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Dietary Behaviors among Public Health Center Clients with Electronic Benefit Transfer Access at Farmers' Markets

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ABSTRACT

Background Although increasing access to electronic benefit transfer (EBT) at farmers' markets has become a popular strategy for encouraging healthy eating, its relationships to a number of dietary behaviors in low-income populations are not well understood.

Objective To describe the frequency of and relationships between EBT access, fruit and vegetable intake, and sugar-sweetened beverage (SSB) consumption among public health center (PHC) clients with access to EBT at farmers' markets during 2011-2012.

Design Cross-sectional.

Participants/setting Low-income participants recruited from the waiting rooms of five multipurpose PHCs operated by the Los Angeles County Department of Public Health.

Main outcome measures Fruit and vegetable and SSB consumption (number per week).

Statistical analysis Data from the 2012 Los Angeles County Health and Nutrition Examination Survey were analyzed using multivariable regressions, with EBT access at farmers' markets as the primary independent variable. Covariates included EBT use, transportation behaviors, neighborhood attributes, and sociodemographic characteristics.

Results A total of 1,503 adults participated in the survey (response rate=69%). Of these, 529 reported receiving EBT benefits. Among these benefits recipients, 64% were women, 54% were aged 25 to 44 years, 62% were black, and 75% were unemployed or part-time employed. In multivariable regression analyses, EBT access at farmers' markets was positively associated with higher fruit and vegetable consumption; however, an association to SSB consumption was not demonstrated.

Conclusions EBT access at farmers' markets is related to higher fruit and vegetable consumption among PHC clients in Los Angeles County. However, the finding of no association to SSB consumption raises important questions about the need for strategies to discourage EBT recipients' purchase of foods of minimal nutritional value in other venues that accept nutrition assistance program benefits.
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DISPARITIES IN OBESITY PREVALENCE AMONG LOW-income and minority communities have been attributed to a number of environmental factors, including unequal neighborhood access to healthy foods and beverages (eg, fruits and vegetables and water as an alternative to soda).[1-4] In recent years, federally funded obesity prevention initiatives in the United States have focused on policy, systems, and environmental change strategies to address these and other socioecologic barriers to healthy eating.[5-8] For example, among underserved neighborhoods, strategies such as community gardens,[8] corner store conversions/makeovers,[9] and farmers' markets[4,10,11] have become popular as program interventions for increasing access to fresh produce. In particular, expanding the availability of farmers' markets is seen as an important grassroots strategy that can be tailored to increase access to affordable, fresh fruits and vegetables in geographic areas where there is a low density of supermarkets or grocery stores that sell these produce (ie, food deserts).[12] Research suggests that the popularity of farmers' markets could be the result of the strategy's natural capacity to promote community and social cohesion.[13] The US Department of Agriculture (USDA) views farmers' markets as a community-based, portable intervention that can be implemented with relative ease.[14,15]

Although greater access to farmers' markets could benefit recipients of federally funded nutrition assistance programs such as the Supplemental Nutrition Assistance Program (SNAP), acceptance of these program benefits via electronic benefit transfer (EBT) at point of purchase is often limited for a number of reasons. Presently, access to EBT terminals at farmers' markets is not readily available in many jurisdictions. In most farmers' markets across the United States, acceptance of SNAP benefits through EBT is optional and

voluntary.[13] Point-of-sale terminals are typically used to accept EBT transactions at farmers' markets.[16,17] Although many markets can access the required point-of-sale terminals free of charge from the USDA Food and Nutrition Service,[18] having access to electricity and/or a landline often pose barriers to their wider use.[19,20] In addition, costs such as those related to contracting third-party vendors to process EBT transactions are added barriers to EBT acceptance in these venues.[16,17] Despite these barriers, recent research suggests farmers' markets and market operators do value low-income shoppers and are willing to take on the inconvenience of meeting their needs, especially in cases where technical support or subsidies are available.[21]

From a public policy and practice perspective, increasing EBT access at farmers' markets represents a potentially promising approach for improving food access equity in underserved populations.[13] This viewpoint is reinforced by major funders who have invested and continue to invest in nutrition strategies involving farmers' markets. The Centers for Disease Control and Prevention (CDC), for example, have encouraged the development of new or expansion of existing farmers' markets (especially those that accept EBT) as a place-based strategy to increase healthy eating in low-resource communities.[10,22,23] The Robert Wood Johnson Foundation's Community Health Improvement Navigator—a tool that identifies evidence-based public health interventions and best practices for informing decision making—ranks farmers' market strategies as having "some evidence" of effectiveness.[24] And in its most recent strategic plan (2014 to 2018), the USDA recommends authorizing eligible vendors in low-access areas to equip farmers' markets to accept SNAP benefits via EBT.[25]

Despite these recent interests and efforts involving farmers' markets, much remains unknown about the relationship between having access to this venue and healthy eating among target groups, especially in urban settings. One recent study of about 200 SNAP participants reported that shopping at farmers' markets was associated with high consumption of fruit and vegetable intake. However, the study was conducted in a rural setting.[26] To date, no studies have examined the relationships between EBT access at farmers' markets and dietary behaviors (eg, fruit and vegetable and sugar sweetened beverage [SSB] consumption) in a low-income, urban population.

To help address these gaps in public health practice, the present study examined the association between EBT access at farmers' markets and dietary behaviors in a predominantly low-income population in Los Angeles County; that is, clients of the public health center system in the region. In the study analyses, the first primary outcome—healthy eating (operationalized as fruit and vegetable consumption)—was selected because it represents a lifestyle factor that affects obesity and chronic disease risk[27,28] and because fresh produce is readily available at farmers' markets. The second primary outcome—unhealthy eating (operationalized as SSB consumption)—was selected because it represents food of minimal nutritional value.[29,30] Its consumption could shift with increased access to farmers' markets. Given that farmers' markets main sales product is fruits and vegetables, we hypothesize that increased EBT access at this venue is associated with increased fruit and vegetable consumption. Based on prior study findings, we further hypothesize that increased EBT access at farmers' markets is not associated with SSB consumption. For example, in their recent study of SNAP participants in rural North Carolina, Jilcott Pitts and colleagues[26] observed a decrease in SSB consumption among SNAP participants who shopped at farmers' markets, but the association did not reach statistical significance.

METHODS

Study Sample

This study used cross-sectional data from the second round of the Los Angeles County Health and Nutrition Examination Survey (LAHANES-II). The data were collected between February and April 2012 at five safety-net, multipurpose public health centers operated by the Los Angeles County Department of Public Health (DPH). The LAHANES-II collected objectively measured anthropometric and clinical measurements, including height, weight, and blood pressure, and self-reported information on sociodemographic characteristics, chronic disease status, dietary and physical activity self-efficacy and behaviors, and factors related to the food environment (eg, EBT use at farmers' markets). The self-reported information was completed via a 95-item self-administered questionnaire. The questionnaire included questions drawn from validated surveys (eg, questions on fruit and vegetable intake and SSB consumption),[31] and questions that were developed internally (eg, EBT use behaviors) for emerging topics with limited literature. All relevant protocols and materials related to LAHANES-II were reviewed and approved by the DPH Institutional Review Board before field implementation. The behavioral profiles of the LAHANES-II participants have been described and published elsewhere.[32]

Recruitment of Participants

Los Angeles County residents were eligible to participate in the LAHANES-II if at the time of recruitment they were at least aged 18 years, spoke English or Spanish, were a client (patient) of one of the five selected DPH-operated public health centers (out of 14 centers total), were not pregnant, and agreed to complete anthropometric and self-administered assessments on specified days at specified locations. Participants were recruited from these centers because in recent years they have been the intended audiences of a range of obesity prevention efforts in the region,[33] including efforts to increase CalFresh (ie, California's SNAP) EBT use at farmers' markets.[34,35]

Before enrollment in the LAHANES-II, each prospective participant provided written informed consent to participate. Participants who completed the LAHANES-II assessments received a $50 gift card. Details of study recruitment methods have been published elsewhere.[32]

Measures

Measures Used in the Descriptive and Regression Analyses. Fruit and vegetable and SSB consumption among LAHANES-II participants were measured using validated questions adapted from the National Institute of Health's Eating at America's Table Quick Food Scan.[36] To measure fruit and vegetable consumption, participants were asked to answer a 6-item scale to estimate the daily intake of fruits for breakfast or morning snacks, vegetables for breakfast or

morning snacks, fruits for lunch or afternoon snacks, vegetables for lunch or afternoon snacks, fruit for dinner or evening snacks, and vegetables for dinner or evening snacks. To measure SSB consumption, participants were asked to answer a similar 5-item scale to estimate the weekly intake (frequency during the past 7 days) of the following beverages: soda, sports drinks, energy drinks, other sugary beverages (eg, lemonade, sweetened tea, coffee drinks, and flavored milk), and 100% juice. Because the latter drink category is typically considered independent of SSBs, we excluded 100% juice from the construction of this variable.[37,38]

In descriptive analyses of fruit and vegetable consumption, intake patterns from participant responses to the LAHANES-II questions were first transformed into daily frequencies (number per day) and then categorized as '5+ fruits and vegetables per day,' '1-4 fruits and vegetables per day,' and '<1 fruits and vegetables per day.' These cutoffs were informed by prior studies on nutrition[39,40] and align with commonly used national and local public health benchmarks for healthy eating behaviors.[41-43] For SSB consumption, intake patterns were transformed into weekly frequencies (number per week) and then categorized as '<1 per week,' '1-6 per week,' and '1+ per day.' The selected cutoffs for this outcome were informed by previous population survey benchmarks or questions[44-46]; for example, similar cut points have been used in previous analyses of dietary patterns in Los Angeles County populations.[32,33] Where appropriate, mean number of fruits and vegetables (per day) and SSBs (per week) consumed are provided in Table 1.

In regression analyses of these two outcome variables, the frequencies for both variables were converted to counts per week. This operationalization of consumption for both outcome variables is similar to a previous analysis by Gase and colleagues,[32] who used the same data as the present study. Model 1 examined the associations between fruit and vegetable consumption and selected independent variables and Model 2 examined the associations between SSB consumption and the same selected independent variables.

To assess EBT access at farmers' markets, survey participants who indicated they were recipients of nutrition assistance program benefits were asked the following question in the LAHANES-II: "Are you able to use your EBT food benefits at your local farmers' market?" Response options included "yes," "no," or "not sure/don't know." In regression analyses, these responses were dichotomized as 'yes' if a participant answered "yes" and 'no' if they answered "no" and "not sure/don't know." Subanalyses were conducted to inform the appropriateness of collapsing these responses in this manner. When appropriate, casewise deletion was applied to address missing responses.

EBT use was measured by asking survey participants to indicate the frequency they "use their EBT food benefits to purchase healthy food items (eg, fresh fruits and vegetables, whole grain)." Response options were dichotomized as 'frequently' if they responded "always/often" and 'does not use frequently' if they responded "sometimes/rarely/never."

Neighborhood food access was measured by asking survey participants to indicate their level of agreement (4-point Likert scale) with the following statements: "In my neighborhood it is easy for me to find fresh fruits and vegetables," and, "In my neighborhood it is easy for me to find supermarkets and grocery stores." For both descriptive and regression analyses, response options for both questions were dichotomized as 'easy access' in cases where they responded "strongly agree/agree" and 'difficult access' in cases where they responded "strongly disagree/disagree/neither agree nor disagree." Current evidence in the literature suggests that there are adverse as well as salutary linkages between neighborhood food access and dietary behaviors,[4] and between neighborhood food environments and chronic disease-related health outcomes.[4,47]

Transportation behaviors were measured by asking survey participants: "How many minutes does it usually take you to get the grocery store?", "How many miles is it from your home to the nearest grocery store (one-way)?", and, "How do you usually get from your home to the grocery store?" In descriptive analyses, responses to the first question were categorized as '≤5 minutes,' '6 to 10 minutes,' '11 to 20 minutes,' and '>20 minutes,' and responses to the second question as '0 miles,' '2 miles,' '3 to 5 miles,' and '>5 miles.' For the third question, participants were given the choice of answering either "drive alone," "carpool," "bus," "Metro (rail)," "motorcycle," "bicycle," "don't know," or "other." Participants who answered "other" were also given the opportunity to fill in their own written description. The "other" descriptions helped inform the creation of a new response category, "walk(ing)."

In the regression analyses, transportation behaviors were operationalized as the number of minutes usually traveled to a grocery store and the usual mean of transportation to get to a grocery store. Minutes traveled and usual mean were included in the analysis because prior research conducted in Los Angeles County found that distance traveled to grocery stores and transportation mode affected obesity status.[48] Unlike the descriptive analyses, responses for minutes traveled were dichotomized as '<5 minutes' vs '≥5 minutes,' and for the usual mean of transportation categorized as 'drive alone,' 'walk,' 'bus/Metro,' 'carpool,' or 'other.'

Collected information on sociodemographic characteristics for the descriptive analyses included: age, classified as 18 to 24, 25 to 44, 45 to 64, or ≥65 years; sex, classified as female, male, or transgender; race or ethnicity, classified as white or non-Hispanic, African American or black, Hispanic or Latino, Asian or Pacific Islander, and other (ie, American Indian or mixed race or ethnic origins); education level classified as less than high school, high school graduate, some college or junior college, and college graduate; and employment, classified as employed, unemployed or employed part-time, or retired or disabled. Similar to the descriptive analysis, sociodemographic information used in the regression models included age, sex, race or ethnicity, and education. Some participant responses, however, were categorized differently. Specifically, sex was dichotomized as 'male' or 'female,' age was dichotomized as '18-49 years' or '50+ years,' and education was dichotomized as 'college graduate or postgraduate' and '< college graduate.' For weight status, body mass index was dichotomized using the CDC defined cutoff points for underweight/normal weight (<25) and overweight/obese (>25).[49]

Statistical Analyses

The descriptive analyses were conducted to compare sociodemographic characteristics, self-reported information about fruit and vegetable and SSB consumption, and EBT use among recipients (n=529) and nonrecipients (n=847) of nutrition

Table 1. Comparison of self-reported eating and beverage consumption behaviors and other characteristics between recipients and nonrecipients of nutrition assistance program benefits with access to electronic benefit transfer: Results from the second round of the Los Angeles County Health and Nutrition Examination Survey, 2012

Characteristic	Benefits recipients	Nonbenefits recipients
	←———%[a] (n)——→	
Total	100 (529)	100 (847)
Self-reported eating and beverage consumption behaviors		
Fruit and vegetable consumption per day		
5+	24.6 (130)	22.2 (188)
1-4	53.9 (285)	56.8 (481)
<1	21.5 (114)	21.0 (178)
	←———mean±SD[b]——→	
Fruits and vegetables eaten per day	3.9±4.6	3.7±4.6
	←———%[a] (n)——→	
Sugar-sweetened beverage consumption***		
<1/wk	6.0 (31)	12.7 (106)
1-6/wk	28.6 (147)	34.7 (290)
≥1/d	65.4 (336)	52.6 (440)
	←———mean±SD[b]——→	
Sugar-sweetened beverages consumed per week	18.1±19.9	13.3±17.9
	←———%[a] (n)——→	
Neighborhood food access		
Perceives easy access to fresh produce in neighborhood[c]	70.3 (367)	74.5 (620)
Perceives easy access to supermarkets and grocery stores[d]	80.4 (418)	84.4 (699)
Transportation behaviors		
Minutes usually traveled to grocery store**		
≤5	42.3 (224)	51.8 (436)
6-10	27.8 (147)	26.6 (224)
11-20	18.9 (100)	14.9 (125)
>20	9.5 (50)	6.8 (57)
Miles traveled to nearest grocery store from home**		
0	8.8 (42)	9.6 (78)
1	41.3 (196)	47.5 (385)
2	20.0 (95)	19.5 (158)
3-5	19.8 (94)	18.2 (147)
>5	10.1 (48)	5.2 (42)
Usual means of transportation to grocery store***		
Drive alone	37.8 (197)	56.6 (474)
Carpool	9.4 (49)	6.1 (51)
Bus and/or metro	17.7 (92)	8.6 (72)
Walk	19.4 (101)	17.8 (149)
Other	15.7 (82)	11.0 (92)
Weight status		
Body mass index (measured)[e]		
Underweight or normal	33.5 (177)	34.6 (293)
Overweight or obese	66.5 (352)	65.4 (554)

[a]Percentages may not add up to 100% due to rounding and missing values.
[b]SD=standard deviation.
[c]Respondents were asked to indicate their level of agreement with the statement, "In my neighborhood, it is easy for me to find fresh fruits and vegetables." Responses were dichotomized as 'easy access' if respondents responded "strongly agree/agree" and 'difficult access' if they responded "strongly disagree/disagree/neither agree nor disagree."
[d]Respondents were asked to indicate their level of agreement with the statement, "In my neighborhood, it is easy for me to find supermarkets and grocery stores." Responses were dichotomized as 'easy access' if respondents responded "strongly agree/agree" and 'difficult access' if they responded "strongly disagree/disagree/neither agree nor disagree."
[e]Based on Centers for Disease Control and Prevention guidelines for body mass index:[34] ≤24.9 (normal or nonobese), 25.0-29.9 (overweight), and ≥30.0 (obese).
**$P<0.001$ based on χ^2 test comparing sociodemographic characteristics of benefits recipients vs nonbenefits recipients.
***$P<0.0001$ based on χ^2 test comparing sociodemographic characteristics of benefits recipients vs nonbenefits recipients.

assistance program benefits. To aid variable selection for the multivariable regressions, univariate, bivariate, correlation, and sensitivity analyses were performed. The modeled regressions focused on describing the relationships between EBT access at farmers' markets and fruit and vegetable and SSB consumption. The final models included variables pertaining to EBT access at farmers' markets, EBT use to purchase healthy

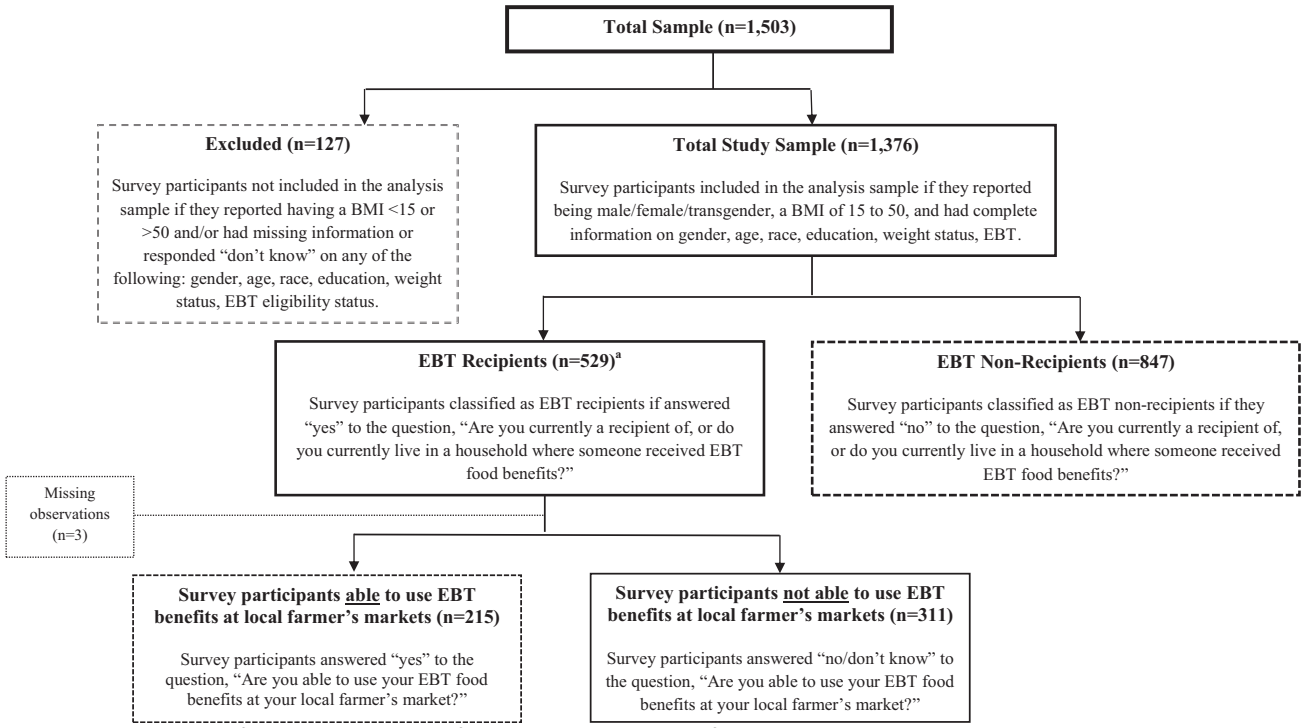

Figure. Flow diagram of the analysis sample from the second round of the Los Angeles County Health and Nutrition Examination Survey, 2012. [a]The analysis sample of the negative binomial regression models was derived from this pool; after 29 cases were dropped due to missing covariates, the sample used in the two models was 500. EBT=electronic benefit transfer. BMI=body mass index.

foods, perceived access to supermarkets and grocery stores, minutes usually traveled to nearest grocery store, usual mean of transportation to grocery store, and sociodemographic characteristics. For the two primary outcome variables (ie, fruit and vegetable and SSB consumption), they were modeled as counts using a negative binomial regression procedure.[50] Consistent with others' analytic treatment of cross-sectional count data, regression coefficients in these models were exponentiated to produce rate ratios.[32,50] In the early part of the model building, alternative multivariable regression approaches such as linear and logistic regressions were explored; these approaches generated similar (if not less robust) models of the analysis sample. The latter results are not presented here.

All data for this study were cleaned and managed using the SAS version 9.3 statistical software package.[51] All multivariable regression analyses were performed using Stata version 13.1.[52]

RESULTS

Of 3,317 adults approached at the five public health centers, 2,184 were eligible and scheduled appointments for the LAHANES-II. Of these, a total of 1,503 completed the survey for a response rate of 69%. After application of the study's exclusion criteria, the sample was reduced to 1,376, of whom 529 received nutrition assistance program benefits; in the final regression models, 29 cases were dropped due to missing values. The breakdown of the study sample is provided in the Figure.

Sociodemographic characteristics for participants who were recipients of nutrition assistance program benefits (n=529) and nonrecipients (n=847) are summarized in Table 2. A comparison of self-reported healthy status, eating behaviors, and other characteristics between these two groups is provided in Table 1.

In the multivariable regression analyses (Table 3), access to EBT at local farmers' markets among recipients of nutrition assistance program benefits was associated with 25% higher fruit and vegetable consumption per week than those without access (incidence rate ratio [IRR] 1.251, 95% CI 1.019 to 1.536; $P<0.05$). The relationship between frequency of EBT use to purchase healthy foods and fruit and vegetable consumption was also statistically significant; that is, 54% higher consumption per week among benefits recipients who used EBT frequently to purchase healthy foods vs those who did not (IRR 1.544, 95% CI 1.120 to 1.988; $P<0.01$). Compared with those driving alone as a usual mean of transportation to get to the grocery store, benefits recipients taking the bus/Metro was associated with a 35% higher fruit and vegetable consumption per week (IRR 1.351, CI 1.015 to 1.798; $P<0.05$).

In the analyses of SSB consumption, statistically significant relationships were demonstrated for higher consumption of these beverages and walking as a primary mode of transportation (IRR 1.368, CI 1.063 to 1.761; $P<0.05$), taking the bus/Metro (IRR 1.403, CI 1.084 to 1.815; $P<0.05$), being of a younger age group (IRR 1.569, CI 1.197 to 2.058; $P<0.01$), and being Latino (IRR 0.649, CI 0.510 to 0.827; $P<0.001$) (Table 3). For instance, taking the bus/Metro as opposed to driving alone was associated with a 40% higher SSB consumption per week (IRR 1.403, CI 1.084 to 1.815; $P<0.05$). Unlike fruit and vegetable consumption, no statistically significant relationship was demonstrated for access to EBT at farmers' markets and frequency of EBT use to purchase healthy foods.

Table 2. Comparison of sociodemographic characteristics between recipients and nonrecipients of nutrition assistance program benefits with access to electronic benefit transfer: Results from the second round of the Los Angeles County Health and Nutrition Examination Survey, 2012[a]

Characteristic	Benefits recipients	Nonbenefits recipients
	←——% (n)——→	
Total	100 (529)	100 (847)
Sex**		
Female	63.6 (335)	47.7 (404)
Male	36.6 (193)	52.3 (443)
Transgender	0.2 (1)	0.0 (0)
Age (y)**		
18-24	22.5 (119)	22.4 (190)
25-44	53.5 (283)	50.7 (429)
45-64	23.8 (126)	24.4 (207)
≥65+	0.2 (1)	2.5 (21)
Race or ethnicity**		
Black	62.1 (328)	41.3 (350)
Hispanic or Latino	25.9 (137)	29.4 (249)
White	5.1 (27)	16.3 (138)
Asian or Pacific Islander	2.3 (12)	7.3 (62)
Other	4.7 (25)	5.7 (48)
Education**		
Less than high school	22.9 (121)	13.2 (112)
High school graduate	26.8 (142)	19.2 (163)
Some college or junior college	40.5 (214)	37.4 (317)
College graduate	9.8 (52)	30.1 (255)
Employment**		
Employed[b]	15.6 (82)	31.1 (263)
Unemployed or employed part time	75.4 (396)	58.3 (494)
Retired or disabled	9.0 (47)	10.6 (90)

[a]Data collection was conducted at five designated public health centers during the assessment period (February to April 2012). Number of cases and percentage may not add up to the total or 100%, respectively, due to rounding and missing information.
[b]Employed=employed full-time or self-employed.
**$P<0.001$ based on χ^2 test comparing sociodemographic characteristics of benefits recipients vs nonbenefits recipients.
***$P<0.0001$ based on χ^2 test comparing sociodemographic characteristics of benefits recipients vs nonbenefits recipients.

DISCUSSION

To the best of our knowledge, this study is among the first to examine the relationships between EBT access at farmers' markets and eating behaviors (both healthy and unhealthy) among nutrition assistance program recipients in a large, urban jurisdiction. Two key findings emerged from the analyses. First, the study found that recipients of nutrition assistance program benefits with access to EBT at local farmers' markets consumed more fruits and vegetables than those without access. Frequency of EBT use to purchase healthier food items and use of public transportation also predicted higher consumption of fruits and vegetables among recipients of nutrition assistance program benefits.

Second, the study found that benefits recipients with access to EBT at farmers' markets were not more or less likely to consume SSBs. Instead, we found that those who were younger (ie, between ages 18 and 49 years) and typically walked and/or used public transportation (bus/Metro rail) to get to a grocery store were more likely to consume SSBs.

The first finding is not surprising. Individuals who want to consume more fruits and vegetables are more likely to shop at farmers' markets than those who are not. That being said, emerging evidence suggests that improving access to farmers' market in the community may also entice low-income individuals to eat better, especially through the use of financial incentives.[13,53-60] Farmers' markets by their very mission and the network of partners they support are focused on selling fruits and vegetables, thereby increasing opportunities for shoppers to choose fresh produce (even if this was not the primary intent of each venue). The efforts of farmers' markets to promote the sale of their products are likely to result in the food purchasing patterns seen in the present study.

Although there are a number of possible reasons for why taking the bus or the Metro was associated with higher fruit and vegetable consumption, reviews of the literature and experiential learning in public health practice offer some insights to this finding. Transportation behaviors, for example, could affect fruit and vegetable consumption in several ways. First, those with limited access to transportation (either car or public transportation) may be limited to purchasing and consuming foods sold only in their neighborhood (ie, lower income neighborhoods that typically have less access to healthy foods such as fruits and vegetables). Prior research has demonstrated linkages between vibrancy, safety and quality of neighborhood environments and with food access[4] and obesity.[48,61-64] Second, it is possible that those who own a car or carpool are more likely to purchase foods from drive-through fast-food restaurants. Fast-food restaurants with drive-through windows are plentiful in low-income areas of Los Angeles.[65] Prior studies conducted in this jurisdiction have found that individuals who own cars actually have a higher body mass index.[48] This relationship is ecologic in nature and merits further study.

Unlike the first finding, the second finding requires more careful interpretation, especially in light of emerging evidence suggesting beverages with high sugar content are hyperpalatable and may have an addictive component.[66,67] In addition, there is currently neither an incentive nor a disincentive for nutrition assistance program beneficiaries to reduce SSB consumption, because SNAP presently imposes no specific nutrition-related restrictions on food and beverage purchases.

SSB products are in general far more ubiquitous than fruits and vegetables across all kinds of market settings; in fact, they are often sold at farmers' markets. From a marketing

Table 3. Predictors of healthy eating among recipients of nutrition assistance program benefits with access to electronic benefit transfer (EBT): Results from the second round of the Los Angeles County Health and Nutrition Examination Survey, 2012 (analysis sample n=500)[a]

Predictor	Model 1: Fruit and vegetable consumption	Model 2: Sugar-sweetened beverage consumption
	←——————*incidence rate ratio (95% CI)*[b]——————→	
Independent variables		
EBT access at farmers' markets		
Ability to use EBT at local farmers' market Yes (ref[c]: No)	1.251 (1.019-1.536)*	1.066 (0.881-1.291)
EBT use behaviors		
Uses nutrition assistance benefits via EBT to purchase healthy foods		
Uses EBT frequently (ref: does not use frequently)	1.544 (1.120-1.988)**	1.009 (0.787-1.294)
Neighborhood food access		
Access to supermarkets and grocery stores in neighborhood		
Perceives easy access (ref: Does not perceive easy access)	1.197 (0.937-1.529)	0.925 (0.745-1.149)
Transportation behaviors		
Minutes usually traveled to grocery store		
≤5 (ref: >5)	1.105 (0.902-1.354)	0.940 (0.768-1.151)
Usual means of transportation to grocery store		
Walk (ref: Drive alone)	1.145 (0.865-1.516)	1.368 (1.063-1.761)*
Bus/Metro (ref: Drive alone)	1.351 (1.015-1.798)*	1.403 (1.084-1.815)*
Carpool (ref: Drive alone)	0.943 (0.663-1.342)	1.360 (0.988-1.871)
Other (ref: Drive alone)	0.998 (0.729-1.365)	1.191 (0.849-1.672)
Sociodemographic characteristics		
Sex		
Female (ref: Male)	0.980 (0.798-1.205)	0.917 (0.760-1.106)
Age (y)		
18-49 (ref: ≥50)	0.928 (0.695-1.238)	1.569 (1.197-2.058)**
Race		
Latino (ref: African American)	1.143 (0.907-1.439)	0.649 (0.510-0.827)***
White (ref: African American)	0.750 (0.518-1.084)	0.620 (0.377-1.019)
Asian/Pacific Islander (ref: African American)	1.713 (0.932-3.150)	0.558 (0.322-0.965)
Other (ref: African American)	1.086 (0.665-1.772)	0.876 (0.568-1.350)
Education		
College graduate or postgraduate (ref: <College graduate)	1.265 (0.904-1.769)	0.863 (0.603-1.235)

[a]Participants who reported receiving EBT and had no missing data for any of the variables included in the multivariable analyses.
[b]Negative binomial regression model reporting incidence rate ratios.
[c]ref=reference category.
*$P<0.05$.
**$P<0.01$.
***$P<0.0001$.

perspective, sugar-sweetened carbonated beverages and other SSBs are more heavily advertised than fruits and vegetables,[68,69] thereby exerting substantive influence on beverage selection across a large number of populations, including low-income residents of Los Angeles County, regardless of whether they have EBT access or not. Product marketing is a confounding factor that was not adequately accounted for in the LAHANES-II. Its contribution to the different and complex pathways that can lead to excess SSB consumption is likely substantial, and thus should be

considered when interpreting this study or the analyses of other studies on this topic.[66-68,70-72]

Policy and Practice Implications

Recent federally funded obesity prevention efforts have aimed to leverage EBT use at farmers' markets as a way to promote health in underresourced communities where overweight/obesity and cardiovascular disease are prevalent.[73] For instance, as part of the 2011 to 2014 Community Transformation Grants initiative, the CDC funded DPH to implement a series of multipronged, multisectored prevention strategies to reduce the chronic disease burden in the region.[34] Among these strategies was the *Choose Health LA* Farmers' Market Program. The program's directive was to improve nutrition behaviors among low-income Los Angeles County residents by improving access and increasing use of EBT at farmers' markets across the county.

Findings from the present study provided some clarity and context on how EBT access might help low-income individuals to eat more healthfully and how these interventions could be scaled at farmers' markets across the country. Although the latter is supported by research and by the experiences of other nutrition assistance programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children,[74,75] much remains to be learned about EBT access at farmers' markets and their potential influence on dietary behaviors. More research is clearly needed to help guide federal agencies such as the USDA, or state and local governments, on whether and how EBT access at farmers' markets should be implemented or tailored to target communities.

Limitations

First, the study largely relied on self-reported measures of health behaviors and transportation modes to a grocery store. Unlike objectively measured height, weight, and blood pressure readings, these self-reported measures are subject to recall and reporting bias. In addition, fruit and vegetable consumption may be overreported and SSB consumption underreported due to social desirability bias. Second, although the two selected outcomes were common measures of diet quality, other dimensions of this construct that may be applicable (eg, selection of lower-calorie foods or selection of lower sodium foods) were not examined. Third, information on the amount spent on fruit and vegetable purchases and where they were purchased was not collected; thus, assessing the actual extent to which participants purchased fruits and vegetables using EBT benefits could not be determined. Similarly, information on where SSBs were purchased was not collected. Fourth, fruit and vegetable consumption was assessed in terms of the number of times per week rather than the number of servings per week. The latter allows for a standardized measure of amount consumed. Finally, the LAHANES-II sample was not a random sample of all residents in Los Angeles County, limiting the generalizability of these findings to the larger Los Angeles County adult population or to other communities. However, the sample did comprise lower-income residents of the region, which represented the intended audiences of the federal programs on obesity prevention.

PRACTICE IMPLICATIONS

- To date no studies have examined the relationships between EBT access at farmers' markets and eating behaviors (both healthy and unhealthy) among nutrition assistance program recipients in a large urban jurisdiction.
- This research sheds light on how EBT access might help low-income individuals to eat more healthfully and how these interventions could be scaled at farmers' markets across the country.
- Study findings illuminate complexities of having access to EBT at farmers' markets and dietary behaviors and may inform ongoing dialogues about public health policies and strategies to improve nutrition for the poor and underserved locally and nationally.

CONCLUSIONS

Our findings suggest that access to EBT at farmers' markets is associated with higher fruit and vegetable consumption among recipients of nutrition assistance program benefits. No association between EBT access and lower SSB consumption was found. Given that farmers' markets generally focus on the sale of fresh produce, our findings raise important questions about the need for strategies to discourage EBT recipients' purchase of foods of minimal nutritional value in other venues that accept nutrition assistance program benefits. Although it could be argued that recipients of nutrition assistance program benefits who shop at farmers' markets are a self-selected sample, there is evidence to suggest that availability and cost of food available in retail stores influence food purchasing/eating behavior patterns.[4,76] Thus, similar influence at farmers' markets is plausible. The present findings have important policy implications that can contribute to the ongoing dialogue about the strategies that can be used to improve nutrition among poor and underserved individuals in both Los Angeles County and elsewhere in the United States.

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