Am J Community Psychol (2018) 61:488–499
DOI 10.1002/ajcp.12245

ORIGINAL ARTICLE

Predictors of Farmers' Market Shopping among People Receiving Supplemental Nutrition Assistance Program Benefits

Darcy A. Freedman,[1] Eunlye Lee,[1] Punam Ohri-Vachaspati,[2] Erika Trapl,[1] Elaine Borawski,[1] Kimberly Bess,[3] and Susan Flocke[1]

Highlights

- Study finds factors influencing farmers' market use among low income.
- Awareness of farmers' markets and incentive programming were related to increased market use.
- Farmers' market use associated with multiple dimensions of healthy food access among low income.
- Findings reveal modifiable leverage points to enhance reach of farmers' markets.

Abstract Promoting use of farmers' markets (FMs) is a promising community-level strategy to increase access to nutritious foods such as fruits and vegetables. Yet, FM shopping among people with Supplemental Nutrition Assistance Program (SNAP) benefits remains low. This research examined predictors of FM shopping among SNAP recipients living within 1 mile of a FM. A cross-sectional survey of SNAP participants ($N = 270$) was conducted in 2015 in Cleveland and East Cleveland, OH, USA. Multinomial regression and zero-truncated Poisson regression analyses were conducted to examine factors associated with FM shopping. Results indicate 48% reported shopping at a FM at least once in the past year, 26% had shopped at a FM before, but not in the last year, and 26% had never shopped at a FM. The multivariable analyses found awareness of FMs and a healthy food incentive program, and four dimensions of healthy food access are significantly associated with FM shopping among SNAP recipients. The food access dimensions included service delivery, spatial-temporal, personal, and social access. Findings highlight modifiable leverage points for improving the reach of FMs among low-income populations.

✉ Darcy A. Freedman
daf96@case.edu

[1] Case Western Reserve University, Cleveland, OH, USA

[2] Arizona State University, Phoenix, AZ, USA

[3] Vanderbilt University, Nashville, TN, USA

Keywords Community interventions · Farmers' markets, nutrition · Poverty · Health promotion · Supplemental Nutrition Assistance Program

Introduction

Farmers' markets (FMs) are a promising community-level strategy to increase access to nutritious foods such as fruits and vegetables especially in neighborhoods with limited access to other healthy food retailers (Khan et al., 2009; U.S. Department of Agriculture [USDA], 2013; Centers for Disease Control and Prevention [CDC], 2011). One targeted low-income population for these strategies is households receiving Supplemental Nutrition Assistance Program (SNAP) benefits. SNAP is the largest food assistance program in the U.S. providing financial resources for food purchases to more than 40 million low-income Americans each year (U. S. Department of Agriculture, Food and Nutrition Service, 2017b). Among this population, FM shopping is less common (U. S. Department of Agriculture, Food and Nutrition Service, 2016; USDA, 2017; U. S. Department of Agriculture, Food and Nutrition Service, 2017a). The goal of this study was to identify factors associated with FM shopping among households with children that are receiving SNAP benefits.

Food, Health, and Community-level Change

Most Americans consume fewer fruits and vegetables per day than recommended by dietary guidelines (Lee-Kwan,

Moore, Blanck, Harris, & Galuska, 2017). Subpopulations categorized by social positions related to class and race experience disproportionately worse dietary patterns and diet-related chronic disease trends (Dong & Lin, 2009; Lee-Kwan et al., 2017; Wang et al., 2014). The persistence of class- and race-based inequities in diet and diet-related chronic disease motivated research on community-level factors that may be at the root of these disparities, including growing attention to spatial differences in healthy food access (Beaulac, Kristjansson, & Cummins, 2009; Dutko, Ver Ploeg, & Farrigan, 2012; Walker, Keane, & Burke, 2010). The term "food desert" is now commonly used in public and professional discourse reflecting mainstream awareness of healthy food access gaps more common in low-income and racial and ethnic minority communities.

There is increasing interest in community-level interventions to improve diet-related health conditions. This is in contrast to individual-level interventions that focus on changing personal attributes such as knowledge, attitudes, and beliefs considered to shape lifestyle choices. Community-level health interventions include changes to environments to make the healthy choice the easy choice (Frieden, 2010). This approach draws attention to limitations of individual-level interventions by highlighting environmental constraints on lifestyle choices. Community-level interventions such as FMs have the potential for broader population health impact because exposure is generally available to the public versus a select group.

Nutritious Food Access Framework

A multicomponent framework of nutritious food access draws attention to five domains to guide community-level strategies designed to improve healthy food access (Freedman, Blake, & Liese, 2013). The five domains of nutritious food access include (a) spatial-temporal, (b) economic, (c) service delivery, (d) social, and (e) personal. Spatial-temporal access takes into account the stores available in the local food environment, travel time and transportation resources needed for food shopping, and time costs for food preparation. Economic access represents financial constraints and resources influencing nutritious food access including food prices, household finances, perceived value of foods in stores, and the availability of financial incentive programs to reduce food costs. Service delivery access is defined as retailer factors including the quality and variety of foods sold, staff and customer service, and the organization and cleanliness of the retail space. Social access takes into account familial, racial, and ethnic foodways and traditions, as well as social connections shaping food habits. Personal access includes food-related identities and preferences, food preparation knowledge and skills, and personal health status that influence food-related behaviors.

Importantly, the multicomponent framework of nutritious food access illuminates that changes to spatial contexts through the introduction of a new food retailer is only one part of a community-level intervention approach. Developing a new food retailer in a food desert context may be the necessary first step to community-level change. However, additional steps are needed to address economic access to promote affordability, service delivery access to improve availability, social access to support acceptability, and personal access to realize alignment and accommodation to individual need. The aim in this research was to assess different domains of nutritious food access to understand which factors are related to utilization of FMs located within urban communities that have limited access to full-service supermarkets and grocery stores offering a wide variety of healthy foods.

Reach of Farmers' Market Interventions

Farmers' markets are a recommended community-level approach to increase healthy food access with the broader goal of improving diet (CDC, 2011; Khan et al., 2009; USDA, 2013). The number of FMs in the U.S. has grown exponentially over the past two decades (U. S. Department of Agriculture, Agricultural Marketing Service, 2016). While FM growth is important, FM reach among populations with high rates of diet-related health conditions is critical to achieve population health goals. In 2015, <1% of all SNAP dollars were spent at FMs; these purchases were made by SNAP recipients representing <0.02% of the households receiving SNAP during this timeframe (U. S. Department of Agriculture, Food and Nutrition Service, 2016; U. S. Department of Agriculture, Food and Nutrition Service, 2017a). Results of a systematic review revealed barriers to FM use among low-income populations related to the five domains of the multicomponent nutritious food access framework (Freedman et al., 2016). We are unaware of any study that examined collectively all five domains of nutritious food access to better understand FM shopping behaviors.

Study Goals

To realize population health goals through FM implementation, it is important to identify factors associated with FM shopping, particularly among those who might benefit the most. Thus, this study examined the association of multiple measures of access associated with FM shopping among SNAP recipients who live within 1 mile of a FM.

Methods

Study Context

This research used data collected from *FreshLink*, a 5-year study seeking to increase the reach, adoption, and impact of FMs among people receiving SNAP benefits using a peer-to-peer outreach intervention approach. Building on methods used to develop other social network-based dissemination interventions (Kegeles, Hays, & Coates, 1996; Li, Weeks, Borgatti, Clair, & Dickson-Gomez, 2012), we conducted two formative studies including a cross-sectional survey and in-depth interviews to inform the peer-to-peer outreach intervention.

This manuscript is focused on findings from the cross-sectional survey conducted between June and August 2015 in Cleveland and East Cleveland, Ohio. These adjacent metropolitan areas were selected for several reasons. First, more than a third of residents received SNAP benefits (U. S. Census Bureau, 2010). Second, these cities had a significant number of census tracts that are low income with low access to full-service supermarkets (i.e., food deserts) (U. S. Department of Agriculture, Economic Research Service, 2016). Third, since 2010, FMs have been implemented as a community-level strategy to address food access challenges in these cities (Walsh, Taggart, Freedman, Trapl, & Borawski, 2015). At the time of data collection, these cities had higher access to FMs compared to state and national trends (CDC, 2013). Fourth, since 2010, a FM healthy food incentive program has been implemented to promote economic access among SNAP recipients. The program provides a dollar for dollar match on SNAP benefits used at a FM for a maximum of $10 in matching benefits per day that can only be used to purchase fruits and vegetables.

Participants

To select the geographic boundaries for sampling, we first identified all FMs in Cleveland and East Cleveland that were open between 2014 and 2015 and were located in or adjacent to at least one census tract with a SNAP participation rate of ≥30%. Second, a 1-mile radius around these FMs was created resulting in a 32.5 square mile target area including 17 FMs that accepted SNAP benefits for payment. Eleven of the 17 FMs offered healthy food incentives (Freedman et al., 2017). Within these geographic boundaries, individuals were eligible for the study if they: (a) resided in targeted geographic area ≥1 year; (b) were current SNAP recipients; (c) had child(ren) ≤18 years in household; (d) were responsible for household food shopping; (e) spoke English or Spanish; and (f) were ≥18 years old. One adult per household could participate.

Trained community researchers approached 1,182 individuals and 910 (77.0%) completed the initial eligibility screening. Five of the study personnel were community residents who lived and/or worked in the targeted geographic area and one was a research assistant who was bilingual in English and Spanish. Of the 910 screened, 360 (39.6%) met the inclusion criteria. Most ineligible individuals lived outside the targeted geographic area or did not receive SNAP. A total of 355 individuals (98.6% of eligible) provided written consent to join the study and 322 (89.4%) completed the survey. The analyses here are focused on 270 participants with data for relevant variables.

Procedure

Recruitment took place at community locations with high access to SNAP or SNAP eligible populations. Recruitment of study participants and data collection was simultaneous (June to August 2015). Over the 12-week period, the team conducted 37 recruitment events at 17 community-based sites to raise awareness about the study and directly recruit. Thirty-seven percent of the people who joined the study were recruited at county offices were SNAP benefits and other social services were provided. Of the remaining participants, 23.3% were recruited at emergency food assistance sites, 15.2% at neighborhood centers, and 3.1% at farmers' markets. Additionally, 21.4% of the participants joined by calling the study phone line in response to fliers and word-of-mouth. All interested individuals were screened by study personnel.

Participants completed an approximately 40-minute close-ended survey administered orally in-person or on the phone by trained researchers. Data were directly entered into survey software (Qualtrics, 2015). Participants received a $25 supermarket gift card for their participation. All study procedures were approved by the Institutional Research Board at Case Western Reserve University.

Measures

Outcome Variables: Farmers' Market Shopping

Participants were asked if they ever shopped at a FM. If yes, then they were asked to indicate the last time they shopped at a FM, and responses were recorded as less than 1 year ago, 1–2 years ago, 3–4 years ago, and 4+ years ago. Those who reported "less than 1 year ago" were asked to provide the name of the FM(s) and how often they went to each FM during the past 12 months. All responses were coded as a frequency in the past 12 months (e.g., once every month = 12 times). These variables were used to create two outcome measures. A

categorical variable of FM shopping included four groups: never, not in the last year, 1–2 times in past year, three or more times in past year. Among those who went to a FM in the past year (n = 129), a continuous outcome variable was calculated.

Predictor Variables

Predictor variables included measures of awareness of FMs and the healthy food incentive program developed for this study and six measures of access to healthy foods that are described in full detail in a prior study by Flocke et al. (2017). Nutritious food access measures aligned with the framework developed by Freedman et al. (2013) including indicators to assess service delivery, economic, spatial-temporal, personal, and social factors.

Awareness of farmers' markets and healthy food incentive program. Two single items were developed to assess awareness of FMs near home and the healthy food incentive program. Participants were asked, "Is there a farmers' market located near where you stay or live?" and "Have you heard about the [name of healthy food incentive] Program?" and were shown a flyer for the incentive program. Response options were *Yes* (1), *No* (0), or *Don't Know* (0).

Service delivery measure. A single item assessed perceptions of the quality of fruits and vegetable at FMs. The questions stated, "How does the quality of the fresh fruit and vegetables at farmers' markets compare to the quality of fresh fruits and vegetables you buy from other stores? In general would you say that it is…?" Response option ranged from *a lot worse quality* (1) to *a lot better quality* (5). A higher score indicates better perceived quality of fruits and vegetables available at FMs compared to other stores.

Economic measure. A single item assessed perceptions of prices of fruits and vegetables at FMs: "How do the prices of the fresh fruits and vegetables at farmers' markets compare to the prices of fresh fruits and vegetables you buy from other stores? In general would you say that it is…?" Response option ranged from *a lot higher prices than other stores* (1) to *a lot lower prices than other stores* (5). This variable was reverse-coded so a higher score reflected higher perceived prices of fruits and vegetables at FMs compared to other stores.

Spatial-temporal measures. Two measures of spatial-temporal access were included. Ease of access to FMs is a four-item scale (Cronbach's alpha = .85) informed by a prior study (Liese et al., 2013). Participants rated the features of the FM they shopped at most often. If they had never been to a FM or did not have a most frequent FM, then they were asked to respond based on what they think about FMs. Sample items included: "It is near the bus stop or other public transportation" and "It is easy to get there." Responses were recorded on a 5-point Likert scale ranging from *poor* (1) to *very good* (5). An average score was calculated with higher scores indicating higher perceived spatial access to FMs.

Time costs of food purchased and consumed is a four-item scale (Cronbach's alpha = .74) adapted from prior research (Steptoe, Pollard, & Wardle, 1995). The four-item scale asked participants how much they agreed or disagreed with statements such as: "I never have enough time to shop for fruits and vegetables" and "My food shopping is always rushed." Responses were on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5). For each scale, an average score was calculated with higher scores reflecting greater levels of time burden.

Personal access measure. Personal access was measured using a four-item fruit and vegetable preparation self-efficacy scale (Cronbach's alpha = .86) adapted from an existing measure (Condrasky, Williams, Catalano, & Griffin, 2011). Participants were asked to rate their confidence in preparing foods such as "fresh green vegetables (e.g., broccoli, spinach)" and "root vegetables (e.g., potatoes, beets, sweet potatoes)" on a 5-point Likert-type scale from *not at all confident* (1) to *extremely confident* (5). Scores on each item were averaged to create a total scale score with higher scores indicating higher levels of self-efficacy.

Social access measure. A seven-item measure of social connectedness to FMs (Cronbach's alpha = .86) assessed feelings of welcome, familiarity, and social relationships with people at FMs; the measure was informed by other studies (Leone et al., 2012; Liese et al., 2013; Steptoe et al., 1995; Thompson, Haziris, & Alekos, 1994). Five questions asked participants to rate the features of the FM they go to most often or about FMs more generally using items such as "You feel welcome when you shop there" or "Other customers at the farmers' market will be friendly." Response options ranged from *poor* (1) to *excellent* (5). Participants rated agreement on a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5) on two items: "Members of my family think that it is a good idea to buy food at farmers' markets" and "Most of my friends and acquaintances think that shopping for food at a farmers' market is a good idea." Item scores were averaged to create a total score; higher scores were indicative of greater social connectedness to FMs.

Analytic Approaches

Frequency distributions were examined for demographics, predictors, and the outcome variables. Given our modest sample size and goal to develop a parsimonious model,

one-way ANOVA and chi-square tests were conducted to assess if demographic variables were significantly associated with the outcome variables and were potential confounding variables ($p < .10$).

Two multivariable statistical analyses were conducted to examine factors associated with FM use among SNAP recipients. A multinomial logistic regression model investigated factors associated with the four groups of FM shoppers: never, not in last year, 1–2 times in past year, and (reference category) three or more times in past year. A zero-truncated Poisson regression examined which factors influenced more frequent use of FMs and was limited to the subsample who reported shopping at a FM at least once in the past 12 months ($n = 129$). All preliminary analyses and the multinomial regression were conducted in SPSS (v. 24) [IBM Corp, 2016] and STATA (v. 13) [StataCorp, 2013] was used for the zero-truncated regression analysis. All results were considered statistically significant at $p < .05$.

Results

Most participants ($N = 270$) were female (88%) and African American (84%) (see Table 1), representing a higher proportion of females and African Americans compared to the total population of SNAP recipients from the same time period and within the same census tracts (data source: 2015 aggregate data by census tract from Cuyahoga County Jobs and Family Services). On average, households included 2.4 children and 1.5 adults. Roughly 25% did not have a high school degree, 70% reported their annual household income was less than $10,000, and 70% were unemployed. Almost 67% had received SNAP benefits for more than 5 years. Less than half (43%) had access to their own form of transportation for food shopping. No significant relationships between the demographic characteristics and the outcome variables were identified, therefore all demographic variables were excluded from further analyses (see Table 1).

Table 2 presents descriptive statistics of predictors by the four groups of FM shoppers. Among the total sample, 26% had never shopped at a FM, 26% had shopped at a FM before but not in the last 12 months, 20% went 1–2 times in the past 12 months, and 28% went 3+ times. More than half (57%) were not aware of a FM near their home. There were significant differences in awareness of FM near the home by the four groups of FM shoppers. Awareness was lower among participants who never shopped at a FM, did not shop at a FM in the past 12 months, and shopped at a FM 1–2 times compared to those who went 3+ times ($p < .001$). Those who shopped at a FM 3+ times during the past 12 months had significantly higher perceptions of the quality of fruits and vegetables at a FM compared to the other categories ($p = .03$). Ease of access to FMs scores were highest among those shopping at a FM 1 or 2 times and 3+ times in the past year, and the difference across groups was significant ($p < .001$). Participants shopping at a FM 1 or 2 times and 3+ times in the past year had significantly higher levels of confidence about their fruit and vegetable preparation skills ($p < .001$). There was also a significant difference in social connectedness to FMs by FM shopping groups. Specifically, the mean score of social connectedness to FMs was the highest among those in 3+ times, whereas participants in the "not in the last year" group had the lowest level of social connectedness to FM ($p < .001$).

Table 3 reports the results of the multinomial logistic regression model that compared the four groups of FM shoppers. Perception of prices of fruits and vegetables at FMs, ease of access to FMs, and time costs of food purchased and consumed were not significant predictors for any comparisons in the model. Additionally, there were no significant differences between the two groups of current FM shoppers (1–2 times v. 3+) for any of the variables in the model. The odds of being aware of FM near home were 75% lower among the never group than for the 3+ times group (RR = 0.25, $p < .01$, 95% CI (0.11, 0.56)). Similarly, the odds of being aware of FM near the home were 54% lower for the not in the last year group compared to the 3+ times group (RR = 0.46, $p < .05$, 95% CI (0.21, 0.98)). The odds of being aware of the healthy food incentive program were 59% lower for the never group compared to the 3+ times group (RR = 0.41, $p < .05$, 95% CI (0.17, 0.96)). Perceptions of quality of fruits and vegetables at FMs were 35% lower for the never group than for the 3+ times group (RR = 0.65, $p < .05$, 95% CI (0.44, 0.98)). Similarly, the odds of fruit and vegetable preparation self-efficacy were 51% lower among the never group compared to the 3+ times group (RR = 0.49, $p < .05$, 95% CI (0.27, 0.89)). The odds of social connectedness to FMs was 55% lower in the not in last year group compared to the 3+ times group (RR = 0.45, $p < .05$, 95%).

Table 4 presents the results of the Zero-truncated Poisson regression model to investigate factors associated with more frequent FM use among SNAP recipients who shopped at a FM at least once during the past 12 months. Awareness of the healthy food incentive program had a significant and positive relationship with frequency of FM use in the past year, yielding an 18% increase in FM shopping frequency (IRR = 1.18, $p < .05$, 95% CI (1.01, 1.39)). However, awareness of FMs near the home was not a significant predictor of frequency of FM use. A

Table 1 Demographic characteristics of participants (N = 270) by farmers' market shopping categories

	Total (N = 270)	Never (n = 70)	Not in Last year (n = 71)	One or Two Times (n = 54)	Three or More Times (n = 75)	Chi-square/ F value	p value
	n (%) or Mean (SD)						
Gender							
Female	237 (88.1)	61 (22.7)	66 (24.5)	46 (17.1)	64 (23.8)	2.6	.5
Race							
Black	228 (84.4)	58 (21.5)	63 (23.3)	45 (16.7)	62 (23.0)	1.4	.7
White, Hispanic/ Latino, or Other	42 (15.6)	12 (4.4)	8 (3.0)	9 (3.3)	13 (4.8)		
Age							
18–27	58 (21.6)	23 (8.6)	14 (5.2)	11 (4.1)	10 (3.7)	14.9	.1
28–37	92 (34.2)	15 (5.6)	25 (9.3)	21 (7.8)	31 (11.5)		
38–47	56 (20.8)	15 (5.6)	18 (6.7)	11 (4.1)	12 (4.5)		
48 or older	63 (23.4)	16 (5.9)	14 (5.2)	11 (4.1)	22 (8.2)		
Education attainment							
Less than high school	67 (24.8)	19 (7.0)	21 (7.8)	11 (4.1)	16 (5.9)	2.1	.5
High school degree or More	203 (75.2)	51 (18.9)	50 (18.5)	43 (15.9)	59 (21.9)		
Annual household income							
Less than $ 10,000	185 (69.8)	54 (20.4)	50 (18.9)	38 (14.3)	43 (16.2)	6.7	.1
$ 10,000 or more	80 (30.2)	15 (5.7)	19 (7.2)	16 (6.0)	30 (11.3)		
Length of time on SNAP							
Less than 1 year	11 (4.2)	3 (1.1)	1 (0.4)	2 (0.8)	5 (1.9)	14.9	.1
1–2 years	30 (11.3)	10 (3.8)	7 (2.6)	8 (3.0)	5 (1.9)		
3–4 years	47 (17.7)	16 (6.0)	9 (3.4)	14 (5.3)	8 (3.0)		
5 or more years	177 (66.8)	39 (14.7)	52 (19.6)	30 (11.3)	56 (21.1)		
WIC recipient							
Yes	99 (36.7)	33 (12.2)	22 (8.1)	17 (6.3)	27 (10.0)	4.9	.2
Employment status							
Employed for wages	80 (29.6)	24 (8.9)	16 (5.9)	20 (7.4)	20 (7.4)	4.2	.2
Transportation to primary food shopping							
Has own car	115 (42.6)	25 (9.3)	33 (12.2)	21 (7.8)	36 (13.3)	2.9	.4
Number of adults[a]	1.5 (0.8)	1.7 (0.8)	1.4 (0.7)	1.6 (0.8)	1.4 (0.7)	1.5	.2
Number of children[a]	2.4 (1.6)	1.9 (1.2)	2.5 (1.9)	2.5 (1.4)	2.5 (1.9)	2.4	.1

No significant differences between each demographic variable and farmers' market use were found. The numbers of sample varied for some variables due to missing values.
SNAP = Supplemental Nutrition Assistance Program.
WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
[a]Means and standard deviations are reported.

one-unit increase in perception of quality of fruits and vegetables at FMs was associated with 23% increase in FM shopping frequency (IRR = 1.23, $p < .001$, 95% CI (1.11, 1.36)). Ease of access to FMs significantly predicted frequency of FM shopping; every one-unit increase in ease of access to a FM is associated with a 14% increase in frequency of FM shopping (IRR = 1.14, $p < .01$, 95% CI (1.03, 1.26)). Time costs of food purchased and consumed were inversely related to frequency of FM shopping indicating that for every one-unit increase in time costs, there is 24% reduction in FM shopping in the past 12 months (IRR = 0.76, $p < .001$, 95% CI (0.67, 0.86)). For every one-unit increase in fruit and vegetable preparation self-efficacy, the frequency of FM shopping increased by 32% (IRR = 1.32, $p < .001$, 95% CI (1.12, 1.55)). Lastly, social connectedness to FMs was significantly, but inversely related to FM shopping frequency. Every one-unit increase in social connectedness to FMs is associated with 15% reduction in the frequency of FM use (IRR = 0.85, $p < .05$, 95% CI (0.75, 0.97)).

Discussion

This study is the first, to our knowledge, to quantitatively assess multiple domains of nutritious food access influencing FM shopping patterns among people receiving SNAP benefits using robust measures. Informed by a multicomponent framework of nutritious food access (Freedman et al., 2013) and by prior research on FM use (Brown, 2002; Byker, Misyak, Shanks, & Serrano, 2013; Freedman et al., 2016; McCormack, Laska, Larson, & Story, 2010), this study extends research, policy, and practice by identifying modifiable leverage points for

Table 2 Descriptive statistics of predictors for farmers' market shopping categories among participants receiving SNAP benefits

	Total (N = 270)	Never (n = 70)	Not in last year (n = 71)	One or two times (n = 54)	Three or more times (n = 75)	Chi-square/ F value	p value
	n (%) or Mean (SD)						
Measures of awareness							
Awareness of FM near home	117 (43.3%)	18 (6.7%)	22 (8.1%)	33 (12.2%)	44 (16.3%)	27.4	<.001
Awareness of healthy food incentive program	73 (27.0%)	11 (4.1%)	19 (7.0%)	17 (6.3%)	27 (10.0%)	8.1	.05
Service delivery access							
Perceived quality of fruits and vegetables at FM	4.2 (1.0)	3.9 (0.9)	4.1 (1.0)	4.2 (0.9)	4.4 (0.9)	3.0	.03
Economic access							
Perceived prices of fruits and vegetables at FM	2.5 (1.2)	2.4 (1.1)	2.6 (1.2)	2.5 (1.3)	2.3 (1.1)	0.6	.62
Spatial-temporal access							
Ease of access to FM	3.5 (1.1)	3.4 (1.1)	3.1 (1.2)	3.8 (1.1)	3.8 (0.9)	6.8	<.001
Time costs of food purchased and consumed	2.0 (0.8)	2.2 (0.9)	1.9 (0.8)	2.0 (0.7)	1.9 (0.7)	2.6	.06
Personal access							
Fruit and vegetable preparation self-efficacy	4.4 (0.7)	4.1 (0.8)	4.3 (0.7)	4.5 (0.6)	4.5 (0.5)	5.4	<.001
Social access							
Social connectedness to FM	3.8 (0.8)	3.7 (0.9)	3.5 (0.9)	4.0 (0.7)	4.1 (0.7)	9.8	<.001

FM, Farmers' Market; SNAP, Supplemental Nutrition Assistance Program.

Table 3 Multinomial logistic regression predicting farmers' market shopping categories among participants receiving SNAP benefits

	Never (n = 70)		Not in last year (n = 71)		One or two times (n = 54)	
	RR	95% CI	RR	95% CI	RR	95% CI
Measures of awareness						
Awareness of FM near home	0.25**	0.11, 0.56	0.46*	0.21, 0.98	1.15	0.53, 2.50
Awareness of healthy food incentive program	0.41*	0.17, 0.96	0.82	0.38, 1.75	0.82	0.38, 1.76
Service delivery access						
Perceived quality of fruits and vegetables at FM	0.65*	0.44, 0.98	0.88	0.59, 1.32	0.83	0.54, 1.27
Economic access						
Perceived prices of fruits and vegetables at FM	0.95	0.69, 1.32	1.06	0.79, 1.44	1.14	0.84, 1.55
Spatial-temporal access						
Ease of access to FM	1.38	0.88, 2.15	0.92	0.61, 1.38	1.10	0.70, 1.71
Time costs of food purchased and consumed	1.36	0.85, 2.18	0.82	0.51, 1.33	1.16	0.71, 1.89
Personal access						
Fruit and vegetable preparation self-efficacy	0.49*	0.27, 0.89	0.86	0.47, 1.56	1.05	0.55, 1.98
Social access						
Social connectedness to FM	0.61	0.33, 1.13	0.45*	0.25, 0.79	0.83	0.45, 1.54

Risk ratios (RR) are presented. Reference category = three or more times.
FM, Farmers' Market; SNAP, Supplemental Nutrition Assistance Program.
-2 LL = 667.43 (df = 24, $p < .001$), Chi-square ($\Delta-2$LL) = 77.20, df = 24, $p < .001$.
Deviance statistic = 667.43 (df = 783, p = .99); Naglekerke Pseudo R^2 = 0.27.
*$p < .05$. **$p < .01$.

improving the reach of FMs among low-income populations. The sampling approach, which included participants with similar spatial access to FMs, allowed for a more nuanced examination of the influence of other domains of nutritious food access including economic, service delivery, social, and personal factors on FM shopping.

Importantly, the only domain of nutritious food access that was not associated with FM shopping patterns in both regression models was perceptions of the prices of fruits and vegetables available at FMs. On average, the SNAP recipients participating in this study perceived prices at FMs to be about the same as or slightly higher than prices at other food stores. This finding is important because

Table 4 Zero-truncated Poisson regression model predicting farmers' market shopping frequency among SNAP participants who visited farmers' markets at least once during the past year (N = 129)

	IRR	95% CI
Measures of awareness		
Awareness of FM near home	1.00	0.84, 1.18
Awareness of healthy food incentive program	1.18*	1.01, 1.39
Service delivery access		
Perceived quality of fruits and vegetables at FM	1.23***	1.11, 1.36
Economic access		
Perceived prices of fruits and vegetables at FM	0.96	0.90, 1.02
Spatial-temporal access		
Ease of access to FM	1.14**	1.03, 1.26
Time costs of food purchased and consumed	0.76***	0.67, 0.86
Personal access		
Fruit and vegetable preparation self-efficacy	1.32***	1.12, 1.55
Social access		
Social connectedness to FM	0.85*	0.75, 0.97

Incident rate ratios (IRR) for zero-truncated Poisson models are presented. Likelihood ratio Chi-square = 83.23, df = 8, $p < .001$.
FM, Farmers' Market; SNAP, Supplemental Nutrition Assistance Program.
Pseudo R^2 = 0.08.
*$p < .05$. **$p < .01$. ***$p < .001$.

food prices are a major driver of food-related habits (Drewnowski, 2010; Glanz, Basil, Maibach, Goldberg, & Snyder, 1998).

Healthy food incentive programs are one approach to address economic barriers, such as food prices, to using FMs. These programs represent a behavioral economic approach to motivate FM use by providing a small financial incentive to reduce the costs of purchasing fruits and vegetables. There is strong evidence that healthy food incentive programs result in improvements in diet (Afshin et al., 2017; Pearson-Stuttard et al., 2017). In the present study, participants had low levels of awareness of the healthy food incentive program that had been available in the study community for at least 4 years prior to data collection (Cleveland-Cuyahoga County Food Policy Coalition, 2014). This program provides a dollar for dollar match for SNAP benefits that are transacted at a FM (Cleveland-Cuyahoga County Food Policy Coalition, 2014). Only 10% of the study participants who shopped at a FM three or more times in the past year reported awareness of the program; awareness was significantly less among those who never shopped at a FM. These findings reveal the need for dissemination strategies aimed at raising awareness about healthy food incentive programs as well as the need for general outreach targeting SNAP participants about FM availability in the neighborhood. Notably, study participants who never shopped at a FM or had not shopped at one in the past year were significantly less likely to know they had a FM near their home even though all participants lived within 1 mile of a FM. This finding corroborates other research that found coordinated marketing and outreach efforts to be lacking in many FM implementation models (Colasanti, Conner, & Smalley, 2010; Flamm, 2011; Leone et al., 2012).

Additional factors that differentiated the never group from those shopping at FMs more often were fruit and vegetable preparation self-efficacy and perceptions of the quality of fruits and vegetables available at FMs. Those in the never group had significantly lower levels of self-efficacy indicating less confidence in preparing foods such as fresh green vegetables or root vegetables. Additionally, those in the never group had less favorable views of the quality of fruits and vegetables at FMs compared to these same foods available at other food stores. While there is consistent evidence that low-income consumers perceive the quality of fruits and vegetables at FMs to be high (Freedman et al., 2016), factors such as the balance of vendors at a FM (e.g., more arts and craft vendors than produce vendors) may influence perceptions of quality (Colasanti et al., 2010).

Examining FM shopping patterns as a continuous measure with Poisson regression reinforced several of the results of the multinomial logistic regression. Awareness of the healthy food incentive program, perceptions of quality of fruits and vegetables at FMs, and fruit and vegetable preparation self-efficacy were all positively associated with increased frequency of FM shopping. Two additional factors emerged as significant predictors of increased FM use. First, as perceptions of ease of access to a FM increased (e.g., FM is easy to get to), FM shopping frequency also increased. Second, as perceptions about the time costs of foods purchased and consumed increased (e.g., do not have time to cook), FM shopping frequency decreased. These factors related to spatial-temporal domains of nutritious food access highlight complexity within community-level interventions. While a FM was located near all participants, access to transportation may influence ease of access to this community resource. In our study, only 43% of the sample had access to a personal vehicle for food shopping. Furthermore, integration of FMs into food procurement routines was less likely for those with constrained access to time needed for food shopping and preparation. These findings illuminate the need for additional research into factors that improve convenience of FMs for low-income populations.

The influence of social access to FMs on shopping patterns resulted in findings that were contrary to our predictions. The role of FMs as spaces for supporting social interaction is a salient theme in FM literature, although

this social benefit seems to be less pronounced in FM studies including low-income populations (Freedman et al., 2016). Study participants who went to a FM, but not in the last year, reported significantly lower perceptions of social connectedness to FMs compared to those who shopped at FMs three or more times in the past year. For this group, there is a chance that visiting the FM resulted in a negative social experience contributing to their decisions to discontinue FM shopping. Among the current FM shoppers, increased social connectedness to FMs was predictive of decreased FM shopping frequency.

The unexpected social connectedness findings may be explained in several ways. Prior research suggests people receiving SNAP may feel stigmatized shopping at FMs because of the unique payment method required to transact SNAP benefits (Haynes-Maslow, Auvergne, Mark, Ammerman, & Weiner, 2015). At many FMs, SNAP benefits are often transacted at a central point-of-purchase where these benefits are transferred into tokens that are transacted directly with a vendor. The use of a token distinguishes a SNAP customer from other customers using cash or check with a vendor. Other research suggests FMs can be exclusionary spaces because of limited diversity among customers and vendors (Alkon & McCullen, 2011; Larchet, 2014). However, there is evidence that FMs provide a space to bridge social divides and build social capital (Alia, Freedman, Brandt, & Browne, 2014). Finally, there is a chance that those who frequent FMs more often are motivated by utilitarian factors more than social connectedness. Prior research on motivations for food shopping reveals differences between *utilitarian* versus *hedonic* shoppers (Guido, 2006). Decisions to shop at a particular food store are based not only on expectations about what is available at the store but also on desires related to inner motivations, interests, and goals (Guido, 2006). These differences may explain why social interactions at FMs are inversely related to FM shopping frequency. Further research is needed to unpack the complexity of this phenomenon.

This study has strengths and limitations. Strengths include the sample population of SNAP recipients that all had access to a FM, use of robust measures, assessment of multiple domains of nutritious food access, orally administered data collection to promote engagement across different levels of literacy, and use of community researchers who may be considered more trustworthy than university-based research staff. Limitations include the risk of recall bias since participants were asked to provide feedback about FM shopping in the past, social desirability, lack of information about the specific FMs where participants were shopping, and cross-sectional nature of the research. Results of this research may not be generalizable to populations not receiving SNAP benefits, non-urban settings, contexts with limited or no access to FMs, or communities with low rates of poverty.

Implications

Lewin's concept that behavior is a function of personal and environmental interactions is at the core of community psychology and has relevance for interpreting the findings of this study (Lewin, 1935; Lewin, 1997). Additionally, social ecological theory, another dominant framework guiding the field of community psychology, posits multiple levels of influence on behaviors (Bronfenbrenner, 1977). These two frameworks highlight the dynamic relationship between community-level interventions such as FMs and individual behavior. Building on these frameworks, findings can be used to inform strategies designed to increase access to and use of FMs among SNAP recipients by focusing on individual, market, and community-level factors.

At the individual level, results illuminate the opportunity for FM interventions to operate in tandem with educational and skill-based training aimed at promoting fruit and vegetable preparation self-efficacy. Prior intervention research that used tailored email-based information exchange to deliver messages to promote fruit and vegetable self-efficacy resulted in improvements in consumption over time (Luszczynska, Tryburcy, & Schwarzer, 2007). Future research may explore connecting these types of interventions within the context of community-level FM interventions.

At the market level, findings reveal opportunities for FMs to strategically implement communication and outreach efforts as a core element of the program model. Social marketing theory suggests active dissemination will require development of salient messages and inclusion of relevant messengers to reach different target populations (Grier & Bryant, 2005). These dissemination efforts may take into account different categories of FM shoppers such as frequent versus less frequent (Freedman et al., 2017). Findings also highlight the importance of quality and price in terms of FM operations. Efforts to promote quality through diversification of vendors as well as through actions to help potential customers experience high-quality products through taste testing may enhance reach. Integration of healthy food incentive programs may reduce price concerns related to FMs, though our study offers clear evidence that incentive programs must be marketed to potential customers.

At the community level, findings highlight FM use is facilitated or constrained by some factors that are beyond the control of an individual that may be addressed through macro-level change fostered by local food policy coalitions (Calancie et al., 2017). Our study offers evidence to

support efforts to promote ease of access to FMs through strategic location, such as aligning FMs with public transportation or within settings where low-income consumers reside and/or work. Findings illuminate the dynamic relationship between time costs and FM shopping. Factors that make food shopping or preparation a rushed experience such as irregular or extensive work hours or child care duties should be considered in FM implementation. Finally, results highlight that social climate may influence FM use especially among SNAP recipients shopping at FMs less frequently.

Conclusion

Farmers' markets have the potential to increase access to fruits and vegetables in communities where healthy food access is limited. Findings from this research provide evidence to support a multicomponent approach to improve FM reach among low-income populations. Farmers' market interventions that include strategies focused on individuals, markets, and the community should be tested to further the impact of these community-level interventions.

Acknowledgments We thank the data collection team, study participants, and community partners who supported this research, which is a product of a Health Promotion and Disease Prevention Research Center supported by Cooperative Agreement Number 1U48DP005030 from the Centers for Disease Control and Prevention. Findings and conclusions in this publication are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. The authors do not have any conflicts of interest, real or perceived, related to this research.

Conflict of Interest

This research was funded through a grant from the Centers for Disease Control and Prevention, Cooperative Agreement Number 1U48DP005030. Findings and conclusions in this publication are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. The authors do not have any conflicts of interest, real or perceived, related to this research. The study complied with all ethical standards of human subjects research. It was reviewed and approved by the Institutional Review Board at Case Western Reserve University (IRB-2015-1102).

References

Afshin, A., Peñalvo, J. L., Del Gobbo, L., Silva, J., Michaelson, M., O'Flaherty, M., … & Mozaffarian, D. (2017). The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis. *PLoS ONE*, *12*, e0172277.

Alia, K. A., Freedman, D. A., Brandt, H. M., & Browne, T. (2014). Identifying emergent social networks at a federally qualified health center-based farmers' market. *American Journal of Community Psychology*, *53*, 335–345.

Alkon, A. H., & McCullen, C. G. (2011). Whiteness and farmers markets: Performances, perpetuations … contestations? *Antipode*, *43*, 937–959.

Beaulac, J., Kristjansson, E., & Cummins, S. (2009). A systematic review of food deserts, 1966-2007. *Preventing Chronic Disease*, *6*, 1–10.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*, 513–531.

Brown, A. (2002). Farmers' market research 1940-2000: An inventory and review. *American Journal of Alternative Agriculture*, *17*, 167–176.

Byker, C. J., Misyak, S., Shanks, J., & Serrano, E. L. (2013). Do farmers' markets improve diet of participants using federal nutrition assistance programs? A literature review. *Journal of Extension*, *51*, 1–11.

Calancie, L., Allen, N. E., Ng, S. W., Weiner, B. J., Ward, D. S., Ware, W. B., & Ammerman, A. S. (2017). Evaluating food policy councils using structural equation modeling. *American Journal of Community Psychology*, *61*, 251–264.

Cleveland-Cuyahoga County Food Policy Coalition (2014). *Double value produce perks 2014 report*. Available from: Cleveland-Cuyahoga County Food Policy Coaltion website: http://cccfoodpolicy.org/sites/default/files/resources/2014_dvpp_report_final.pdf [last accessed March 18, 2018].

Colasanti, K. J. A., Conner, D. S., & Smalley, S. B. (2010). Understanding barriers to farmers' market patronage in Michigan: Perspectives from marginalized populations. *Journal of Hunger and Environmental Nutrition*, *5*, 316–338.

Condrasky, M. D., Williams, J. E., Catalano, P. M., & Griffin, S. F. (2011). Development of psychosocial scales for evaluating the impact of a culinary nutrition education program on cooking and healthful eating. *Journal of Nutrition Education and Behavior*, *43*, 511–516.

Dong, D., & Lin, B. (2009). *Fruit and vegetable consumption by low-income Americans*. Washington, DC: U. S. Department of Agriculture.

Drewnowski, A. (2010). The cost of US foods as related to their nutritive value. *The American Journal of Clinical Nutrition*, *92*, 1181–1188.

Dutko, P., Ver Ploeg, M., & Farrigan, T. (2012). *Characteristics and influential factors of food deserts*. Available from: the U. S. Department of Agriculture, Economic Research Service website: https://www.ers.usda.gov/publications/pub-details/?pubid=45017 [last accessed March 28, 2018].

Flamm, L. J. (2011). Barriers to EBT use at farmers' markets: Lessons in empowerment evaluation from rural Ohio. *Journal of Hunger and Environmental Nutrition*, *6*, 54–63.

Flocke, S. A., Ohri-Vachispati, P., Shon, E.-J., Borawski, E., Matlack, K., & Freedman, D. A. (2017). Developing multidimensional measures of healthy food access among low-income adults in Cleveland, Ohio, USA. *Public Health Nutrition*, *20*, 2859–2868.

Freedman, D. A., Blake, C. E., & Liese, A. D. (2013). Developing a multicomponent model of nutritious food access and related implications for community and policy practice. *Journal of Community Practice*, *21*, 379–409.

Freedman, D. A., Flocke, S., Shon, E. J., Matlack, K., Trapl, E., Ohri-Vachaspati, P., Osborne, A., & Borawski, E. (2017). Farmers' market patterns among Supplemental Nutrition

Assistance Program recipients with high access to farmers' markets. *Journal of Nutrition Education and Behavior*, *49*, 397–404.

Freedman, D. A., Vaudrin, N., Schneider, C., Trapl, E., Ohri-Vachaspati, P., Taggart, M., … & Flocke, S. (2016). Systematic review of factors influencing farmers' market use overall and among low-income populations. *Journal of the Academy of Nutrition and Dietetics*, *116*, 1136–1155.

Frieden, T. R. (2010). A framework for public health action: The health impact pyramid. *American Journal of Public Health*, *100*, 590–595.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., & Snyder, D. (1998). Why Americans eat what they do: Taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association*, *98*, 1118–1126.

Grier, S., & Bryant, C. A. (2005). Social marketing in public health. *Annual Review of Public Health*, *26*, 319–339.

Guido, G. (2006). Shopping motives, big five factors, and the hedonic/utilitarian shopping value: An integration and factorial study. *Innovative Marketing*, *2*, 57–67.

Haynes-Maslow, L., Auvergne, L., Mark, B., Ammerman, A., & Weiner, B. J. (2015). Low-income individuals' perceptions about fruit and vegetable access programs: A qualitative study. *Journal of Nutrition Education and Behavior*, *47*, 317–324.

IBM Corp. (2016). *IBM SPSS statistics for windows, version 24.0*. Armonk, NY: Author.

Kegeles, S. M., Hays, R. B., & Coates, T. J. (1996). The Mpowerment Project: A community-level HIV prevention intervention for young gay men. *American Journal of Public Health*, *86*, 1129–1136.

Khan, L. K., Sobush, K., Keener, D., Goodman, K., Lowry, A., Kakietek, J., & Zaro, S. (2009). Recommended community strategies and measurements to prevent obesity in the United States. *Morbidity and Mortality Weekly Report*, *58*(RR07), 1–26.

Larchet, N. (2014). Learning from the Corner Store. *Food, Culture and Society*, *17*, 395–416.

Lee-Kwan, S. H., Moore, L. V., Blanck, H. M., Harris, D. M., & Galuska, D. (2017). Disparities in state-specific adult in fruit and vegetable consumption – United States, 2015. *Morbidity and Mortality Weekly Report*, *66*, 1241–1247.

Leone, L. A., Beth, D., Ickes, S. B., Macguire, K., Nelson, E., Smith, R. A., Tate, D. F., & Ammerman, A. S. (2012). Attitudes toward fruit and vegetable consumption and farmers' market usage among low-income north Carolinians. *Journal of Hunger and Environmental Nutrition*, *7*, 64–76.

Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.

Lewin, K. (1997). *Resolving social conflicts: Field theory in social science* (pp. 289–300). Washington, DC: American Psychological Association.

Li, J., Weeks, M. R., Borgatti, S. P., Clair, S., & Dickson-Gomez, J. (2012). A social network approach to demonstrate the diffusion and change process of intervention from peer health advocates to the drug using community. *Substance Use and Misuse*, *47*, 474–490.

Liese, A. D., Bell, B. A., Barnes, T. L., Colabianchi, N., Hibbert, J. D., Blake, C. E., & Freedman, D. A. (2013). Environmental influences on fruit and vegetable intake: Results from a path analytic model. *Public Health Nutrition*, *17*, 2595–2604.

Luszczynska, A., Tryburcy, M., & Schwarzer, R. (2007). Improving fruit and vegetable consumption: A self-efficacy intervention compared with a combined self-efficacy and planning intervention. *Health Education Research*, *22*, 630–638.

McCormack, L. A., Laska, M. N., Larson, N. I., & Story, M. (2010). Review of the nutritional implications of farmers' markets and community gardens: A call for evaluation and research efforts. *Journal of the American Dietetic Association*, *110*, 399–408.

Pearson-Stuttard, J., Bandosz, P., Rehm, C. D., Penalvo, J., Whitsel, L., Gaziano, T., Conrad, Z., Wilde, P., Micha, E., Lloyd-Williams, F., Capewell, S., Mozaffarian, D., & O'Flaherty, M. (2017). Reducing US cardiovascular disease burden and disparities through national and targeted dietary policies: A modelling study. *PLOS Medicine*, *14*, e1002311.

Qualtrics (2015). *Qualtrics software*. Provo, UT: Author.

StataCorp. (2013). *Stata statistical software: Release 13*. College Station, TX: Author.

Steptoe, A., Pollard, T. M., & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: The food choice questionnaire. *Appetite*, *25*, 267–284.

Thompson, K. E., Haziris, N., & Alekos, P. J. (1994). Attitudes and food choice behavior. *British Food Journal*, *96*, 9–13.

U. S. Census Bureau (2010). *Decennial census*. Washington, DC: Author.

U. S. Department of Agriculture (USDA) (2013). *SNAP-Ed strategies and interventions: An obesity prevention toolkit for states*. Washington, DC: Author.

U. S. Department of Agriculture (USDA) (2017). *Comparison of SNAP authorized farmers' and markets FY2012 and FY2017*. Available from: https://fns-prod.azureedge.net/sites/default/files/snap/SNAP-Farmers-Markets-Redemptions.pdf [last accessed March 18, 2018].

U. S. Department of Agriculture, Agricultural Marketing Service (2016). *National count of farmers' market directory listings: graph: 1994-2017*. Available from: https://www.ams.usda.gov/sites/default/files/media/NationalCountofFMDirectory17.JPG [last accessed March 18, 2018].

U. S. Department of Agriculture, Economic Research Service (2016). Food environment atlas. Available from: https://www.ers.usda.gov/data-products/food-environment-atlas [last accessed March 18, 2018].

U. S. Department of Agriculture, Food and Nutrition Service (2016). *Fiscal year 2015 at a glance*. Available from: Food and Nutrition Service websiteFood and Nutrition Service website: https://fns-prod.azureedge.net/sites/default/files/snap/2015-SNAP-Retailer-Management-Year-End-Summary.pdf [last accessed March 18, 2018].

U. S. Department of Agriculture, Food and Nutrition Service (2017a). *Fiscal year 2016 at a glance*. Food and Nutrition Service website. Available from: https://fns-prod.azureedge.net/sites/default/files/snap/2016-SNAP-Retailer-Management-Year-End-Summary.pdf [last accessed March 20, 2018].

U. S. Department of Agriculture, Food and Nutrition Service (2017b). *Supplemental Nutrition Assistance Program: As of May 5, 2017*. Available from: https://www.fns.usda.gov/sites/default/files/pd/34SNAPmonthly.pdf [last accessed March 28, 2018].

U. S. Department of Health and Human Services, Centers for Disease Control and Prevention (2011). *Strategies to prevent obesity and other chroinic diseases: The CDC guide to strategies to increase the consumption of fruits and vegetables*. Available from: http://www.cdc.gov/obesity/downloads/FandV_2011_WEB_TAG508.pdf [last accessed March 18, 2018].

U. S. Department of Health and Human Services, Centers for Disease Control and Prevention (2013). *State indicator report on fruits and vegetables, 2013*. Atlanta, GA: Centers for Disease Control and Prevention.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healhty food in the United States: A review of food deserts literature. *Health and Place*, *16*, 876–884.

Walsh, C. C., Taggart, M., Freedman, D. A., Trapl, E. S., & Borawski, E. A. (2015). The Cleveland-Cuyahoga county food policy coalition: "we have evolved". *Preventing Chronic Disease*, *12*, E86.

Wang, D. D., Leung, C. W., Li, Y., Ding, E. L., Chiuve, S. E., Hu, F. B., & Willett, W. C. (2014). Trends in dietary quality among adults in the United States, 1999 through 2010. *Journal of American Medical Association Internal Medicine*, *174*, 1587–1595.