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But Where Can We Buy an Ounce of Prevention? Sprawl, Access, and Fresh Fruit and Vegetable Consumption

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ABSTRACT

Fresh fruit and vegetable consumption (FFV) is integral to a healthy diet and increased longevity, yet 25.8 million Americans live in areas of restricted access, with under-resourced communities particularly vulnerable. To consider how immediate environment influences FFV, this study uses the Behavioral Risk Factor Surveillance System (BRFSS) survey ($N = 122{,}265$) to examine the influence of sprawl on FFV consumption. Findings indicate that higher sprawl relates to lower FFV consumption, and this relationship persists net of demographic covariates. Implications offer that social work's person-in-environment approach can increase FFV access in under-resourced communities.

KEYWORDS

Sprawl; fruit and vegetable consumption; barriers to access

Low fruit and vegetable consumption is one of the top 10 mortality risk factors worldwide: diet-related deaths accounted for 62% of all reported U.S. deaths in 2011 (Mokdad, Marks, Stroup, & Gerberding, 2004; Wang et al., 2014). Despite clear evidence on the crucial dietary role of fresh fruits and vegetables (FFVs), most Americans do not meet dietary guidelines for consumption, and those least likely to meet guidelines include people of color and people living in poverty (T. Robinson, 2008) Although the consumption of FFVs is integral to a healthy diet, many individuals experience severely restricted proximal and financial access to these fundamental foods (Ludwig & Pollack, 2009; Walker, Keane, & Burke, 2010). Conservative estimates indicate that approximately 9% of all U.S. residents, or 25.8 million people, live in areas of severely restricted access to FFVs (U.S. Department of Agriculture [USDA], n.d). The USDA (n.d.) defines areas of severely restricted access, or "food deserts." as areas that are low income (more than 20% of residents live below the poverty line or in households with incomes less than 80% of the area median) and low access (at least 33% of residents live greater than a mile from a supermarket, or 10 miles in rural areas). By definition, the lack of accessible, affordable FFVs in food deserts dramatically reduces the opportunity of healthy diets (Hendrickson, Smith, & Eikenberry 2006; Ludwig & Pollack, 2009).

Purpose and significance

Although social workers have long incorporated an ecological approach to addressing social problems, historically, community access to FFVs has not been examined through a social work lens. This article seeks to (a) bring attention to fruit and vegetable access as a relevant social work issue, specifically within minority, poor, and otherwise under-resourced communities; (b) examine the role of "place" predictors in FFV consumption, specifically environmental sprawl; and (c) harness social work's unique person-in-environment perspective to influence practice and policy recommendations and to guide future research in the area.

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Place, race, and access

An inverse correlation exists between distance to a supermarket and FFV intake: the farther one must travel, the fewer daily servings consumed (Larson, Stor, & Nelson, 2008; Michimi & Wimberly, 2010; P. L. Robinson et al., 2013). Barriers to access may include having few or no grocery stores or supermarkets that stock FFVs, inundation of fast-food outlets or corner stores, transportation obstacles (no personal vehicle nor available public transit), or limited income (Cotterill & Franklin, 1995; Glanz, Sallis, Saelens, & Frank, 2007; Hendrickson et al., 2006; Jetter & Cassady, 2006; Moore & Roux, 2006). Difficulty accessing supermarkets may go beyond physical proximity to include factors such as individual perception of whether a retailer offering fruits and vegetables is within reasonable travel distance, unsafe or pedestrian-unfriendly neighborhoods, lack of awareness or agreement regarding the importance of fruits and vegetables in the diet, and lack of prioritizing time for grocery shopping (Caspi, Sorenson, Subramanian, & Kawachi, 2012; Garasky, Morton, & Greder, 2004; Richards & Smith, 2007; Rose & Richards, 2004; Walker et al., 2010).

Minority, poor, and otherwise under-resourced communities are more likely to be food deserts, and residents experience higher levels of diet-related morbidity and mortality (Giang, Karpyn, Laurison, Hillier, & Perry, 2008; Glanz et al., 2007; Lewis et al., 2005). Supermarkets are less available in neighborhoods comprising primarily minority residents compared to neighborhoods comprising primarily White residents (Larson et al., 2008). Conversely, outlets without FFVs, such as fast-food restaurants, corner stores, and liquor stores, are more heavily concentrated in lower-income and minority neighborhoods (D. Block & Kouba, 2006; J. P. Block, Yulei, Zaslavsky, Ding, & Ayanian; 2009; Jetter & Cassady, 2006; Morland & Filomena, 2007; Powell, Slater, Mirtcheva, Bao, & Chaloupka, 2007). When produce items are offered from convenience retailers in poor neighborhoods, they are frequently of low quality, unpalatable, or even inedible (Hendrickson et al., 2006; Martin et al., 2014; Raja, Ma, & Yadav, 2008).

In addition to limited access, low-income families experience financial barriers to purchasing FFVs (Chung & Myers, 1999; Glanz et al., 2007; Hendrickson et al., 2006). For example, the average price for fresh items at convenience retailers—when they are available—is higher than at supermarkets (Chung & Myers, 1999; Kaufman, 1998). Similarly, in order to meet the USDA fruit and vegetable guidelines, low-income families would need to devote between 43% to 70% of their food budget to purchase produce items alone (Cassady, Jetter, & Culp, 2007).

Personal prioritization of FFV consumption also influences consumption (Adams & Adams, 2011; Caldwell, Kobayashi, DuBow, & Wytinck, 2009; Feldmann, & Hamm, 2015). Some individuals perceive low FFV value relative to cost. For example, individuals who perceive FFVs as too expensive—more common among socioeconomically disadvantaged groups—consume significantly fewer daily servings than those who perceive affordability, regardless of actual affordability (Williams, Abbott, Crawford, & Ball, 2012; Williams, Thornton, Ball, & Crawford, 2014). In fact, some research indicates affordability (financial access) is a stronger predictor of FFV intake than availability (proximal access; Kyureghian, Nayga, & Bhattacharya, 2013).

Measuring access

Prior studies examining the effects of the local food environment on FFV consumption, particularly with poor and minority populations, use various strategies to measure environment (Caspi et al., 2012; Walker et al., 2010). Some studies relied on geospatial analysis to measure proximity or density of retailers (Gustafson et al., 2011; Izumi, Zenk, Schulz, Mentz, & Wilson, 2011; Jennings et al., 2011; Moore, Roux, Nettleton, Jacobs, & Franco, 2009), others relied on in-store audits to assess food selection, variety, quality, and price (Bodor, Rose, Farley, Swalm, & Scott, 2008; Caldwell, Kobayashi, DuBow, & Wytinck, 2009; Cheadle et al., 1991; Zenk et al., 2009), and others relied on respondent-based methods to measure residents' perceptions of their food environment (Caldwell et al., 2009; Caspi et al., 2012; Moore et al., 2009; Rose & Richards, 2004; Zenk et al., 2009). Although available studies

demonstrate the importance of food environment, studies often examine a single dimension of food environment, such as distance from home to grocery store or neighborhood grocery store density, which may not capture the complexity of FFV consumption. Informed by density-based research, for example, lawmakers enacted a 2008 ordinance in a poor neighborhood in southern Los Angeles prohibiting new fast-food restaurants from opening in the area. However, the ordinance did not reduce fast-food consumption nor obesity rates in the neighborhoods, and obesity rates in the targeted area continued to rise (Lewis et al., 2005; Sturm & Hattori, 2015). Indeed, qualitative work indicates that retailer location is only one factor influencing FFV consumption. Additional environmental factors include existing mobility patterns, dynamic social ties, and household budget constraints (Widener & Shannon, 2014).

Sprawl

Sprawl is a recently devised measure of the food environment that incorporates multiple components of an area's overall food accessibility as opposed to relying upon single factors such as proximity or density (Ewing, Pendall, & Chen, 2003; Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003). Sprawl captures proximity, density, walkability, street network connectivity and safety, presence of community centers, and neighborhood mix of available jobs, homes, and service types (Ewing, Pendall,& Chen, 2003; Ewing, Schmid, et al., 2003). In general, sprawling areas have few resources within safe walking distance for residents; homes are far from services, stores, and businesses; and few, if any, walkable roads between destinations (Ewing, Pendall, & Chen, 2003; McCann & Ewing, 2003). Consequently, sprawl is a multidimensional measure of an area's accessibility, and its usage can contribute to knowledge about community food accessibility (Ewing, Pendall, & Chen, 2003; Ewing, Schmid, et al., 2003; O'Dare, 2011).

Few studies have examined the role of sprawl and community food accessibility and dietary behaviors (Ewing, Brownson, & Berrigan, 2006; Ewing, Schmid et al., 2003; Feng, Glass, Curriero, Stewart, & Schwartz, 2010; Kirk, Penney, & McHugh, 2010). Most studies examining sprawl use it as a predictor of obesity or physical activity-limiting characteristics of the environment (Cho, Chen, Yen, & Eastwood, 2006; Ewing et al., 2006; Ewing, Meakins, Hamidi, & Nelson, 2014). The current study answers Ewing et al.'s (2014) call to examine the influence of sprawl on FFV consumption within the context of food choice availability. We address the following research questions:

Research Question 1: How does sprawl level relate to individual FFV consumption?
Hypothesis 1: Based on prior findings (Cheadle et al., 1991; Ewing, Pendall, & Chen, 2003; Ewing, Schmid, et al., 2003; Herman, Harrison, Afifi, & Jenks, 2008; Larson et al., 2008; Rose & Richards, 2004), we expect an inverse relationship between sprawl score and FFV consumption such that people who live in more isolated areas consume fewer FFV.

Research Question 2: How do the influences of race and poverty influence the relationship between sprawl score and FFV consumption?
Hypothesis 2: Based on prior findings (Cassady et al., 2007; Ewing et al., 2006; Ewing, Pendall, & Chen, 2003; Ewing, Schmid, et al., 2003; Larson et al., 2008), we expect that people of color and those living in poverty will consume fewer FFV. We also expect that sprawl will inversely influence FFV consumption above and beyond race and poverty status.

Research study

Data

The study utilized the 2009 Behavioral Risk Factor Surveillance System (BRFSS) ($N = 432{,}607$). The BRFSS is a cross-sectional, population-based system of surveys used by the Centers for Disease Control and Prevention (CDC) to examine health-related behaviors and conditions. Utilizing disproportionate stratified random sampling based on landline telephone density, the BRFSS collects monthly surveys in

all 50 states via random-digit dial telephone surveys (CDC, 2006). We weight data to be representative of people in the United States with landline telephones.

To measure sprawl, we merged Ewing's County Sprawl Scale with the BRFSS (Ewing, Schmid et al., 2003). Drawn from the physical activity literature, Ewing's Sprawl Scale is a comprehensive, multidimensional measure of sprawl used for assessing characteristics that help or hinder access to resources in environments. The measure incorporates 22 items representing different aspects of development patterns thought to characterize sprawl across four factors: (a) residential density; (b) neighborhood mix of homes, jobs, and services; (c) strength of activity centers and downtowns, and (d) accessibility of the street network (Ewing et al., 2006; Ewing, Pendall, & Chen, 2003; Ewing, Schmid, et al., 2003). These four factors are important to consider when measuring food environment because they may capture the complex decision-making processes about purchasing FFV that single measures of proximity or density may miss.

Sample

Ewing's Sprawl Scale includes scores for 83 of the largest metropolitan regions in the United States, including nearly 82% of the U.S. population (Ewing et al., 2006; Ewing, Pendall, & Chen, 2003; Ewing, Schmid, et al., 2003). From the 2009 BRFSS survey respondents, we restricted the study sample to respondents who also had a corresponding Ewing sprawl score ($n = 148{,}361$). The study sample further excluded a small number individuals who were pregnant, who did not respond to the FFV measure, and those who did not respond to any of the independent variables resulting in an analytic sample of $n = 122{,}265$.

Variables and measures

Dependent variable

To measure daily servings of FFV, respondents completed the nutrition indicators component of the BRFSS. The Nutrition Indicators Component of the BRFSS questionnaire consists of six questions related to fruit and vegetable consumption (see Table 1); the measure has been shown to have high reliability and validity (Nelson, Holtzman, Bolen, Stanwyck, & Mack, 2001). BRFSS analysts summed the six items to calculate daily FFV servings.

Main independent variable

Sprawl scores were measured at the county level and range from a low of 14.2 to a high of 177.8 (80% of scores fell within the range of 78.26–128.35). Lower scores indicate higher sprawl, characterized by fewer community focal points, little mixing of homes with business areas, low residential density, and poor street networks and connectivity (Ewing, Pendall, & Chen, 2003). Higher scores indicate less sprawl. Scores were relatively normally distributed, with a mean of 104.98 ($SD = 30.19$, median of 101.79). Only scores from two individuals fell outside two standard deviations of the mean.

Table 1. The Nutrition Indicators Component of the Behavioral Risk Factor Surveillance System Questionnaire, Fruit and Vegetable Consumption Items, Centers for Disease Control and Prevention 2010.

Fruit and Vegetable Consumption Items
1. How often do you drink fruit juices such as orange, grapefruit, or tomato? (times per day)
2. Not counting juice, how often do you eat fruit? (times per day)
3. How often do you eat green salad? (times per day)
4. How often do you eat potatoes not including French fries, fried potatoes, or potato chips? (times per day)
5. How often do you eat carrots? (times per day)
6. Not counting carrots, potatoes, or salad, how many servings of vegetables do you usually eat? (Example: A serving of vegetables at lunch and dinner would be two servings.) (times per day)

Additional covariates

Previous research indicates that race, education, income, marital status, and gender affect consumption (Blanchard & Lyson, 2006; Cassady et al., 2007; Larson et al., 2008). To measure race and ethnicity, we combine two items: one that asks respondents to specify whether or not they are of Hispanic or Latino origin and another that asks respondents to specify their race(s). From these measures, we categorized respondents as Hispanic, non-Hispanc Black, non-Hispanic other race, non-Hispanic multirace, non-Hispanic White (reference). To measure education, respondents are classified as having less than high school education, high school diploma only, some college or technical school, or college degree (reference). Annual income is a ordinal variable based on household earnings from 2008 differentiating people who earned less than $10,000, $10,000 to 14,999, $15,000 to 19,999, $20,000 to $24,999, $25,000 to $34,999, $35,000 to $49,999, $50,000 to $74,999, and $75,000 or more (reference). Marital status distinguishes among respondents who report being divorced, widowed, separated, never married, coupled, or married (reference). Sex is a dichotomous variable (male or female).

In addition demographic covariates, previous research has demonstrated that behavioral patterns and health characteristics including perception of food security, perceived health status, and Body Mass Index (BMI) influence FFV consumption patterns (Caspi et al., 2012). We include these variables from the BRFSS in the analysis. To measure perceptions of food security, respondents answered how frequently they were worried or stressed about having enough money to purchase healthy food items during the past 12 months on a 5-point scale, 1 (*never*), 2 (*rarely*), 3 (*sometimes*), 4 (*frequently*), and 5 (*always*). The BRFSS also measured perceived health status on a 5-point scale, 1 (*poor*), 2 (*fair*), 3 (*good*), 4 (*very good*), and 5 (*excellent*). BMI is a continuous measure of body fatness calculated from self-report data of weight(kg)/ height(m)^2. Finally, to further control for geographic variation in obesity prevalence, we created a regional variable in which we assigned each respondent to one of eight U.S. Census regions (Pacific, Mountain, West North Central, East North Central, Middle Atlantic, New England, South Atlantic, South Central).

Analytic techniques

First, we calculated descriptive statistics using frequency distributions and tests of statistical significance between each covariate and FFV consumption utilizing *t* tests and ANOVA techniques, as appropriate. Second, we employed linear regression techniques to estimate the relationship between sprawl score on FFV consumption. Sequential models measured the extent to which demographic, behavioral patterns, and health characteristics influence FFV consumption. Analyses proceeded from an unadjusted base model to a fully adjusted model including all significant predictors. We present results of the base and final model as the final model captures the findings of the intermediate sequential models. Significance was tested at $\alpha = .01$ and $\alpha = .05$ levels. The current analyses incorporated weights to account for the complex BRFSS sample design. Analyses were conducted in SPSS 21.0.

Results

Descriptives

Table 2 presents the percentage distributions of the independent and dependent variables for the total sample and FFV means by all of the covariates. The mean number of fruits and vegetables consumed daily by all respondents in the sample was 3.74 ($SD = 1.99$, $M = 3.43$). Whites averaged 3.80 servings whereas Blacks and Hispanics averaged significantly fewer servings, averaging 3.59 and 3.49, respectively. In terms of martial status, widowed individuals consumed the most fruits and vegetables (3.90), followed by married individuals ($M = 3.82$), members of unmarried couples ($M = 3.74$), those who are separated ($M = 3.61$) and divorced ($M = 3.59$). Those who reported being never married consumed the fewest FFV servings ($M = 3.51$). College graduates displayed a mean FFV score of 4.05

Table 2. Fruit and Vegetable Consumption by Covariates[a].

Variable	Daily Fresh Fruit and Vegetable Consumption (FFV) Mean	*SD*	SE Mean
Race and ethnicity			
White (non-Hispanic)	3.80	1.94	.025
Black (non-Hispanic)	3.59	2.13	.063
Other race (non-Hispanic)	3.98	1.97	.078
Multiracial (non-Hispanic)	3.86	2.06	.170
Hispanic	3.49	2.04	.051
Education			
Not high school graduate	3.38	2.11	.073
High school graduate	3.40	1.95	.041
Some college	3.66	1.97	.040
College graduate	4.05	1.95	.031
Income			
Less than $10,000	3.40	2.19	.104
$10,001 – 14,999	3.34	2.08	.100
$15,000 – $19,999	3.56	2.12	.088
$20,000 – $24,999	3.56	2.02	.076
$25,000 – $34,999	3.54	1.99	.066
$35,000 – $49,999	3.67	1.97	.055
$50,000 – $74,999	3.74	1.91	.049
More than $75,000	3.95	1.94	.032
Marital status			
Married	3.82	1.93	.025
Divorced	3.59	2.02	.070
Widowed	3.90	1.99	.090
Never married	3.61	2.02	1.460
Unmarried couple	3.74	2.12	.108
Gender			
Women	3.49	1.92	.028
Men	3.99	2.03	.028
Food security (frequency of worry)			
Always	3.0	1.66	.294
Usually	3.3	1.54	.289
Sometimes	3.3	1.59	.148
Rarely	3.4	1.54	.124
Never	3.7	1.51	.061
Perceived health status			
Excellent	4.1	1.52	.035
Very Good	3.8	1.51	.027
Good	3.5	1.56	.031
Fair	3.4	1.58	.052
Poor	3.4	1.59	.093
Region			
Mountain	3.71	2.07	.036
Pacific	3.91	2.10	.060
West North Central	3.57	1.82	.063
East North Central	3.63	2.02	.046
Middle Atlantic	3.82	2.05	.045
New England	3.89	1.99	.075
South Atlantic	3.62	2.00	.046
South Central	3.57	1.88	.097

Source. Behavioral Risk Factor Surveillance System data.
Note. $N = 122{,}265$.
[a] The FFV score for each category is significantly different at $p < .000$ for all comparisons, with one exception. There were no significant differences in mean FFV found between the $10,001 – 14,999 category and $35,000 – 49,000 category ($p = .267$).

daily, .65 servings higher than high school graduates ($M = 3.40$) and .68 servings higher than those without high school diplomas ($M = 3.38$).

Respondents earning more than $75,000 averaged 3.95 servings daily, significantly more than their middle-class ($25,000 – 34,999, $M = 3.54$) and poor counterparts (under $10,000, $M = 3.40$). In addition, men consumed more FFV servings (3.99) than women (3.49).

Financial hardship was also related to FFV consumption such that those who worried about money to buy food consumed fewer fruits and vegetables. Approximately 70% of those who reported never worrying about money to buy food ate five or more FFV servings daily compared to only 2.6% of those who always or usually worried. Health status was positively related to FFV consumption with those eating more fruits and vegetables reporting better health. More than one fourth of respondents reporting excellent health ate five or more FFV servings per day, compared to 2.8% of those reporting poor health. In addition, respondents with BMIs in the overweight or obese categories consumed less servings of FFV daily. For example, 78% of individuals with healthy BMIs reported consuming at least five servings daily, compared to 22% of those who were overweight or obese. There was significant regional variation in mean FFV consumption as well: Pacific (3.91), Mountain (3.71), West North Central (3.57), East North Central (3.63), Middle Atlantic (3.82), New England (3.89), South Atlantic (3.62), South Central (3.57).

Regression analyses

Model 1, the base model, indicates that for each unit increase in sprawl (higher scores equate to a less sprawl), daily FFV consumption increased by .019 servings, $\beta = .019$, $t(95285240) = 28.11$.

Examining the full model (Model 2), sprawl remained positively related to FFV consumption ($p < .001$) such that residents in areas with more sprawl consumed fewer FFVs. Likewise, demographics, behavioral patterns, and health characteristics contributed to understanding differences in FFV consumption. Demographic disadvantage was related to lower levels of FFV consumption. For example, Black residents consumed .03 fewer FFVs than non-Hispanic Whites. Respondents earning less than $10,000 consumed .10 fewer FFVs than their highest earning counterparts. Similarly, individuals with less than a high school education consumed significantly fewer FFVs than college graduates ($\beta = -0.16$). Economic and health problems also related to lower levels of FFV consumption. For each incremental increase in worry about the ability to purchase food, respondents consumed 0.08 fewer FFVs. Likewise, for each incremental decrease in health respondents consumed 0.09 fewer FFVs. In summary, Table 3 demonstrates the importance of sprawl and advantage in FFV consumption.

Discussion

The current analysis focused on the role of sprawl in FFV consumption among a nationally-representative sample of adults with landline telephones. The descriptive analysis showed that counties experienced a wide range of sprawl and that this distribution was associated with individual FFV consumption. We also found that demographic characteristics, behavioral patterns, and health characteristics influenced FFV consumption such those with more advantage consumed more FFVs. However, net of all covariates, sprawl level remained significantly related to FFV consumption.

In support of Hypothesis 1, sprawl decreased FFV consumption. Residents of areas with more sprawl consumed significantly fewer FFV servings daily than did residents of areas with less sprawl. This result may be due in part because FFVs are less available in more sprawling areas (Rose & Richards, 2004). For example, up to 70% of low-income populations in the Mississippi Delta regions (areas characterized with greater sprawl) must travel more than 30 miles to access food selection and prices available at chain grocery stores (Rose & Richards, 2004).

Turning to Hypothesis 2, sprawl remained positively and significantly related to FFV consumption net of demographic characteristics, behavioral patterns, and health characteristics. Although this is one of the first studies to examine sprawl in a multivariate framework, the results support the notion that sprawl is a contributor to FFV consumption disadvantage (Ewing et al., 2014).

Supporting earlier studies (Giang et al., 2008; Glanz et al., 2007; Lewis et al., 2005), the analysis revealed that demographic characteristics were related to FFV consumption. Individuals facing disadvantage (e.g., people of color, lower educational attainment, lower incomes) consumed fewer FFV

Table 3. Results of Multivariate Analyses.

Variable	Model 1[a] *b*, SE *b*	Model 2[a] *b*, SE *b*
Sprawl	.019, .001	.001, .000
Race and ethnicity (Reference: White non-Hispanic)		
Black (non-Hispanic)		−.032, .001
Other race (non-Hispanic)		.306, .001
Multi-racial (non-Hispanic)		.174, .002
Hispanic		.010, .001
Education (Reference: College degree or higher)		
Not high school graduate		−.158, .001
High school graduate		−.141, .001
Income (Reference: $50,000 or more)		
Less than $10,000		−.097, .001
$10,001–14,999		−.177, .001
$15,000–$19,999		−.015, .001
$20,000–$24,999		−.049, .001
$25,000–$34,000		−.014, .001
$35,000–$49,999		−.020, .001
Not married		.096, .001
Gender		
Women		−.332, .001
Food security		−.080, .001
Perceived health status		−.091, .001
Body Mass Index		−.036, .000
Region (Reference: Mountain)		
Pacific		.239, .001
West North Central		.038, .001
East North Central		.112, .001
Middle Atlantic		.151, .001
New England		.234, .001
South Atlantic		.056, .001
South Central		.180, .002

[a] All results reached significance at $p < .001$.

servings daily compared to those with more with resources. Proximity and cost prohibit minority and low-income communities' access to FFVs in particular (Larson et al., 2008). These differences may be attributable to lack of access to healthful food resources as well as the lower household incomes, lower educational attainment, and unique cultural food characteristics among minorities.

Although not the focus of the analysis, we found respondents' level of FFV consumption noteworthy. No group, including those with college educations, met the U.S. Department of Agriculture's (USDA; 2011) recommendation of five daily servings for optimal health. Although the five daily servings of FFV consumption has changed recently to "fill half their plate with fruits and vegetables" (USDA, 2011), our analysis indicates that Americans, in general, will benefit from increased FFV consumption.

Although the USDA (2011) launched the new campaign to increase FFV consumption, our analysis indicates that environmental disparities in access to FFV persist, particularly among individuals experiencing demographic, health, or economic disadvantage. Our multivariate analysis indicates that sprawl continues to adversely affect FFV consumption patterns, net of demographic and economic covariates. In addition, the fact that more than 70% of those who never worry about purchasing healthy foods ate five or greater servings of FFV daily demonstrates how much financial access to fruits and vegetables can influence FFV consumption.

Limitations

Although current findings provide strong evidence for the role of location in food choice, the study must be considered in the context of its limitations. First, one major limitation of the BRFSS is that it excludes persons who do not have landline telephones. Wireless-only households are more likely to be made up of poorer ethnic minorities and uninsured persons (CDC, 2010). Second, the FFV variable is

based on dietary recall data from self-reports and may be subject to reporting errors. Social desirability bias may have influenced responses; however, if so, our findings would understate rather than overstate the FFV consumption problem. Third, though our utilized measure of FFV consumption has support for its reliability and validity, more precise instrumentation to operationalize and measure FFV intake will yield further insight into consumption differences. For example, males' higher intake of FFVs may be due to their overall higher food consumption. Fourth, we did not employ multilevel modeling techniques to consider the shared variance in our county-level sprawl measure. Future research should incorporate these more sophisticated techniques to examine how multiple individual and community characteristics may simultaneously influence individual FFV consumption. Fifth, and, perhaps most importantly, though these results indicate a positive relationship between sprawl and FFV consumption, the analysis does not consider the mechanisms through which these relationships occur. The analysis may suffer from omitted variable bias such that unmeasured variables such as culture, family, peers, meal patterns, attitudes, beliefs, and knowledge about food account for the relationship between sprawl and FFV (Caspi et al., 2012).

Implications and conclusions

Despite our limitations, our findings lead to two central implications. Social workers' unique person-in-environment perspective, our focus on organizational and community, interventions, and our unique strengths perspective have the potential to mitigate the effects of sprawl on FFV consumption in under-resourced communities.

First, macrolevel social workers, such as researchers and policy practitioners, can work to discover and disseminate effective, evidence-based, and culturally-competent interventions and engage in scientifically based policy making. For example, clients who receive increased nutrition assistance benefits for the purchase of fruits and vegetables and who have the opportunity to use benefits at local farmers markets increase their fruit and vegetable consumption (Herman et al., 2008). Macrolevel social workers can harness this evidence to advocate for targeted subsidies of government-sponsored programs to promote the consumption of fruits and vegetables, particularly in areas where access to FFVs is low (e.g., areas with higher levels of sprawl). One such program, Florida Fresh Access Bucks (FAB), a partnership between the USDA, local community farmers markets, and not-for-profit organizations is successfully addressing the issue of restricted access to FFV among Supplemental Nutrition Assistance Program (SNAP) beneficiaries by funding programs that allow beneficiaries to purchase FFV from locally grown and community-based food source vendors at local farmers markets. FAB makes community-based produce more affordable and accessible to low-income families while supporting farmers and enhancing local economies. FAB provides a one-to-one match for locally grown fruits and vegetables (a SNAP cardholder who spends $10 on fresh, locally-grown produce receives an additional $10 to purchase more fresh, local produce). Since its inception in 2013, FAB has expanded access to affordable, healthy foods among SNAP beneficiaries, enhanced local economies, increased farmer's market and farm viability, and strengthened support for community-based foods (Florida Organic Growers, 2015).

Second, social work practitioners working in mezzo settings, such as communities, neighborhoods, and organizations, should advocate for and ensure the sustainable implementation of scientifically based policies and programs (O'Dare Wilson & Scott, 2015). For example, practitioners have an important opportunity to support the establishment of accessible farmers markets or community sponsored agriculture (CSA) agreements in local areas. Microlevel social workers, such as those working directly with individuals, families, and groups, should provide education and evidence-based interventions to facilitate the process of behavioral change, such as providing information to clients on how to shop for and prepare healthier meals while respecting and affirming cultural contexts and considering logistical barriers (e.g., cost, transportation).

Sprawl is an important measure of community well-being influencing an array of individual health characteristics. Previous studies demonstrated the importance of sprawl on obesity rates and rates of

physical activity (Ewing, Schmid et al., 2003; Ewing et al., 2006; Ewing et al., 2014). This study contributes to the current knowledge base by identifying sprawl as a significant predictor of FFV consumption. The USDA and select states (Florida, Mississippi, Virginia) have begun to create more comprehensive measures of food environments, including online mapping tools that consumers, researchers, policy makers, and other stakeholders can use to identify and delimit food deserts as well as resources such as food pantries and farmers markets. Through our work on macro-, mezzo-, and individual environments, social workers are in a critical position assist communities and clients simultaneously to increase food access, and, ultimately, individual health.

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