Linking Neighborhood Characteristics to Food Insecurity in Older Adults: The Role of Perceived Safety, Social Cohesion, and Walkability

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ABSTRACT *Among the 14.6% of American households experiencing food insecurity, approximately 2 million are occupied by older adults. Food insecurity among older adults has been linked to poor health, lower cognitive function, and poor mental health outcomes. While evidence of the association between individual or household-level factors and food insecurity has been documented, the role of neighborhood-level factors is largely understudied. This study uses data from a representative sample of 1,870 New York City senior center participants in 2008 to investigate the relationship between three neighborhood-level factors (walkability, safety, and social cohesion) and food insecurity among the elderly. Issues relating to food security were measured by three separate outcome measures: whether the participant had a concern about having enough to eat this past month (concern about food security), whether the participant was unable to afford food during the past year (insufficient food intake related to financial resources), and whether the participant experienced hunger in the past year related to not being able to leave home (mobility-related food insufficiency). Unadjusted and adjusted logistic regression was performed for each measure of food insecurity. Results indicate that neighborhood walkability is an important correlate of mobility-related food insufficiency and concern about food insecurity, even after controlling the effects of other relevant factors.*

KEYWORDS *Food insecurity, Nutrition, Neighborhood effects, Social cohesion, Safety, Walkability, Multilevel models*

INTRODUCTION

Food security is a vital aspect of well-being; however, according to the US Household Food Security Survey, 14.6% of American households were found to be insecure with regard to food accessibility in 2008. Among these 17 million food-insecure households, approximately 2 million were occupied by older adults. Research indicates that, for the elderly, limited access to nutritionally adequate foods may increase the risk of poor nutritional and health status.¹ In addition,

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studies of elder subpopulations have associated levels of inadequate nutrition with depressive symptomatology² and lower cognitive function.³

More broadly, the salience of food insecurity has been underscored by its links to cardiovascular risk,^{4,5} self-rated health,⁶ body mass index or obesity,⁷⁻⁹ risk of emergent and overnight care,¹⁰ and non-adherence to pharmaceutical regimes.^{10,11} In older adults specifically, food insecurity has been found to predict poor nutritional outcomes,¹² including lower caloric intake, fewer meals per day, and foods lower in nutrients.^{1,13} Such outcomes are significantly more prevalent among older adults with lower incomes.¹³ Moreover, food insecurity among older adults is associated with poor self-reported health,¹ increased functional impairment,^{14,15} and lower quality of life.¹⁶ While studies have documented that both individual or household-level factors are associated with food insecurity among both the elderly and non-elderly,¹⁷⁻¹⁹ research on contextual, neighborhood-level contributors to nutritional insecurity is limited to a single investigation of the effect of neighborhood-level social factors.²⁰ The absence of such useful information exists despite the growing body of research on the role of neighborhoods as an important contributor to health.^{21,22} The purpose of this study, therefore, is to address this gap in research by examining the relationship between neighborhood-level factors and food insecurity among the elderly.

A number of neighborhood elements have been investigated in relation to health. Neighborhood socioeconomic status (SES) has been isolated as a particularly protective factor, whose strong correlation with individual SES underscores the robustness of this finding.²³ Elements of the built environment, which include land use, urban design, and transportation, have also been linked to well-being.²⁴ Studies have suggested that the built environment may promote walkability²⁵ and encourage healthful nutrition practices,²⁶ which in turn, may affect obesity,²⁷ self-rated health,²⁸ and chronic conditions such as hypertension.²⁹ Neighborhood safety may also influence varied individual domains of health. For example, safety's effect on social interactions and outdoor activities, in addition to its potential prevention of psychological stress, may have positive effects on both psychological and physiological markers of health.³⁰ Neighborhood-level social factors are, to our knowledge, the only such variables that have been studied in relation to food insecurity.²⁰ This research, which found that high community-level social capital significantly reduces the risk of hunger, suggested that social cohesion and community trust may increase the likelihood that nutritionally insecure individuals will borrow food from neighbors in times of need, or that higher social capital will encourage informal credit agreements for food purchases by the food insecure.²⁰

Using data obtained from participants of 56 senior centers across New York City (NYC), the present study investigates the relationship of three neighborhood-level factors—walkability, safety, and social cohesion—to measures related to food insecurity.

METHODS

Data Source

Data and Sample. The data used for this study were taken from the 2008 Health Indicators Project (HIP), the first representative health and social assessment of older adults attending senior centers in NYC. Among other domains of well-being, the HIP survey assessed health status, utilization patterns, and barriers to health care. Conducted by the Brookdale Center for Healthy Aging and Longevity, it employed a

multistage stratified random sample of 1,870 older adults attending 56 randomly selected senior centers out of the 278 centers located throughout NYC.

The HIP sampling plan involved stratification of the sample by borough, and by size of the senior center. The primary stratum of borough was created by determining the percentage of senior centers per borough as a proportion of the number of senior centers citywide, using information provided by the New York City Department for the Aging (DFTA). At the time the survey was conducted, there were 278 senior centers throughout the five boroughs and the sampling scheme was designed to reflect their distribution. The secondary stratum, center size, was based on reported daily lunch count as a proxy for a daily census. All centers operating under DFTA were divided into quartiles based on size. Senior centers were then randomly chosen among those in the specified strata, yielding 10 of the 51 centers in the Bronx, 16 of the 80 centers in Brooklyn, 13 of the 63 centers in Manhattan, 14 of the 68 centers in Queens, and 3 of the 16 centers in Staten Island.

Each senior center maintained daily sign-in sheets as a means of record keeping for the daily “lunch count.” One interviewer monitored the sign-in process, ensuring that participants signed in upon entering the senior center. Survey respondents were chosen from these sign-in sheets. Every third eligible individual was selected for recruitment. Interviewers from the research team were then directed to the prospective participant, and the interviewer briefly outlined the study using the recruitment script and invited the subject to participate in the study. All interviews were completely voluntary and anonymous, which was communicated to the participants during the informed consent process. If the individual met the inclusion criteria (age ≥ 60 ; spoke at least one of the available interview languages) and expressed willingness to participate, he or she was led to a private room where the informed consent form was read aloud. Following informed consent, face-to-face interviews were conducted in the senior center in the respondent’s preferred language (English, Spanish, Chinese, Russian, or Italian). Trained bilingual research assistants administered the interviews, which took an average of 75 minutes to complete.

A comprehensive structured survey instrument was designed for the HIP using standardized questionnaire items validated in national and local surveys, such as the Behavioral Risk Factor Surveillance System, the Medicare Current Beneficiary Survey, the National Health Interview Survey, and the New York City Community Health Survey. Additional survey items were drawn from the New York City Age-Friendly Cities Project. The survey was translated into Spanish, Chinese, Russian, and Italian and then back-translated into English to identify any inconsistencies.

The overall response rate was 76.7%, with a refusal rate of 20.3%. The data collection took place between April and November 2008. The study was approved by the Hunter College Institutional Review Board for the Protection of Human Subjects.

Study Sample

The sample used in our analysis is 1,650. We arrived at this final study sample by eliminating from the full HIP sample ($N=1,870$) all observations with missing data in one or more study variables ($n=643$), and then restoring observations ($n=423$) based on multiple imputation of the three independent neighborhood variables of interest. We found no statistically significant differences, among the explanatory variables, between the 220 deleted observations and the 1,650 observations used in

our analysis. The multiple imputation of neighborhood walkability, safety, and social cohesion—each of which is a scale variable comprising multiple items—was accomplished with an ordinal logistic model in STATA version 11.2, in which all other study variables, in addition to the senior center site, were used to predict 10 values for the missing components.

Outcome Variables

Three binary measures of food insecurity were studied in relation to neighborhood characteristics. The first of these considers concern about food security, and is based on the question: *In the past 30 days, have you been concerned about having enough food to eat?* This binary variable was coded 1 if respondents answered yes and 0 if no. An identical coding mechanism (1=yes, 0=no) was used for the other two food insecurity-related variables, one of which measured insufficient food intake related to financial resources (*In the past 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?*) and the other of which measured mobility-related food insufficiency (*In the past 12 months, were you hungry, but did not eat because you weren't able to get out to buy food?*).

Explanatory Variables

Neighborhood Factors Neighborhood safety was assessed by a scale that combined participants' responses to the following three safety-related survey statements: *People often get mugged or attacked in my neighborhood*; *People sell or use drugs in my neighborhood*; *I feel safe at night in my neighborhood*. To create the scale, we reverse-coded original Likert responses (1=*very true* to 4=*not at all true*) for the first two items, and then summed respondents' values for the three items (range, 3–12; Cronbach's $\alpha=0.70$), where higher scores represent a greater level of perceived safety.

Neighborhood social cohesion was represented by a scale consisting of summed responses to five survey items. The items were: *People around here are willing to help their neighbors*; *This is a close-knit neighborhood*; *People in this neighborhood can be trusted*; *People in this neighborhood generally don't get along with each other*; and, *People in this neighborhood do not share the same values*. As with construction of the safety variable, we reverse-coded Likert responses (1=*very true* to 4=*not at all true*) of the final two items, and summed responses over the five variables. In the resulting scale (range, 5–20; $\alpha=0.75$), higher values represent stronger neighborhood social cohesion.

An eight-item composite variable for walkability was created to capture this feature of the neighborhood's built environment. The survey items were related to *continuous paved sidewalks*, *curb cuts*, *crossable intersections*, *lighting at night*, *benches on which to sit*, *cracks in sidewalks*, *uneven sidewalks*, and *excessive (extra) noise from traffic, car alarms, trains, etc.* After reverse-coding binary responses to the three negatively presented items, responses for the eight items were summed, with scores ranging from 0 to 8 ($\alpha=0.48$), in which higher scores represented better neighborhood walkability.

Because transportation may play a key role in food access and security,²⁴ a variable based on a four-question Likert-scaled battery on transportation was considered for inclusion in the built environment measure. However, lack of response variation (over 90% of participants rated each of the four items positively)

suggested that doing so would simply scale the measure upward, and would not add any additional information.

Covariates

Covariates and potential confounders were selected from six domains of individual-level factors: demographic, physical disability, mental health, chronic conditions, social support, and income.

Demographic Variables Sex was a binary variable (female=1). Age was a continuous variable. Education was represented by five dummy variables (less than high school [HS], completed HS, more than HS, completed college, and post-college). Marital status was dichotomized (married or living together with someone as a couple vs. other). Race was captured by five dummy variables, representing Asian, Black, White, Hispanic, and other races.

Physical Disability Physical disability, used as a proxy for physical health status, was based on seven questions in which survey respondents ranked their degree of difficulty performing the following tasks: *eating, dressing, bathing; moving in/out of a bed or chair; grasping/handling small objects; walking indoors; walking several blocks; walking one block or climbing one flight of stairs; bending, kneeling, stooping*. Responses available were *none, some, much, can't due to health, and don't do this activity*. Answers of *none* and *don't do this activity* were re-coded into a value of 0 and all other responses were coded as 1. A composite variable was created by summing the codes, establishing scores ranging from 0 to 7 where higher scores represent greater disability.

Mental Health Depression was assessed using the nine-item Patient Health Questionnaire (PHQ)-9, whose validity and reliability have been demonstrated.³¹ Responses for each item were scored from 0 (*not at all*) to 3 (*nearly every day*); with a total score ranging from 0 to 27. Scores from 0 to 4 indicate no depression, 5 to 14 suggest mild to moderate depression, and 15 or greater signify severe depression.

Chronic Conditions This variable was a continuous measure based on self-report of 25 conditions, including diabetes, high blood pressure, high cholesterol, bronchitis, asthma, osteoporosis, and heart disease. The conditions were recoded into binary values of 1=yes and 0=no, then summed to determine the total number of chronic conditions. Totals could range from 0 to 25.

Individual Social Support With five survey items, respondents were asked about their availability to a person who could *help you if you were confined to a bed; give you good advice about a crisis; love you and make you feel wanted; get together with for relaxation; or confide in or talk to about your problems*. Likert scale responses ranged from a score of 0 (*none of the time*) to 4 (*all of the time*). After summing responses, the individual social support variable score ranged from 0 to 20, with higher scores indicating greater support.

Income Income was a categorical variable represented by two dummy variables: 1=less than or equal to \$19,999, 2=greater than or equal to \$20,000. Because over 29% of original categorical responses were missing, we created a third dummy variable for

missing responses. In a robustness check, we replaced the income dummy variables with a binary variable that measured difficulty meeting regular expenses. Our results were qualitatively similar to those presented.

Statistical Methods

We calculated means (with standard deviations) and proportions to describe the sample. We used binomial logistic regression to conduct the multivariate analyses, accounting for the multiple imputation missing values in the three neighborhood variables. In this way, our logistic models reflect the average model estimates over 10 full-model estimations. Two specifications were fitted to analyze the effect of neighborhood-level factors for each outcome variable. The first specification estimated the effect of neighborhood variables only; the second, fully adjusted, specification added all covariates to the first model specification. The exception to full adjustment is in the analysis of insufficient nutritional intake related to financial resources (*In the past 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?*) For this outcome, our adjusted analyses omitted the measure of income because of its implicit inclusion in the outcome variable.

We estimated all models in a multilevel framework, wherein the clustering of individuals within a senior center was statistically controlled to correct the standard errors for non-independence and the denominator degrees of freedom were corrected for the number of clusters. Due to the differing response distributions among the neighborhood variables, these were standardized so that the results reflect on one standard deviation change in the neighborhood variable on the log odds of food insecurity. We used STATA, version 11.2, to perform all statistical analyses.

RESULTS

Respondent Characteristics

Characteristics of the study sample are presented in Table 1. The study sample, of which the majority of respondents were female (64%), had a mean age of 75.4 (range 60–96). The largest proportion of the sample consisted of White participants (40%), followed by Hispanic (24%), Black (20%), and Asian (14%) respondents. Educational attainment varied but was somewhat evenly distributed across three groups: respondents who did not complete high school (36%), those who completed high school (33%), and those who completed more than a high school level of education (30%). More than one in three respondents (38%) indicated extreme or some difficulty with meeting regular expenses such as rent, food, and gas. Mean depression severity, as measured by the PHQ-9, was 3.56 on a scale of 0–27. Respondents reported an average of four chronic conditions, and two functional limitations. Additionally, sample members had a mean social support score of 13.41 out of 20.0.

Regarding variables of interest, 10% of participants reported being concerned about having enough food to eat. About 9% indicated that in the past year they ate less due to financial insecurity, while roughly 5% reported that they went hungry because they were not able to get out and purchase food. Neighborhood safety had a mean of 6.83 (range, 3–12); the mean of neighborhood social cohesion was 12.29 (range, 5–20). The average walkability score among study sample respondents was 5.26 out of 8.0.

TABLE 1 Sample characteristics (N=1,650)

Variable Name	% (N) ^a
Neighborhood factors (range, Cronbach's alpha)	
Safety (3–12, 0.70)	6.83 (0.34)
Social Cohesion (5–20, 0.75)	12.29 (0.33)
Walkability (0–8, 0.48)	5.26 (0.04)
Language of interview	
English	67 (1,253)
Spanish	19 (349)
Chinese	10 (188)
Russian	4 (73)
Italian	<1 (7)
Covariates	
Age	75.38 (0.19)
Female sex	64 (1,058)
Married or partnered	28 (475)
Race/ethnicity	
Asian	14 (215)
Black	20 (309)
Hispanic	24 (376)
White	40 (638)
Other	2 (39)
Educational attainment	
Less than HS	36 (586)
Completed HS	33 (532)
More than HS	12 (208)
Completed college	13 (233)
Post graduate work	5 (91)
Physical disability	2.09 (0.05)
Mental Health (PHQ-9)	3.56 (0.11)
Chronic conditions	4.35 (0.07)
Social support	13.41 (0.14)
Income	
<\$20,000	52 (866)
≥\$20,000	19 (469)
Missing income	28 (469)
Outcomes	
Concern about food security	10 (157)
Insufficient intake of food due to lack of money	9 (150)
Mobility-related food insufficiency	5 (76)

^aContinuous variables are reported from imputation models with mean and standard error

Multivariate Logistic Regression Results

Concern about Food Security The results obtained from the unadjusted model specification (Table 2, column 2) suggest that higher neighborhood safety and walkability independently influence concern about food security. For each 1 SD increase in neighborhood safety, the log odds of indicating concern about having enough to eat are reduced by about 8% (safety odds ratio [OR]=0.92; 95% confidence interval [CI]=0.85, 1.0). The effect of perceived neighborhood walkability is more pronounced. In this case, each 1 SD increase in the walkability scale

TABLE 2 Influence of neighborhood variables on food insecurity (N=1,650): odds ratios (confidence intervals)

Variable Name	Concern about food security		Insufficient intake of food due to lack of money		Mobility-related food insufficiency	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Neighborhood factors						
Safety	0.92 (0.85, 1.00)*	0.97 (0.91, 1.04)	0.99 (0.92, 1.06)	1.05 (0.98, 1.13)	0.99 (0.89, 1.10)	1.07 (0.96, 1.20)
Social Cohesion	0.98 (0.95, 1.02)	1.0 (0.96, 1.04)	0.95 (0.92, 0.99)**	0.97 (0.92, 1.01)	0.94 (0.89, 0.99)**	0.96 (0.90, 1.03)
Walkability	0.79 (0.70, 0.88)***	0.83 (0.73, 0.95)**	0.81 (0.71, 0.91)***	0.87 (0.75, 1.00)	0.75 (0.65, 0.87)***	0.84 (0.70, 0.99)*
Covariates						
Age	—	0.95 (0.92, 0.97)*	—	0.96 (0.94, 0.98)***	—	0.96 (0.93, 1.00)*
Female sex	—	1.01 (0.68, 1.50)	—	0.89 (0.57, 1.37)	—	0.99 (0.50, 1.95)
Married or partnered	—	0.80 (0.48, 1.31)	—	0.66 (0.42, 1.06)	—	0.68 (0.35, 1.32)
Race/ethnicity						
Asian	—	0.52 (0.23, 1.18)	—	2.73 (1.60, 4.66)***	—	1.38 (0.55, 3.46)
Black	—	1.75 (0.90, 3.42)	—	2.43 (1.20, 4.91)*	—	2.33 (0.89, 6.16)
Hispanic	—	1.91 (1.16, 3.13)*	—	3.51 (2.16, 5.70)***	—	2.32 (1.19, 4.53)*
Other race	—	1.34 (0.63, 2.83)	—	1.28 (0.56, 2.92)	—	1.04 (0.41, 2.69)
Education						
Less than HS	—	0.79 (0.38, 1.64)	—	0.74 (0.36, 1.55)	—	0.81 (0.29, 2.27)
Completed HS	—	0.83 (0.38, 1.81)	—	0.54 (0.27, 1.11)	—	0.56 (0.19, 1.68)
More than HS	—	0.64 (0.27, 1.48)	—	0.64 (0.28, 1.46)	—	1.43 (0.53, 3.85)
Completed college	—	0.88 (0.34, 2.24)	—	0.65 (0.28, 1.49)	—	0.89 (0.24, 3.24)
Physical disability	—	1.11 (0.99, 1.24)	—	1.10 (0.99, 1.22)	—	1.13 (1.01, 1.27)
Mental health	—	1.08 (1.03, 1.13)***	—	1.08 (1.03, 1.14)***	—	1.12 (1.06, 1.18)***
Chronic conditions	—	0.99 (0.93, 1.07)	—	1.05 (0.99, 1.12)	—	1.01 (0.92, 1.12)
Social support	—	0.97 (0.94, 1.01)	—	0.95 (0.91, 0.99)*	—	0.94 (0.90, 0.98)**
Income						
<\$20,000	—	0.35 (0.19, 0.66)***	—	—	—	0.51 (0.18, 1.49)
≥\$20,000	—	0.84 (0.56, 1.24)	—	—	—	0.94 (0.41, 2.16)

*p<0.05, **p<0.01, ***p<0.001

reduces the odds of concern about nutritional adequacy by 21% (OR=0.79; 95% CI=0.70, 0.88). With adjustment for covariates (Table 2, column 3), the effect of neighborhood safety becomes statistically nonsignificant. However, the effect of neighborhood walkability remains significant, its magnitude only slightly reduced by the addition of the control variables (OR=0.83; 95% CI=0.73, 0.95). Among the adjustment variables, the results indicate that being Hispanic (vs. White) and having higher depression score were associated with increased odds of reporting concern about nutritional adequacy. Higher age and lower income (relative to the missing category) were associated with reduced odds of the outcome.

Insufficient Food Intake Related to Financial Resources In the unadjusted model specification (Table 2, column 4), higher neighborhood social cohesion and walkability were associated with lower odds of experiences of not being able to afford food in the past year. For each 1 SD increase in social cohesion, the risk of insufficient food intake decreased by 5% (OR=0.95; CI=0.92, 0.98). For neighborhood walkability, each 1 SD increase was associated with a 19% reduced risk of insufficient food intake (OR=0.81; CI=0.72, 0.91). In the adjusted model specification (Table 2, column 5) neighborhood social cohesion becomes statistically nonsignificant, while neighborhood walkability remains suggestive of an association (OR=0.87; CI=0.75, 1.00; $p=0.056$). Among covariates, age and social support were negatively related to the outcome, whereas depression was positively associated with the outcome. Asian, Black, and Hispanic participants were all at higher risk of eating less due to lack of financial resources compared with White participants.

Mobility-Related Food Insufficiency Prior to controlling covariates (Table 2, column 6), our results suggest that higher neighborhood social cohesion and walkability were associated with lower odds of having experienced hunger because of the inability to leave home. For each 1 SD increase in social cohesion, the risk of mobility-related food insufficiency decreased by 6% (OR=0.94; CI=0.89, 0.99); for each 1 SD increase in walkability, a 25% reduced risk of reduced of hunger was observed (OR=0.75; CI=0.65, 0.87). After adjustment for covariates (Table 2, column 7) only neighborhood walkability remained statistically significant (OR=0.84; CI=0.70, 0.99). Among covariates, age, Hispanic race/ethnicity, depression, and individual social support were significant and in the expected direction.

DISCUSSION

In this study, we assessed the effect of three different neighborhood level variables—safety, social cohesion, and walkability—on outcomes related to food insecurity among senior center participants in New York City. Our results indicate that neighborhood walkability is an important correlate of food insecurity, even after controlling the effects of other relevant factors. While previous research has suggested that dietary intake is influenced by accessibility to food,^{1,32} our results additionally underscore the possible significance of the walking environment. These results support both qualitative findings by Wolfe et al.¹⁸ and the conceptual notion that neighborhoods designed to encourage walking may promote accessibility to affordable food outlets, which can be an important determinant of food security, particularly among elders with lower income.¹⁴ On the other hand, our results depart from the findings of Martin et al.²⁰ in that neighborhood social cohesion was

not associated with reduced risk of food insecurity in any of our fully adjusted models. One possibility for the divergent findings is differences in the question pertaining to mobility-related food insufficiency. Our survey question (*In the past 12 months, were you hungry, but did not eat because you weren't able to get out to buy food?*) combines hunger with problems leaving the home, which may be a more nuanced measure than the one used by Martin et al. Confirming previous research,^{4,7} our models suggest that individuals who reported lower income and those who experienced more depressive symptoms had a higher likelihood of food insecurity.

This study contributes to the current body of knowledge in several ways. It draws from the first city-level representative sample of ethnically, racially, and linguistically diverse senior center participants. Second, it examines older adults' perceptions of their living environments, which may have a greater impact on behavior than observed neighborhood characteristics. This is also the first study of senior center participants to inquire about their perceptions of neighborhood characteristics and nutritional risk.

Several limitations should nonetheless be noted. The first concerns the walkability measure. Despite its being designed as a single scale, the walkability measure has low internal consistency. Nevertheless, factor analysis of the component items offered no suggestion of more than one underlying latent factor. Moreover, the measure, having been adapted from existing instruments developed in semi-urban areas, may lack components that are more appropriate to a heavily urbanized area such as New York City. Second, our sample is not a true catchment area sample. In other words, it is possible that survey participants travel to senior centers outside of their immediate neighborhoods, in which case their appraisals of neighborhood attributes may apply to the neighborhoods in which they live, rather than the neighborhoods in which the senior centers are located. While the perceived nature of the neighborhood assessment helps to circumvent many of the possible problems with this scenario, there remains the potential for bias, as our data clusters are statistically controlled at the level of the senior center. Finally, individuals who attend senior centers may not be representative of the larger elderly population.³³ Research has suggested that senior center participants may be more mobile and healthier than nonparticipants.³³ This potential shortcoming is nonetheless circumscribed by supplementary analyses whose results suggest that our sample is largely representative of older adults in New York City.

A note on inference may also be useful. Causal inference between neighborhood factors and food insecurity cannot be made due to the cross-sectional nature of the study. Moreover, although it might be argued that neighborhood factors, particularly walking environments, precipitate problems that lead to food insecurity, selection may be an equally plausible explanation. In this way, elderly individuals who are concerned about food insecurity may be more likely to reside in less walkable, safe, or socially cohesive neighborhoods. In a related way, as our study only captured self-reported data, our empirical findings are subject to same-source bias³⁴—the idea that individuals who reported being concerned about food insecurity may be more likely to report negative perceptions about their health, social, or community status.

Many questions still remain unanswered concerning how the neighborhood may affect older adults' food insecurity. Further research on this topic will provide additional understanding to the growing body of evidence regarding the impact of community and environmental determinants on health.

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