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Measuring Social Cohesion and Social Capital within the Context of Community Food Security: A Confirmatory Factor Analysis

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ABSTRACT

This study uses a community food security (CFS) framework to understand how social capital and social cohesion may address food security. We assessed the presence of these constructs using a confirmatory factor analysis in the context of a community food assessment (N = 563). Social capital, social cohesion, and community food participation (e.g., CSAs, farmers' markets, gardens) were unique factor structures that could lead to development and testing community-based interventions to improve food security, food access, and health. We provide a discussion of the conceptualization and measurement of these constructs, and offer areas of improvement helpful to practitioners and researchers.

KEYWORDS

Social capital; social cohesion; community food security; confirmatory factor analysis

Introduction

Food insecurity is a common experience for many households in the US: one in seven were categorized as food insecure in 2014.¹ Food security is defined as access to enough food for a healthy and active life.² Food insecure households may have decreased food intake and/or reduced dietary quality.² As a result, food insecure individuals may be more likely to experience adverse outcomes, such as chronic diet-related diseases, obesity, depression, anxiety, limited mobility, work impairment, decreased social participation, and child developmental problems.^{3–6}

Food security research has largely focused on household economic determinants of food insecurity, showing that higher rates of food insecurity exist in low-income households that have limited financial resources and budgetary constraints (e.g. trade-offs between food costs, healthcare, transportation, rent/mortgage).^{7,8} Poverty is still an important predictor of food insecurity.^{9,10} However, in 2018, 61% of persons living below the poverty line were food secure, and 59% of food insecure households in which income information is

available, were above the poverty line.⁷ This may be in part due to ineligibility for federal food assistance programs like the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).⁷ Research has also emerged that focuses on the food environment, especially in areas with concentrated poverty.^{11–14} This research has focused on potential barriers to household food security, such as, affordability (price variations among food sources and between processed food and fresh produce), accessibility (availability and distance of food sources and transportation to sources), and availability of nutrient-dense food varieties.^{11–14}

Food insecurity is most commonly measured at the individual or household level² and emphasizes a resource deficiency perspective¹⁵ (i.e., enough money or food to last through the month). Anti-hunger strategies have largely been important ways to treat the immediate problem of food insecurity through emergency food programs (e.g., food pantries, communal meals) and federal programs that provide transfer payments to households to purchase food (e.g., SNAP, WIC).¹⁶ While these programs may decrease individual and household food insecurity,⁸ our study uses a broader community food security (CFS) framework to understand how social capital and social cohesion, two theoretical constructs related to the socioeconomic environment, may also influence food security and consumption.¹⁷

The CFS framework has been used to develop community-level interventions to address food security and resulting health outcomes with success.^{18,19} It focuses on the interconnections among economically and environmentally sustainable food systems, public health, community self-reliance, and social justice within communities.^{18,20} For example, in the UK, intervention strategies have focused on building social capital, encouraging civic responsibilities, and strengthening capacity through investment in human capital.^{21,22} At one level, CFS strategies provide financial and material resources (e.g., Community Supported Agriculture [CSA] and community gardens provide produce). However, the intent, and perhaps the potential, of the CFS framework is to incorporate strategies that rely upon relationships (e.g., farmers and customers at farmers' markets, community gardener and other community gardeners) to share resources, to invest in community food production, retain localized food knowledge, increase capacity for food-related economic opportunities, and address nutritional quality.^{18,19}

A CFS perspective considers the social environment including the social processes intertwined within that environment. Debates about the conceptualizations and definitions of social capital and social cohesion exist; this research draws on the theoretical perspectives of Bourdieu²³ and Carpiano²⁴, who distinguish these constructs as separate. Social capital refers to something that can be possessed, and is described as the tangible and intangible resources that are directly derived from social relationships.²³ Resources can include material goods, information, or emotional support.²⁵ Social cohesion, on the other hand, refers to

a characteristic of a community or neighborhood, sometimes referred to as a sense of community. Rather than being something that is possessed by the community, it describes the strength of trust, values, familiarity, and solidarity among residents within a specific neighborhood.²⁵ Social cohesion is a precursor to the production and maintenance of social capital,²⁵ in that people need the opportunity to meet and interact with one another in order for resources to accrue from relationships. Neighborhoods can be optimal settings for interactions, as they facilitate dialogue due to close proximity of residents. In socially-cohesive neighborhoods, people may feel more inclined to socialize and engage with one another. These relationships can then produce greater access to resources.

Bourdieu's conceptualization of social capital differs from Putman, whose conceptualization has been more traditionally used in food insecurity research.^{26–28} Carpiano argues that Putnam's conceptualization of social capital, in which benefits like mutual aid, trust, reciprocity arise from social networks,²⁹ is more consistent with the construct of social cohesion. For example, an older female adult living alone on a fixed income may face significant financial limitations. After engaging with a neighbor, she may learn about local food pantries and free community meals intended to assist people with nutritional needs. This initial interaction may encourage her to attend a free community meal where she may learn about market voucher programs, produce giveaways, and federal benefit programs from other diners. Social cohesion laid the fertile ground for the older adult female to network with a neighbor that led to the social capital, in this case, the advice about where to locate free meals.

The aim of this study was to assess the presence of social cohesion and social capital, as two distinct theoretical constructs, in the context of a community food assessment survey conducted to assess baseline measures of food access, food security, and self-reported health in 10 neighborhoods across a large city.³⁰ This analysis fits into a broader community-university research agenda interested in developing and testing community-level interventions in low food access areas identified through the community food assessment. In order to better understand what strategies may be used or developed to address food insecurity at the community-level, this factor analysis aimed to identify potential underlying factor structures of social cohesion and social capital. We offer insights into the conceptualization and measurement of these constructs and build on literature investigating social capital and social cohesion as it relates to food insecurity.

Methods

Data

We conducted a cross-sectional, community food assessment survey within a large metropolitan area in a Midwestern state between January 2014 and

April 2014. The study area was determined through a series of community-university research team meetings and was chosen based on feasibility and reaching a representative sample of neighborhoods that historically vary in levels of investment and resources.^{30,31,32} The research team conducted an initial review of the American Community Survey 2011 5-year estimates in each of the Census tracts representing the study area to identify expectations for a representative sample in terms of race, age, gender, and household income. In order to obtain a representative sample, surveys were administered either in-person, at predetermined sites, or online. The research team identified study sites that would best reach 2% of the population in these areas, which was related to the maximum reasonable expectations for an effort of this scale with resources available. Survey sites were determined based on their proximity to the study area and their potential for reaching a diverse representation of the study population. Sites included public libraries, settlement houses, affordable housing development, food retail stores, Boys and Girls Club, health department, and YMCA/YWCA sites. In-person surveys were administered by trained research assistants. We shifted expectations and sampled approximately 1% of households in the area, in part due to delayed data collection during one of the coldest winters on record. This limited surveying to indoors, resulted in survey sites closing during survey periods, and provided challenges for research assistants who could not get to sites due to weather conditions (i.e., cars snowed in, not starting). Our community-university research team relied on our survey sites, agencies or businesses that could not host a survey site but wanted to be involved, personal and professional networks, paid research assistants (community-based and students), and food-based professional listserv to share information through flyers, emails, social media, and postcards. Participants could enter a raffle to receive \$25-\$50 grocery gift cards and two digital tablets for completing the survey.^{30,31,32}

Key Measures

Food Security

The six item U.S. Household Food Security Survey Module³³ was used to measure food security. The module establishes four levels of food security: high, marginal, low, and very low. This shorter version of the 18-item scale is often used if the scale is part of a longer survey.³⁴

Social Capital

Six survey items were used to measure social capital (Table 1). These items were adapted for this study by utilizing Bourdieu's social capital definition and represent resources that accrue from formal social networks. Participants were asked about resources (i.e., transportation, food) gained from

Table 1. Description of survey items included in analysis.

Item	Proposed Theoretical Factor	All N = 563 Mean (SD)	Food Secure n = 377 Mean (SE)	Food Insecure n = 186 Mean (SE)
1. How often did you travel to go food shopping using [getting a ride with someone I know as a source] of transportation? [Never = 1, Some of the time = 2, Most of the time = 3] **	Social Capital	1.64 (0.64)	1.59 (0.032)	1.74 (0.049)
2. How often have you or someone in your household used [friends, co-workers, neighbors as a] food sources? [Never = 1, 1-3x/yr = 2, 4-6x/yr = 3, One or more x/mo = 4]	Social Capital	1.87 (1.04)	1.87 (0.054)	1.86 (0.073)
3. How often have you or someone in your household used [relative outside of the home as a] food sources? [Never = 1, 1-3x/yr = 2, 4-6x/yr = 3, One or more x/mo = 4]**	Social Capital	1.87 (1.01)	1.78 (0.050)	2.04 (0.078)
4. How often have you or someone in your household used [Farmer's Market or Produce Stand] food sources? [Never = 1, 1-3x/yr = 2, 4-6x/yr = 3, One or more x/mo = 4] ***	Social Capital/ Community Food	2.29 (0.97)	2.42 (0.050)	2.03 (0.069)
5. How often have you or someone in your household used [Community supported agriculture (CSA) (i.e. buy food shares from farm)] food sources? [Never = 1, 1-3x/yr = 2, 4-6x/yr = 3, One or more x/mo = 4]	Social Capital/ Community Food	1.28 (0.75)	1.32 (0.041)	1.21 (0.047)
6. How often have you or someone in your household used [Community or personal garden] food sources? [Never = 1, 1-3x/yr = 2, 4-6x/yr = 3, One or more x/mo = 4] *	Social Capital/ Community Food	1.80 (1.07)	1.88 (0.057)	1.62 (0.073)
7. My friends in the neighborhood are part of my everyday activities. [Strongly Disagree = 1, Disagree = 2, Not Sure = 3, Agree = 4, Strongly Agree = 5] **	Social Cohesion	2.87 (1.32)	2.99 (0.067)	2.62 (0.097)
8. People here know they can get help from others in the neighborhood if they are in trouble. [Strongly Disagree = 1, Disagree = 2, Not Sure = 3, Agree = 4, Strongly Agree = 5] **	Social Cohesion	3.22 (1.13)	3.31 (0.055)	3.02 (0.092)
9. I have NO friend in the neighborhood on whom I could depend. [Strongly Disagree = 1, Disagree = 2, Not Sure = 3, Agree = 4, Strongly Agree = 5] ***	Social Cohesion	3.75 (1.25)	2.03 (0.056)	2.68 (0.105)

*p < .05, **p < .01, ***p < .001 (t statistic)

immediate relationships. Participants responded to the question, “Over the last year, how often did you travel to go food shopping using [getting a ride with someone I know as a source] of transportation?” The responses were categorized as “never”, “some of the time”, “most of the time”, and “do not know/refused to answer.” We included transportation because of its relationship to previous research on food access³⁵ and our own research from the community food assessment which showed that, while 70% of households had access to their own car, this decreased to 51% for food insecure households.³² In addition, respondents were asked, “In the past 12 months, how often have you or someone in your household obtained food from friends, co-workers, neighbors, and relatives outside of the home. Responses were categorized as “never”, “1–3 times during the year”, “4–6 times during the year”, “one or more time each month”, and “do not know/refused to answer.” These questions were asked based on research related to coping strategies or food acquisition strategies low-income households may use to ensure their household has enough to eat.^{36,37}

Participants were also asked about resources gained from social exchanges through participation in community-based food programs that are considered CFS strategies.^{38,39} Respondents were asked, “In the past 12 months, how often have you or someone in your household obtained food from a farmers’ market or produce stand, community supported agriculture (CSA), or a community or personal garden. Responses were categorized as “never”, “1–3 times during the year”, “4–6 times during the year”, “one or more time each month”, and “do not know/refused to answer.”

Social Cohesion

Three items measured the presence of social cohesion, derived from the valid and reliable Sense of Community Scale⁴⁰ (see [Table 1](#)). The Sense of Community Scale is typically used to assess psychological sense of community at the neighborhood level (e.g., social supports, casual contacts); different versions have been used by planning professionals, social science researchers, public health practitioners, and geographers.^{41–44} Since several of our research team members have these backgrounds and would be involved in future community-level intervention strategies, the team decided this measure would be most useful for understanding participants’ sense of community as it relates to CFS strategies like capacity-building, civic engagement, and participatory action.^{21,39} Participants were asked to respond to three statements on a five-point scale (1 = strongly disagree to 5 = strongly agree) including “My friends in the neighborhood are part of my everyday activities”, “People here know they can get help from others in the neighborhood if they are in trouble”, and “I have no friend in the neighborhood on whom I could depend.”

Statistical Analysis

Data was managed and cleaned resulting in the inclusion of 563 respondents for this analysis. Data was cleaned in order to remove 141 cases with missing data, 1 case that was considered a univariate outlier, and 11 cases that violated multivariate assumptions about normality and linearity. Descriptive statistics are provided for demographic information and the nine items that were included as part of our factor analysis. In addition, we conducted t-tests comparing the mean scores of those nine items between food secure and food insecure households in our sample.

Confirmatory factor analysis (CFA) was chosen to empirically test a theoretical model specifying the factor structure of social capital and social cohesion. A minimum of 300 cases is recommended for factor analyses.⁴⁵ CFA is a robust, theory-driven analysis that can determine how adequate items represent a construct and provide an overall assessment of fit of a hypothesized model.⁴⁶ We performed the CFA using MPlus v.7.4,⁴⁷ a software program capable of working with ordinal data. MPlus applies a mean and variance-adjusted weighted least squares (WLSMV) estimator and takes into account the unique distribution features of categorical data. WLSMV applies pairwise deletion for missing data.

Planned analyses for the study involved using CFA to test two models. First, we tested a theory-driven model specifying a two-factor solution (Model A). In Model A, six items representing resources accrued from immediate social and distal community networks were loaded onto social capital and three items representing perceptions of neighborhood interaction quality were loaded onto social cohesion. Our second model (Model B) was an alternative theory-driven model that tested a three-factor solution. In Model B, three items representing resources accrued from immediate social networks loaded onto social capital, three items representing resources accrued from distal community networks loaded onto community food participation, and three items representing perceptions of neighborhood interaction quality were loaded onto social cohesion.

The goodness-of-fit was assessed using several fit indices,^{46,48} including: chi square (χ^2), root mean square of approximation (RMSEA), comparative factor index (CFI), Tucker-Lewis index (TLI) and weighted root mean square (WRMR). Modification indices provided suggestions on how to improve model fit. Modifications were made if consistent with theory or empirical evidence.

Results

Participant Characteristics

Table 2 shows our study was skewed with 68% of participants identifying as women, though the city is around 51.3% female.⁴⁹ The city's population,

Table 2. Demographic characteristics of survey participants.

Characteristic	n	%
Gender	379	67.6
Female	178	31.7
Male	4	0.7
Transgender or Other		
Race/Ethnicity	375	68.1
White/Caucasian	121	22.0
Black/African American	55	10.0
Other		
Hispanic/Latino Descent	21	3.8
Educational Status	100	17.8
H.S. Grad or GED	116	20.7
Some College, No Degree	36	6.4
Associates, Two-Year, Technical School	150	26.7
Bachelor's Degree	159	28.3
Graduate/Professional Degree or greater		
Household Income Source ¹	379	67.3
Part-Time Employment in HH (< 35 hrs/week)	176	31.3
Full-Time Employment in HH (> 35 hrs/week)	92	16.3
Temporary, Seasonal, Cash-Based Work	10	1.8
TANF	19	3.4
Child Support	70	12.4
SSI/Disability/Veterans Benefits	76	13.5
Social Security/Pension/Retirement	21	3.7
Unemployment/Workers Compensation		
Food Security Status	377	66.9
Food Secure (Marginal & High Combined)	91	16.2
Low Food Secure	95	16.9
Very Low Food Secure		
Federal Government Assistance Programs	133	23.6
SNAP Use		
Household Income	190	33.7
\$0-\$24,999	119	21.1
\$25k-\$49,999	80	14.2
\$50k-\$74,999	131	23.2
\$75k-more		
Health Conditions in Households	189	33.6
Hypertension	152	27.0
High Cholesterol	55	9.8
Pre-Diabetes	66	11.8
Type II Diabetes		
	M	SD
Age, in years	40.1	14.8
Household Size	2.8	1.6

Percentages may not equal 100 due to missing data.

which does include some areas not surveyed, is around 61.1% White/Caucasian, 28.0% Black/African American, and 5.8% Hispanic.⁴⁹ Our study included a slightly higher number of White/Caucasian participants (68%) and a slightly lower percentage of Black/African American participants (22%) and Hispanic participants (4%) than the general population. Around 88% of people in the city 25 years of age or older have a high school education or

more, and 34.8% have obtained a Bachelors' degree.⁴⁹ Our sample, which included people under the age of 25 (but 18 or older), included 17.8% with a high school degree or equivalence, 20.7% with some college, but no degree, 26.7% with a Bachelor's degree, and 28.3% with a graduate, professional degree or higher. The higher percentage of education is likely reflective of the participants who lived near the university where the study took place, which the higher percentage of low education attainment is likely skewed in neighborhoods of the study where educational attainment is far lower than the city's average. While estimates of food insecurity for the city where the study take place are around 17.4%,⁵⁰ our sample for this analysis had 33% of households identifying as food insecure (16% low food secure, 17% very low food secure). Most households relied on part-time employment as a source of income (67%), 31.3% had a person employed full-time, 16.3% received income through temporary, seasonal, or cash-based work, and almost one-fourth received SNAP benefits. Many households were living in poverty; about 34% of households had annual incomes below \$25,000.

Table 1 provides the mean scores of the nine theory-driven items selected for the CFA for the entire sample, food secure households, and food insecure households. On average, food insecure households received rides to food stores from someone they knew ($M = 1.74$, $SE = 0.049$) significantly more than food secure households ($M = 1.59$, $SE = 0.032$; $t(561) = 2.732$, $p = .006$; $r = 0.11$). Food insecure households also obtained food from relatives ($M = 2.04$, $SE = 0.078$) significantly more than food secure households ($M = 1.78$, $SE = 0.050$; $t(561) = 2.928$, $p = .004$, $r = 0.12$). Food secure households regularly purchased food from farmers' markets or produce stands ($M = 2.42$, $SE = 0.050$) significantly more than food insecure households ($M = 2.03$, $SE = 0.069$; $t(377) = -4.550$, $p = .000$), representing a low effect size ($r = 0.23$). The same was true for the use of community or personal gardens with food secure households ($M = 1.88$, $SE = 0.057$) participating more than food insecure households ($M = 1.62$, $SE = 0.073$; $t(403) = -2.775$, $p = .006$; $r = 0.14$). Food insecure households reported lower levels agreement with the statement about friends in the neighborhood being part of every activities ($M = 2.62$, $SE = 0.097$) than food secure households ($M = 2.99$, $SE = 0.067$; $t(561) = -3.124$, $p = .002$; $r = 0.13$), while significantly higher differences with the statement about having no friend in the neighborhood on whom they could depend ($M = 2.68$, $SE = 0.105$) than food secure households ($M = 2.03$, $SE = 0.056$; $t(294) = 5.437$, $p = .000$). The latter represented a medium effect size ($r = 0.30$). Food secure households reported more agreement with the statement about people knowing they can get help from neighbors if they needed it ($M = 3.31$, $SE = 0.055$) more than food insecure households ($M = 3.02$, $SE = 0.092$; $t(318) = -2.777$, $p = .000$; $r = 0.15$).

Model A

Model A tested a two-factor solution in which six social capital items loaded onto the social capital latent variable and three items loaded onto neighborhood social cohesion latent variable. The Cronbach's alpha for the six-item social capital scale was 0.547, and .738 for the three-item neighborhood social cohesion scale. The two-factor model proposes that social capital and social cohesion are theoretically disparate constructs. Resources could derive from immediate social relationships (e.g., neighbor, friend, relative, coworker) or social exchanges with people producing and/or distributing food through community-based food strategies (e.g., farmers' markets, CSAs, gardens). All social capital items loaded on the factor with coefficients >0.2 , and all coefficients for social cohesion were >0.6 (Table 3). The goodness-of-fit was poor: $\chi^2_{26} = 193.423$ ($p < .05$), RMSEA = 0.107, CFI = 0.889, TLI = 0.846, WRMR = 1.69. Given that model fit indices test whether the data fit the hypothesized relationships and do not provide insight as to whether this is the best model, it is important to test alternative models.⁴⁶

One source of poor model fit may be the factor loadings.⁵¹ Four items loaded sub-optimally onto the social capital construct: food shopping using a ride with someone they knew, how often they shopped for food at a farmers' market or produce stand, and how often they participated in a CSA, community/personal garden. Standardized factor loadings were 0.225, 0.391, 0.416, and 0.484, respectively. Given poor fit, we identified an alternative, theory-drive model.

Model B

Model B tested a three-factor solution in which three items loaded onto the social capital latent variable (coefficient $\alpha = .585$), three items loaded onto the community food strategies latent variable (coefficient $\alpha = .550$) and three items loaded onto the social cohesion latent variable (coefficient $\alpha = .738$). Coefficients for the social capital items were >0.3 , coefficients for community food strategies were >0.6 , and coefficients for social cohesion were >0.6 (Table 3). Model fit indices for the three-factor model suggested marked improvement: $\chi^2_{24} = 49.840$ ($p < .05$), RMSEA = 0.044, CFI = 0.983, TLI = 0.974, WRMR = 0.768. Items loaded adequately onto their respective factors with exception to one social capital item: "Over the past year, how often did you travel to go food shopping using (a ride with someone I know)? The item's standardized loading was small, but significant. Unlike exploratory factor analysis, there is less consensus as to minimum factor loading thresholds in CFA.⁴⁶ Whereas EFA is a data driven analysis, CFA is theory driven. These items are theoretically related;

Table 3. Standardized factor loadings of items for models A and B (N = 563).

Item	Model A		Model B		
	Social Capital	Social Cohesion	Social Capital	Community Food Participation	Social Cohesion
1. How often did you travel to go food shopping by getting a ride with someone you know as a source of transportation?	0.23 (0.05)		0.30 (0.05)		
2. How often have you or someone in your household used friends, co-workers, neighbors as food sources?	0.79 (0.05)		0.87 (0.07)		
3. How often have you or someone in your household used a relative outside of the home as a food source?	0.69 (0.05)		0.74 (0.07)		
4. How often have you or someone in your household used farmers' markets or produce stands as a source of food?	0.39 (0.05)			0.87 (0.06)	
5. How often have you or someone in your household used community support agriculture (CSA) as a source of food?	0.42 (0.07)			0.65 (0.07)	
6. How often have you or someone in your household used community or personal gardens as a source of food?	0.48 (0.05)			0.72 (0.06)	
7. My friends in the neighborhood are part of my everyday activities.		0.87 (0.03)			0.64 (0.03)
8. People here know they can get help from others in the neighborhood if they are in trouble.		0.65 (0.03)			0.58 (0.03)
9. I have no friend in the neighborhood on whom I could depend.		0.72 (0.03)			0.72 (0.03)

Standard errors are in parentheses.

Model A: 2-Factor Model. $\chi^2_{26} = 193.423$ ($p < .05$), RMSEA = 0.107, CFI = 0.889, TLI = 0.846, WRMR = 1.69. * $p < .001$. Model B: 3-Factor Model. $\chi^2_{24} = 49.840$ ($p < .05$), RMSEA = 0.044, CFI = 0.983, TLI = 0.974, WRMR = .768. * $p < .001$.

the response patterns to these items may be explained by the underlying social capital latent variable.

Discussion

The purpose of this research was to explore whether a set of items from a community food assessment used in a large Midwestern city (and proposed to be used in other areas) showed evidence of underlying factors of social capital and social cohesion, which have been shown to influence food security and health.^{27,28} In order for the research team to test whether existing CFS strategies (e.g., farmers' markets, CSA programs, community gardens) or other innovative community-level interventions could be used to improve community food security and health, we tested their potential using a theoretically-driven model based on Bordieu's and Carpiano's conceptualization of social capital and social cohesion.^{23,24} Our results provided evidence that community food participation was a distinct factor structure, separate from social capital and social cohesion.

The discussion that follows outlines different interpretations of the three-factor solution that are both useful and challenging to interdisciplinary researchers and practitioners that are interested in exploring different strategies to address community food security. We first discuss the strengths and weaknesses of the items that formed the underlying factor structure we theorized as social capital as it relates to food security. Then we discuss the items that uniquely formed the social cohesion factor as a separate factor from social capital.^{23,24} Next, we discuss the importance of community food participation as a unique factor structure in the context of addressing community food security. We then provide recommendations for improvements to our study based on our findings and future directions for this research.

Social Capital

Carpiano and Bordieu frame social capital in terms of resources embedded in community relationships.^{23,24} We were interested in the extent to which participants in our study accessed food or transportation through relationships with friends, relatives, co-workers, or neighbors. Since we use a CFS framework, we were interested in all households in a community, including food secure and food insecure households. However, it is important to consider the results in light of the different needs of each group when interpreting the results.

Households often use social networks to get food, especially near the end of the month when formal cash or food assistance (e.g., federal food programs, limits on times households can obtain food from pantries) may be depleted.^{36,37} People who receive food from social networks are more likely to be food insecure because the goal of the exchange was giving and receiving food during times of need to ensure no one experienced hunger.⁵²

In our study, there was no significant difference between food secure and food insecure households in terms of getting food from friends, co-workers, or neighbors (between never and 1–3 times/year), but there was difference when specifically asked about obtaining food regularly from relatives. Food insecure households accessed food from relatives between 1–3 times per year. Our community food assessment tool was being used to determine the extent to which people accessed social networks, rather than asking whether they would be available, if needed or desired. We assume the majority of food accessed through social networks was due to need.^{36,37,52} Thus, we are cautious about the results identifying these items as social capital, given the wording and the strong relationship between socioeconomic characteristics of households with low food access.

For participants living in low food access neighborhoods where poverty is high and transportation is challenging, limited affordable and healthy food options may exist.^{53,54} Obtaining a ride from someone may help households with limited food access to visit multiple food stores, find more affordable prices, and obtain better variety of foods. There was a significantly higher number of food insecure households that received a ride from someone they knew to obtain food, though on average, both food secure and food insecure households answered between never getting a ride and only getting a ride some of the time. The way the question was asked may relate more to need; for example, a person with their own car would likely not need to access this resource unless their car was unreliable or needing repairs. However, over 50% of food insecure households did not have a vehicle, and the frequency of accessing a car from someone they knew was very low. In order to gain a better understanding of this item in terms of social capital, we suggest modifying the statement as to whether there was a potential for this resource if needed. Otherwise there is a concern that this item may not be measuring social capital in the sense that people who have higher socioeconomic statuses, are likely to have access to their own vehicle. In addition, this issue may be different in communities in which more people of all socioeconomic background use public transportation.

Social Cohesion

Social cohesion has been described more recently as “patterns of social interaction and values (e.g., network formation and ties, familiarity, and mutual trust) that lead to social capital and which serve as intermediaries between structural antecedents and social capital.”²⁴ The two- and three-factor model confirmed that social cohesion was disparate from social capital. In both models, modification indices do not suggest adding covariance relationships between social cohesion and other factors.

The community food assessment used in this study included three items from the Sense of Community Scale,⁴⁰ which specifically addresses

individual's perceptions of their neighborhood. Since differences exist in definitions of and distinctions between social capital and social cohesion, some scholars argue that Sense of Community Scale items are cognitive social capital, as they are subjective and relate more to values and perceptions.⁵⁵ Harpham distinguishes survey items that are considered intermediate variables between social capital and health, including items such as "sense of belonging."⁵⁵ Carpiano's conceptualization of social cohesion²⁰ aligns with Harpham's⁵⁵ distinction for items similar to those in our survey, which further supports social cohesion as a unique factor.

In our study, perceptions of participants' sense of connectivity and support in their community⁵⁶ serve as a strategy to gauge the potential network of neighbors with whom individuals in a neighborhood could build relationships. We can use the three social cohesion items to understand perceived social support, trust, and the existence of informal networks in neighborhoods. Social cohesion in a community can lead to social capital, as social interactions have been correlated with improving food access, which can impact food security and health.⁵⁷ When communities are more connected, people may be more inclined to ask each other for help, lend help, or engage in community actions like planting and maintaining a community garden. Social cohesion is the soil that can develop a seed or plant, which is social capital.

Community Food Participation

Our results indicate that a three-factor model is a better fit than a two-factor model for community food strategies (i.e., obtaining food through CSA program, farmers' market, and/or garden). One explanation may be that community food strategies represent different types of potential relationships in which an individual interacts in community spaces designed to address food security through systematic long-term strategies.⁵⁸ Bourdieu and Carpiano refer to social capital deriving from social networks of more or less formal relationships.^{23,25} In our study, we did not ask about the nature of the social exchanges that individuals have in these spaces. Thus, we do not know whether relationships are social or structural. Individuals may have different reasons for obtaining food through farmers' markets, CSAs, and/or gardens, and social interactions may not be as important as simply purchasing food or growing quality produce. Participants may be motivated to participate in these programs to support local economic activities, to become more self-reliant, to redeem farmers' market incentive vouchers, to increase access to fresh fruits and vegetables, to purchase or grow food that aligns with ethical values.^{18,19,58-60}

Community food strategies may, however, serve as antecedents to social capital. Social interactions are correlated with improving food access, which may impact food security and health.⁵⁷ Research on interactions at a farmers'

market located at a federally qualified health center showed that social interactions between producers, consumers, and people at the market range widely, including camaraderie and relationship building, educational, resource sharing, economic and financial exchanges, and conflict resolution⁶¹. The nature of these interactions may provide opportunities for public health interventions.⁶¹

Research has examined the notion of CSAs not only an exchange of food, but also interconnectedness of food, economics and community.⁶⁰ Farms focused on community-building organizational structures (e.g., requiring CSA members to work on the farm, hosting cooking classes and potlucks) may serve as the best space to test a community food security intervention focused on relationship-building.⁶⁰ In our study, we do not know what type of CSA model participants were part of and, thus, do not know the nature of the exchanges beyond obtaining food. Nevertheless, community food strategies provide an opportunity to explore the relationship to food security and health and potential interventions aimed at testing increasing access to resources through social networks.

It is possible that the underlying factor structure is unique due to the potential relationship the three community food participation items have to socioeconomic status. In many communities across the U.S., participation in farmers' markets and CSA's, in particular, have historically been wrought with racism and classism^{62,63} and have often served predominantly white households from high socioeconomic backgrounds. Many studies have shown that CSA members tend to have higher incomes and education,⁶⁴⁻⁶⁶ while less differences exist at farmers' markets.⁶⁷ Interestingly, new research from a national sample provides evidence that higher educated individuals are less likely to participate in a CSA and that race and income don't impact the likelihood of participating in a CSA.⁶⁸ In our study, food secure households participate in farmers' markets and produce stands significantly more than food insecure households.

In the city where this study took place, most markets run from May through October, with only one market north of the city open in the winter. Participation in farmers' markets for food insecure households was in the range of one to three times/year. We don't have any way to gauge what percentage of food comes from markets and whether shopping one to three times/year aligns with participants' regular frequency of shopping. There was low participation in CSAs, though no significant difference between the two groups. We did not separate out community and personal gardens in the original assessment tool, but will in future work in order to explore access to garden space and potential differences between personal gardens and community gardens in terms of social capital, community food participation, and social cohesion.

Since we began this research, more funding has been made available to support CFS strategies and programs that target at least two aspects of the food system.⁶⁹ They are intended to improve healthy food access for low food access communities and households with limited financial means, while also providing new and consistent customers for farmers at markets, produce stands, and direct marketing programs (e.g., CSAs).⁶⁹ In addition, funding has provided ways to amplify federal SNAP dollars so that low-income consumers can purchase fresh produce, without farmers having to reduce their prices and incur the potential profit loss.^{70–72} CSA models have expanded too, allowing customers to pay monthly or bi-weekly, use SNAP, or have their shares subsidized.^{70,73} Additionally, programs have improved access through providing transportation to markets, supporting the development of new markets, or providing delivery to communities.⁷⁴ Early research has shown that CSAs are traditionally about more than food, but more about relationships between members and between producers and consumers.⁷⁵ Future research will need to assess programmatic outcomes and determine how they relate to social capital and social cohesion for low-income households.

Limitations and Future Directions

Our community food assessment was developed with the intent to identify neighborhoods in which food security and diet-related health outcomes were highest and/or food insecurity rates were lower than expected based on socio-demographics. While low social capital has been shown to relate to increased odds of food insecurity, it is not necessarily the case when socio-demographics are considered.²⁶ Some researchers have warned that interventions aimed at improving social cohesion to address food security, must also be paired with improving underlying household and community conditions in low-income communities with low food access.²⁶ Their argument is that the problem of food insecurity is resource deficiency (i.e., not having enough money or food).¹⁵ However, other researchers have shown that interventions strengthening social cohesion within neighborhoods, especially in mothers identified as racial or ethnic minorities, will decrease food insecurity.^{7,6} The next phase of this study will include identifying the relationship between social cohesion, food security, and health outcomes across neighborhoods. It will also be important to consider differences within neighborhoods that may impact food insecurity and health (e.g., socioeconomic status, age, employment status), as people in a neighborhood may not perceive their community environment similarly.^{24,40}

Our community food assessment tool did not allow for a deeper understanding of the strength of relationships participants had with relatives, co-workers, friends, and neighbors. We also did not separate out neighbors as a unique set of individuals, which may have resulted in moving under social

cohesion, nor do we have a sense of whether households in our study live in the same neighborhood as relatives, co-workers, or friends. Future community-university discussions about intervention strategies in specific neighborhoods could propose further research using social network analyses.

In our study, participants were asked about resources in their neighborhood that were available to help obtain food. Our hypothesized social capital factor, however, focused more on accessing those resources, rather than survey items that addressed potential resources (i.e., simply having them available). We did not ask, however, whether there was reciprocal exchange of goods or services (e.g., payment for the ride, sharing of food) or the nature of the exchanges between the driver and passenger(s) beyond the purpose of the ride. Social capital and informal exchanges can complement existing food assistance programs.⁵² Further exploration to determine the impacts of relationships over time would help develop a greater understanding of the strength of those social ties and potential impacts on food insecurity if food is not the only goal of the exchanges.

Conclusion

Our findings contribute to the understanding of social capital and social cohesion within the context of food insecurity, because we deliberately measure these constructs as distinct and include community food measures. Ultimately, we wanted to know if our community food assessment survey included evidence of social capital and/or social cohesion as unique factors in an effort to consider our approach to the development and use of community-level interventions that could relate to those factors and address community food security. Our findings suggest that community-based food strategies are unique and may serve dual purposes, depending on the nature of the social interactions that take place when food is exchanged, shared, or grown with others. Our research provides evidence of conceptualization and measurement of these constructs, as well as offers areas of improvement helpful to other research teams that are trying to address food insecurity at the community-level and who are especially interested in the community food security framework.

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Note

1. Household income does not add to 100% because households may have multiple sources of income.

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