often; total score: 0-16 (higher score=higher perceived stress). Number of personal problems such as “being concerned about getting credit” and “being out of work for a month or longer” was measured with the 9-item Abbreviated Hassles Index<sup>10</sup>;

total score 0-9 (higher score=higher number of personal problems).

Perceptions of neighborhood disorder was measured by responses including not a problem, somewhat of a problem, or a big problem to seven items such as vandalism, burglary, or people selling drugs<sup>11</sup>; total score 6-21 (higher score=worse neighborhood disorder perceptions). Social support, emotional and instrumental domains, were measured using the 8-item modified Medical Outcomes Study Social Support Survey<sup>12</sup>; total score 1-5 (higher score=more social support).

#### *Physical Variables*

Negative physical symptoms were measured using a single item: “Within the past 30 days, have you experienced any physical symptoms, for example, a headache, an upset stomach, tensing of your muscles, or a pounding heart, as a result of how you were treated based on the fact that you live in public housing?” This item was used in a previous study in public housing.<sup>13</sup>

#### **Statistical Methods**

Data were examined descriptively using frequencies and means. Bivariate analyses using chi-square or two-sided t-tests as appropriate for categorical or continuous data were performed to examine food security levels with socio-demographic, psychosocial, and physical variables. Next, we examined the bivariate analyses and selected variables that were statistically significant in the bivariate analyses to further examine in regression models. Finally, we conducted linear or logistic regression to examine the effect of food insecurity (independent variable) on

continuous or categorical dependent variables, both unadjusted and adjusted for demographic variables that were statistically significant at the  $P < .1$  level in bivariate analyses. One variable was excluded (the combined race/ethnicity variable because it was highly correlated with the Hispanic ethnicity variable). Therefore, models were adjusted for Hispanic ethnicity, married/partnered, and ever tobacco use. Generally, missing data were minimal and excluded from analysis.

## **RESULTS**

We contacted 259 individuals to assess initial interest in participation. Of these, 64 were either not able to be reached or not interested in completing the eligibility screening, therefore 195 individuals were screened for participation. Of those, 93 were not eligible. In total, 102 individuals completed the baseline survey.

Participants had a mean age of  $46.5 \pm (11.9)$  years and the majority were female (88.2%), not married or partnered (70.6%), and had a high school level education or below (62.4%). The majority reported Hispanic ethnicity (66.7%), followed by non-Hispanic Black (16.7%), non-Hispanic White (11.8%), and other (4.9%). Most reported use of SNAP benefits (66.7%). One-third (30.4%) reported ever using tobacco. Self-reported diagnosis of diabetes, high cholesterol, or high blood pressure was reported by 20.6%, 18.6%, 24.8% of participants, respectively. For psychosocial factors, the mean perceived stress score was  $5.5 \pm (3.8)$ , number of personal problems was

**Table 1. Unadjusted and multivariate adjusted models of the association between selected psychosocial and physical variables with food insecurity status among Boston public housing residents, 2016-2017**

Variable	Perceived stress		Number of personal problems		Social support		Physical symptoms	
	Mean Diff (95% CI)	P <sup>d</sup>	Mean Diff (95% CI)	P <sup>d</sup>	Mean Diff (95% CI)	P <sup>d</sup>	Odds ratio (95% CI)	P <sup>d</sup>
Food insecurity status: food insecure <sup>a</sup>	3.56 (2.24, 4.89)	<.001	1.85 (1.19, 2.51)	<.0001	-.79 (-1.36, -.22)	<.01	2.86 (1.26, 6.50)	.01
	Adj. Mean Diff <sup>e</sup> (95% CI)	P <sup>d</sup>	Adj. Mean Diff <sup>e</sup> (95% CI)	P <sup>d</sup>	Adj. Mean Diff <sup>e</sup> (95% CI)	P <sup>d</sup>	Adj. Odds ratio <sup>c</sup> (95% CI)	P <sup>d</sup>
Food insecurity status: food insecure <sup>a</sup>	3.39 (2.00, 4.79)	<.001	1.86 (1.17, 2.55)	<.0001	-.70 (-1.30, -.11)	.02	4.92 (1.84, 13.16)	.001
Hispanic: Yes <sup>b</sup>	.03(-1.43, 1.49)	.97	-.39 (-1.11, .34)	.29	.26(-.36, .89)	.41	4.36 (1.53, 12.41)	.006
Married or partnered: Yes <sup>b</sup>	-.74 (-2.27, .79)	.34	.07 (-.69, .83)	.85	.23 (-.43, .88)	.50	1.37 (.50, 3.78)	.54
Ever tobacco use: Yes <sup>b</sup>	-.10 (-1.57, 1.37)	.89	-.38 (-1.11, .35)	.30	.12 (-.51, .75)	.70	.68(.25, 1.82)	.44

a. Referent group = food secure; food insecure category combined both low and very low food security.  
 b. Referent group = no.  
 c. Models adjusted for Hispanic ethnicity, married/partnered, and ever tobacco use.  
 d. P calculated by linear regression modeling or logistic regression modeling (unadjusted and adjusted models).

2.3 ± (1.9), perception of neighborhood disorder was 11.6 ± (4.5), and social support score was 3.4 ± (1.5). For physical characteristics, 40.2% reported feeling symptoms as a result of living in public housing. Approximately half the sample reported food insecurity (48.0%), which includes both very low food security (n=29) and low food security (n=20).

Comparing the demographic characteristics of those who were food insecure with those who were secure, those who were food insecure were more likely to be non-Hispanic (42.9% vs 24.5%, P<.05), not married/partnered (83.7% vs 58.5%, P<.01), and ever tobacco users (38.8% vs 22.6%, P<.1). There were no differences for the other demographic variables. For the psychosocial variables, those who were

food insecure reported significantly greater mean (SD) perceived stress (7.3 [3.8] vs 3.8 [3.0]), P<.01), greater number of personal problems (3.3 [2.0] vs 1.4 [1.4], P<.01), and less social support (3.0 [1.4] vs 3.8 [1.5], P<.01) than those who were food secure. For physical characteristics, those who were food insecure more often reported experiencing physical symptoms (53.1% vs 28.3%, P=.01).

The unadjusted and adjusted results of the regression models are shown in Table 1. For psychosocial variables, those who were food insecure had significantly higher ratings of perceived stress (adjusted mean difference 3.39, 95% CI: 2.00, 4.79), higher number of personal problems (adjusted mean difference 1.86, 95% CI: 1.17, 2.55), and lower social support (adjusted mean difference -.70,

95% CI: -1.30, -.11) compared with those who were food secure. In addition, those who were food insecure had significantly higher odds of reporting negative physical symptoms (aOR 4.92, 95% CI: 1.84, 13.16).

## DISCUSSION

In this cross-sectional sample of low-income public housing residents, we found that approximately half of the sample were food insecure, including some residents on SNAP benefits. Food insecurity was associated with being non-Hispanic, not married/partnered, higher stress, lower social support, a greater number of personal problems and a greater number of negative physical symptoms.

In terms of Hispanic ethnicity, our

finding may be due to multiple factors that influence food insecurity among Hispanic individuals including acculturation, language spoken, and proximity to primary food shopping location<sup>14</sup>; these factors should be further examined in future studies. Our other findings, that food insecure public housing residents indicated less social support, higher perceived stress, and more personal problems compared with those who were food secure, are largely consistent with existing literature.<sup>15,16</sup> In a cross-sectional analysis of a large sample (N=4,672) of data from NHANES, women with food insecurity were 80% less likely (OR .20 95% CI: .11, .36) to have moderate/high levels of social support compared with women with adequate food security.<sup>16</sup> To our knowledge, associations between food insecurity and experiencing physical symptoms as a result of living in public housing has not yet been investigated. We found those with food insecurity were almost five times more likely to report negative physical symptoms as a result of how they were treated based on the fact that they live in public housing compared with those who were food secure. Although not directly assessed, our negative symptoms variable may reflect racism and/or discrimination among our public housing resident sample; these constructs have begun to be examined and linked to food insecurity.<sup>17</sup>

As with all associations reported in this cross-sectional study, it is not possible to determine the temporal pathway, meaning psychosocial and physical factors may either have preceded or have been a result of food insecurity. Further research examin-

ing temporal associations between food insecurity and health outcomes may continue to help us understand these relationships and intervention targets. Furthermore, because of our sampling strategy, we cannot use this data to estimate the prevalence of food insecurity among public housing residents. In addition, assessment of negative physical symptoms should be expanded beyond the one-item measure used in this study. Finally, due to our sample size, we did not examine subgroup differences among those participants living in public housing developments vs those receiving rental subsidies.

We have several ideas about the translational aspects of this work to have an impact on cardiovascular outcomes among public housing residents. One is the use of natural experiments to examine associations between psychosocial factors and food insecurity. For example, HOPE VI revitalization of developments over time may expose residents to changing social environments with potentially varying levels of social support and perceived stress; the impact of these changes as they relate to food insecurity could be assessed over time. Second, future studies could use ecological momentary assessment to get real-time periodic measures on psychosocial and physical factors to obtain better specificity in variable measurement and to better understand the temporal relationships among these variables. Such studies examining temporal, causal relationships can help us better understand if addressing such factors as stress, social support, perceived negative physical symptoms, might be im-

portant to include in food insecurity interventions to further support this population's needs. Lastly, evaluation of different implementation strategies to deliver effective food security interventions (such as widespread enrollment in SNAP) to the public housing resident population, both locally and nationwide, is needed.

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*Food insecurity [found in nearly half of the study sample] was associated with being non-Hispanic, not married/partnered, higher stress, lower social support, a greater number of personal problems and a greater number of negative physical symptoms.*

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One example could be to capitalize on the efficacy of community health workers in health promotion among public housing populations. Community health workers could then use selected implementation strategies to deliver and disseminate food insecurity interventions, such as providing local technical assistance, using mass media to spread messages, and using advisory boards/workgroups; the efficacy of different strategies could then be experimentally examined.

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RESEARCH INVOLVING HUMAN PARTICIPANTS

Our research was approved by the Boston University Medical Campus/Boston Medical Center Institutional Review Board and all procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Quintiliani, Whiteley; Acquisition of data: Quintiliani; Data analysis and interpretation: Quintiliani, Whiteley, Quinn, Murillo, Lara, Kane; Manuscript draft: Quintiliani, Whiteley, Quinn, Murillo, Lara, Kane; Statistical expertise: Quinn; Acquisition of funding: Quintiliani; Administrative: Quintiliani, Whiteley, Murillo, Lara, Kane; Supervision: Quintiliani

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