

RACIAL/ETHNIC DIFFERENCES IN THE SHOPPING BEHAVIORS AND FRUIT AND VEGETABLE CONSUMPTION OF FARMERS' MARKET INCENTIVE PROGRAM USERS IN ILLINOIS

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Introduction: Farmers' market incentive programs, such as Link Match, provide monetary incentives to Supplemental Nutrition Assistance Program (SNAP) participants to promote their use of local farmers' markets. Information on racial/ethnic differences in the shopping behaviors and fruit and vegetable (FV) consumption of farmers' market incentive program users is scarce. This research aimed to address this need by examining users of the Link Match incentive program in Illinois.

Methods: A cross-sectional survey of 328 Link Match users (39.6% non-Hispanic White; 45.4% non-Hispanic Black; and 15.0% other) was conducted in 2016 and 2017. Information on each participant's demographics, farmers' market shopping behaviors, and monthly frequency of FV consumption was collected from Link Match users. Chi-square and ANOVA tests were used to assess differences in farmers' market shopping measures by race/ethnicity. Logistic regression models were used to examine the association between race/ethnicity and frequency of FV consumption.

Results: A significantly higher percentage of non-Hispanic Black participants reported being an infrequent farmers' market user (ie, shopping \leq once a month) compared with non-Hispanic White and other participants ($P=.01$). After adjusting for covariates, non-Hispanic Black participants had lower odds of consuming fruit daily (OR: .44; 95% CI: .22-.86) compared with non-Hispanic White participants. Other participants had lower odds of consuming both fruit and vegetables compared with non-Hispanic White participants (OR: .30; 95% CI: .12-.71).

Conclusions: Differences in shopping behaviors and FV consumption were observed by race/ethnicity among Link Match users. Future research should examine the nutri-

INTRODUCTION

In the United States, low-income populations are disproportionately impacted by obesity and chronic diseases such as type 2 diabetes and hypertension compared with higher income populations.^{1,2} These disparities may be explained, in part, by the retail food environment in low-income communities, which often have limited availability of healthy foods.³ Residing in a community with low availability of healthy foods may negatively influence an individual's diet-related behaviors.³ Healthy food incentive programs implemented at farmers' markets have the potential to improve community nutrition because they allow low-income individuals who partici-

pate in food assistance programs to redeem their benefits at local farmers' markets to procure greater volumes of fresh fruits and vegetables.⁴⁻⁶ In recent years, a number of research studies have reported the positive effects farmers' market incentive programs have on food security, food shopping behaviors, and fruit and vegetable (FV) consumption among low-income populations.⁷⁻¹²

Race and ethnicity are widely considered to be influential factors in shaping health inequities^{1,2}; both have been linked to poorer access to healthy foods and reduced FV consumption among adults.¹³⁻¹⁵ Despite the growing body of literature on the benefits of farmers' market incentive programs, information on the differential impact these programs have by

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race/ethnicity is scarce. Several studies have been conducted on farmers' market usage in general among low-income populations, some of which solely targeted minority individuals to assess their barriers to usage, food shopping behaviors, and/or FV consumption.¹⁶⁻²¹ Although farmers' market usage has been found to be associated with increased FV consumption in several minority communities across the United States, a key limitation to this research is the lack of information on racial/

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ethnic differences in shopping behaviors and FV consumption of low-income farmers' market users.¹⁸⁻²⁰

Epidemiologic research continues to report significant racial/ethnic disparities in food shopping behaviors and FV consumption among US adults.^{14,15,22} For example, non-Hispanic Black adults are less likely to meet dietary recommendations for vegetable consumption.^{14,15} Farmers' market incentive programs aim to provide a financial resource to low-income populations, regardless

of racial/ethnic background, to support their consumption of a healthy diet that aligns with national recommendations.^{7,8} However, there is limited understanding of how FV consumption behavior compares across racial/ethnic groups among low-income adults who have access to a farmers' market incentive program.

The objective of the research is to determine whether racial/ethnic differences exist in the farmers' market shopping behaviors and frequency of FV consumption among a diverse sample of Supplemental Nutrition Assistance Program (SNAP) participants who utilized a statewide farmers' market incentive program in Illinois during the 2016 and 2017 growing seasons. Findings from this study will provide the field a better understanding of the intersection of race/ethnicity, farmers' market usage, and dietary behavior. Furthermore, study findings may provide public health nutrition researchers and community organizations that operate farmers' markets valuable information on differences in the dietary behaviors of diverse populations who utilize farmers' markets and healthy food incentive programs. We hypothesized that non-Hispanic Black participants will report a lower frequency of FV consumption compared with non-Hispanic White participants.

METHODS

Program Overview and Data Source

Link Match is the largest farmers' market incentive program in

Illinois.²³ It provides SNAP participants a one-to-one dollar match (up to \$25 per shopping visit) if they use their food assistance benefits to purchase SNAP-eligible foods from a participating farmers' market.²³ Over 80 farmers' markets and direct marketing farmers (farmers who sell their agricultural products directly to the public) in Illinois offered the incentive in 2017.^{23,24} Experimental Station, a Chicago-based non-profit organization, manages the incentive program.²³ During the 2016 and 2017 farmers' market seasons in Illinois (March – October), the organization surveyed 328 Link Match users (39.6% non-Hispanic White, 45.4% non-Hispanic Black, 7.3% Hispanic, 2.4% non-Hispanic Asian, and 5.2% multiracial/other) at farmers' markets located in the following cities: Chicago, Springfield, Urbana, Woodstock, Northbrook, Aurora, East St. Louis, and Carbondale. Approximately 140 and 188 people were surveyed in 2016 and 2017, respectively.

Each year, Experimental Station conducts a cross-sectional survey of Link Match users to assess their demographics, shopping behaviors, and program satisfaction. Only individuals who were aged ≥ 18 years and current SNAP participants were eligible to participate in the paper survey. Eligible individuals were surveyed once, in either 2016 or 2017, at a participating farmers' market. The survey did not change between years and was available in English and Spanish. Experimental Station staff checked the survey for readability in both languages. Completed surveys were collected by market

staff and mailed to Chicago for review. To examine racial/ethnic differences in the farmers' market shopping behaviors and frequency of FV consumption among Link Match users, a secondary analysis of the cross-sectional survey data collected by Experimental Station was conducted in 2018. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study. The institutional review board at the University of Illinois at Chicago approved this research.

Survey Instrument and Measures

Staff at Experimental Station developed the self-administered survey. It featured 25 items organized into four sections: 1) demographics and health; 2) farmers' market shopping behaviors and attitudes; 3) attitudes toward the Link Match program; and 4) frequency of FV consumption in the prior month. Measures assessing the frequency of fruit and vegetable consumption were taken from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BFRSS). Frequency of farmers' market shopping was assessed by measures found on the National Cancer Institute's Food Attitudes and Behaviors Survey (FAB). Detailed information about these survey instruments is available online.^{25, 26}

The demographic and health measures collected included: age

(years; ≤ 40 , 41-55, 56-70, > 70); sex (male or female); number of household members; height, weight, and general health status (excellent, very good, good, fair, poor). Self-reported height and weight measures were used to calculate each participant's body mass index (BMI). Participants with a BMI ≥ 30 were considered obese. Measures for frequency of FV consumption in the prior 30 days were categorical: never, 1-3 times last month, 1-2 times per week, 3-4 times per week, 5-6 times per week, 1 time per day, 2 times per day, 3 times per day, 4 times per day, 5 or more times per day. Participants recorded their frequency of fruit consumption separate from their consumption of vegetable consumption on the survey.

The farmers' market shopping behaviors assessed were: primary household food shopper (yes or no); number of years shopping at the farmers' market; frequency of farmers' market shopping per month (\leq once a month, every other week, once a week, $>$ once a week); amount of money (\$) spent on food per visit; and reasons for visiting the farmers' market. Amount of money spent on food per visit included all forms of payment: cash; debit/credit; and Link Match. Participants were allowed to select all of their reasons for visiting the farmers' market from the following options: to purchase fruits and vegetables; to purchase baked goods; to purchase meats, eggs, and cheese; to purchase prepared foods/meals; and to enjoy the event/socialize.

Attitude and barrier measures were used to assess participants' views about the Link Match program. Participants recorded on a scale of 1

(disagree) to 5 (agree) if they agreed with the following statements: 1) the Link Match program has positively affected their fruit and vegetable consumption; and 2) the Link Match program is important to their decisions on spending their SNAP benefits. Individuals who agreed with the statements (recorded 4 or 5) were compared with those who were neutral or disagreed (recorded 1, 2, or 3). Participants were allowed to select all of their barriers to using the Link Match more often from the following options: price of produce at the farmers' market; farmers' market hours of operation; farmers' market location; lack of transportation; and the program match limit.

Statistical Analysis

Analyses were performed with SAS software (SAS version 9.4 (SAS Institute Inc., Cary, NC, 2018)). Descriptive statistics (means and frequencies) were calculated for measures among all survey participants and stratified by race/ethnicity. Due to small sample sizes, individuals who reported their race/ethnicity as Hispanic, non-Hispanic Asian, and multiracial/other were grouped together and compared with non-Hispanic White and non-Hispanic Black participants. Considering that the mean number of household members differed among the racial groups, the amount of money spent per food visit was divided by total household size to examine the amount of money spent on food per household member across racial groups.²⁷

Chi-square test of independence and analysis of variance (ANOVA) tests were used to identify statisti-

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cally significant differences in demographics and farmers' market shopping behaviors among the racial/ethnic groups. Crude and multivariable-adjusted logistic regression models were used to examine associations between race/ethnicity and

odds of daily FV consumption in the prior 30 days. Fruit and vegetable consumption were assessed separately. Daily consumption was defined as consuming at least once a day. Thus, all study participants who reported they consumed fruit/vegetables at

least once per day in the prior 30 days were compared with all other participants. Model 1 is the crude model examining the association between race/ethnicity and odds of daily fruit consumption. Model 2 is model 1 adjusted for location (Chicago vs

Table 1. General characteristics of survey participants (2016 and 2017), stratified by race/ethnicity

Variable	All Participants N = 328	Non-Hispanic White 130 (39.6)	Non-Hispanic Black 149 (45.4)	Other 49 (15.0)	TS (DF) ^a	P
Demographics						
Age group, n (%), yrs						
≤ 40	147 (44.8)	71 (54.6)	45 (30.2)	31 (63.3)		
41 – 55	64 (19.5)	25 (19.2)	30 (20.1)	9 (18.4)	30.1 (6)	<.001
56 – 70	90 (27.4)	28 (21.5)	56 (37.6)	6 (12.2)		
> 70	27 (8.2)	6 (4.6)	18 (12.1)	3 (6.1)		
Sex, n (%)						
Female	243 (82.1)	95 (80.5)	108 (83.1)	40 (83.3)	.3 (2)	.84
Male	53 (17.9)	23 (19.5)	22 (16.9)	8 (16.7)		
Household members, mean (±sd)	2.9 (±1.8)	3.1 (±1.9)	2.5 (±1.5)	3.7 (±1.6)	8.2 (2)	<.001
Location, n (%)						
Chicago	92 (28.1)	18 (13.9)	60 (40.3)	14 (28.6)	24.0 (2)	<.001
Other	236 (71.9)	112 (86.2)	89 (59.7)	35 (71.4)		
Health						
BMI, mean (±sd)	28.8 (±7.5)	28.1 (±7.5)	29.3 (±76.3)	29.3 (±7.1)	.9 (2)	.43
Obese (BMI ≥ 30), n (%)						
Yes	108 (40.6)	43 (38.4)	48 (43.2)	17 (39.5)	.6 (2)	.75
No	158 (59.4)	69 (61.6)	63 (56.8)	26 (60.5)		
General health status, n (%)						
Excellent	33 (10.4)	11 (8.7)	15 (10.6)	7 (14.6)		
Very good	87 (27.5)	41 (32.3)	38 (27.0)	8 (16.7)	9.4 (8)	.31
Good	123 (38.9)	42 (33.1)	56 (39.7)	25 (52.1)		
Fair or poor	73 (23.1)	33 (26.0)	32 (22.7)	8 (16.7)		
Fruit & vegetable intake						
Frequency of Fruit Intake, n (%)						
≤ 2 times per week	82 (27.2)	26 (20.8)	40 (30.5)	16 (35.6)		
3-4 times per week	56 (18.6)	20 (16.0)	29 (22.1)	7 (15.6)		
5-6 times per week	42 (14.0)	15 (12.0)	17 (13.0)	10 (22.2)	21.3 (8)	.007
1-2 times per day	55 (18.3)	36 (28.8)	15 (11.5)	4 (8.9)		
≥ 3 times per day	66 (21.9)	28 (22.4)	30 (22.9)	8 (17.8)		
Frequency of vegetable intake, n (%)						
≤ 2 times per week	86 (28.2)	26 (21.0)	46 (34.1)	14 (30.4)		
3-4 times per week	50 (16.4)	17 (13.7)	22 (16.3)	11 (23.9)		
5-6 times per week	42 (13.8)	16 (12.9)	16 (11.9)	10 (21.7)	18.1 (8)	.02
1-2 times per day	60 (19.7)	34 (27.4)	23 (17.0)	3 (6.5)		
≥ 3 times per day	67 (22.0)	31 (25.0)	28 (20.7)	8 (17.4)		

BMI, body mass index; DF, degrees of freedom; SD, standard deviation; TS, test statistic.

Frequencies may not equal the column total due to missing observations.

a. Test statistics and p values presented were calculated with either a chi-square test of independence (categorical measures) or ANOVA test (continuous measures).

other), age, sex, and household size. Model 3 is the crude model examining the association between race/ethnicity and odds of daily vegetable consumption. Model 4 is model 3 adjusted for the same measures included in model 2. $P < .05$ were considered statistically significant.

RESULTS

Information on the demographics, health status, and frequency of

FV consumption of participating Link Match users is displayed in Table 1 stratified by racial/ethnic group. Overall, most participants were aged ≤ 40 years and female. More than 40% of participants were obese according to their calculated BMI. Approximately 22% of participants reported they consumed fruit ≥ 3 times a day, and 22.0% reported they consumed vegetables ≥ 3 times a day. Significant differences were detected among the racial/ethnic groups for the measures: age

group; number of household members; market location; frequency of fruit consumption; and frequency of vegetable consumption. Greater percentages of non-Hispanic Black and other participants reported consuming fruits and vegetables ≤ 2 times per week compared with non-Hispanic White participants.

The farmers' market shopping behaviors and attitudes of participating Link Match users are provided in Table 2 stratified by racial/ethnic group. Approximately 82.2% of

Table 2. Farmers' market shopping behaviors and attitudes of survey participants (2016 and 2017), stratified by race/ethnicity

Variable	All Participants	Non-Hispanic White	Non-Hispanic Black	Other	TS (DF) ^a	P
	N = 328	130 (39.6)	149 (45.4)	49 (15.0)		
Shopping behaviors						
Primary household shopper, n (%)						
Yes	264 (82.2)	109 (83.8)	119 (82.6)	36 (76.6)	1.3 (2)	.53
No	57 (17.8)	21 (16.2)	25 (17.4)	11 (23.4)		
Years shopping at market, mean (\pm sd)	2.7 (\pm 2.5)	3.0 (\pm 2.7)	2.3 (\pm 2.2)	3.33 (\pm 2.5)	4.6 (2)	.01
Frequency of shopping, n (%)						
> Once a week	86 (26.7)	41 (31.5)	34 (23.5)	11 (23.4)		
Once a week	130 (40.4)	54 (41.5)	50 (34.5)	26 (55.3)	16.7 (6)	.01
Every other week	52 (16.2)	18 (13.9)	26 (17.9)	8 (17.0)		
\leq Once a month	54 (16.8)	17 (13.1)	35 (24.1)	2 (4.3)		
Reasons for visiting market, n (%)						
Fruits and vegetables	320 (97.6)	127 (97.7)	144 (96.6)	49 (100.0)	-	-
Baked goods	100 (30.5)	47 (36.2)	35 (23.5)	18 (36.7)	6.3 (2)	.04
Meats, eggs, cheese	119 (36.3)	58 (44.6)	40 (26.9)	21 (42.9)	10.6 (2)	.005
Prepared food/meals	41 (12.5)	14 (10.8)	17 (11.4)	10 (20.4)	3.3 (2)	.19
Enjoy event	99 (30.2)	43 (30.1)	35 (23.5)	21 (42.9)	7.4 (2)	.02
Amount spent per visit, mean (\pm sd) (per household member)	14.0 (\pm 11.4)	13.1 (\pm 11.3)	14.9 (\pm 11.0)	14.5 (\pm 13.0)	.7 (2)	.52
Attitudes and barriers						
"LINK Match has positively affected my FV consumption.", n (%)	286 (89.1)	120 (93.0)	122 (85.3)	44 (89.8)	-	-
"LINK Match is important when deciding to spend my SNAP benefits.", n (%)	297 (93.4)	124 (96.1)	128 (90.8)	45 (93.8)	-	-
Barriers to using LINK Match, n (%)						
Price of produce	27 (8.2)	9 (6.9)	13 (8.7)	5 (10.2)	.6 (2)	.75
Market hours of operation	55 (16.8)	22 (16.9)	22 (14.8)	11 (22.5)	1.6 (2)	.45
Market location	33 (10.1)	13 (10.0)	15 (10.1)	5 (10.2)	.0 (2)	.99
Lack of transportation	55 (16.8)	22 (16.9)	26 (17.5)	7 (14.3)	.3 (2)	.87
Match limit	61 (18.6)	27 (20.8)	16 (10.7)	18 (36.7)	17.1 (2)	.0002

FV, fruits and vegetables; DF, degrees of freedom; SNAP, Supplemental Nutrition Assistance Program; SD, standard deviation; TS, test statistic. Frequencies may not equal the column total due to missing observations.

a. Test statistics and P presented were calculated with either a chi-square test of independence (categorical measures) or ANOVA test (continuous measures).

Table 3. Crude and multivariable-adjusted logistic regression models examining associations between race/ethnicity and odds of daily fruit and vegetable consumption among survey participants

	Model 1	Model 2	Model 3	Model 4
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Race/Ethnicity				
NH White	REF	REF	REF	REF
NH Black	.50 (.30-.83)	.44 (.22-.86)	.55 (.34-.90)	.68 (.35-1.31)
Other	.35 (.16-.73)	.46 (.20-1.05)	.29 (.13-.61)	.30 (.12-0.71)
Other Measures				
Age, years	-	.98 (.72-1.35)	-	.93 (.67-1.29)
Gender				
Male	-	1.24 (.56-2.72)	-	1.05 (.45-2.28)
Female		REF		REF
Household members, n	-	1.07 (.91-1.26)	-	1.10 (.93-1.30)
Location				
Chicago	-	1.37 (.71-.24)	-	.84 (.43-1.61)
Other		REF		REF

CI, confidence interval; NH, non-Hispanic; OR, odds ratio.

Model 1: crude model examining the association between race/ethnicity and odds of daily fruit intake.

Model 2: model 1 adjusted for location (Chicago vs. other), age, gender, and number of household members.

Model 3: crude model examining the association between race/ethnicity and odds of daily vegetable intake.

Model 4: model 3 adjusted for location (Chicago vs. other), age, gender, and number of household members.

participants were the primary food shopper for their household. Mean number of years shopping at the farmers' market was 2.7 and 40.4% of participants reported they visited the farmers' markets once a week. Statistically significant differences were observed among the racial/ethnic groups for the measures: number of years shopping at the market; frequency of shopping; reasons for visiting the market; and barriers to using Link Match more often (the match limit). On average, non-Hispanic Black participants reported fewer years shopping at the farmers' market compared with non-Hispanic White and other participants. A greater percentage of non-Hispanic Black participants reported being infrequent users (ie, shopping \leq once a month). A lower percentage of non-Hispanic Black participants reported baked

goods and meats, eggs, and cheese as reasons why they visit the market. A greater percentage of other participants reported enjoy the event/socialize as a reason why they visit the market. Furthermore, a greater percentage of other participants reported the Link Match limit as a barrier to using the program more often.

Results from crude and multivariable-adjusted logistic regression models examining the association between race/ethnicity and odds of daily FV consumption among participating Link Match users are recorded in Table 3. Crude logistic regression models indicated that non-Hispanic Black and other participants had significantly lower odds of consuming fruit and vegetables at least once a day compared with non-Hispanic White participants. After adjusting for covariates, non-

Hispanic Black participants continued to have lower odds of daily fruit consumption, but not vegetable consumption compared with non-Hispanic White participants. Other participants continued to have lower odds of daily vegetable consumption but not fruit consumption compared to non-Hispanic white participants.

DISCUSSION

The scientific literature on farmers' market usage among low-income populations has grown substantially in the past decade.^{4-6,16-22} Despite this growth, information on racial/ethnic differences in the diet-related behaviors of low-income individuals who utilize farmers' markets and farmers' market incentive programs continues to be limited. In a recent

systematic review on barriers to farmers' market usage among low-income populations, Freedman and colleagues reported that only 41% of the 49 studies included in the review reported the race/ethnicity of their study participants.²⁸ Furthermore, only 15% of the studies focused on racial and ethnic minorities.²⁸ Reporting the race and ethnicity of study participants, and stratifying key results by race/ethnicity, is needed if researchers and stakeholders aim to properly assess the impact of introducing farmers' markets and farmers' market incentive programs to diverse low-income communities.

The aim of the current study was to identify racial/ethnic differences in the farmers' market shopping behaviors and frequency of FV consumption among Link Match users in Illinois. Considering that the existing information on this topic is limited, this study contributes valuable information to the literature on racial/ethnic differences in the diet-related behaviors of low-income farmers' market incentive program users. Non-Hispanic Black participants, on average, reported fewer years shopping at the farmers' market compared with non-Hispanic White and other participants. Furthermore, a greater percentage of non-Hispanic Black participants reported being infrequent farmers' market shoppers while a significantly lower percentage of non-Hispanic Black participants reported that they visit the market to enjoy the event. These findings suggest: 1) interest in farmers' markets may be lower among non-Hispanic Black Link Match users; and 2) non-Hispanic Black users may

have food shopping preferences that differ from non-Hispanic Whites.

Both nutrition and sociological research on farmers' market usage among non-Hispanic Black individuals provide insight to this topic area.^{6, 29-35} Although Blanck and colleagues reported that race/ethnicity was not a significant predictor of monthly frequency of farmers' market use,²⁹ a qualitative study by Fish and colleagues reported that low-income African American women in North Carolina had low interest in

cultural factors in shaping low-income minority population's perceptions of farmers' markets.^{34,35} This research emphasizes the notion that the surrounding community, farmers' market managers, vendors, and regular customers shape the identity of a farmer's market, which may not be inclusive to low-income minority populations.^{34,35} It is possible that low-income minority populations face stigma at farmers' market with a predominately higher income and non-Hispanic White customer base that may deter their usage of the market and its incentive programs.³³⁻³⁵

A key objective of farmers' market incentive programs is to increase FV purchasing and consumption among low-income populations; several studies have reported that usage of farmers' market incentive programs is associated with increased FV consumption.^{8,10,11} Nevertheless, these studies either focused solely on one racial/ethnic group or did not report FV consumption findings by race/ethnicity. Larger epidemiological studies have reported that racial/ethnic disparities exist with respect to meeting national dietary recommendations for FV consumption.^{14,15} For example, Kirkpatrick and colleagues observed that a lower percentage of non-Hispanic Black adults met dietary recommendations for whole fruit and total vegetable consumption compared with non-Hispanic White and Storey and colleagues found that non-Hispanic Black adults consumed less dietary fiber from FVs.^{14,15} After adjusting for covariates, including frequency of market usage per month, non-Hispanic Black participants in the current

*Non-Hispanic Black
participants in the
current study had lower
odds of consuming fruit
daily compared with
non-Hispanic White
participants.*

using farmers' markets to purchase fresh produce.³⁰ Furthermore, Singleton and colleagues found that lack of awareness and lack of interest were key reasons why low-income African American and Latino women in Alabama did not use farm-to-consumer retail outlets (eg, farmers' markets, farm stands, community supported agriculture programs).⁶ Sociological studies by Alkon and colleagues highlight the role of race and social-

study had lower odds of consuming fruit daily compared with non-Hispanic White participants. Other participants had lower odds of consuming vegetables daily. Additional research is needed to understand why these differences in consumption frequency exist among Link Match users and provide greater context to the implications of these differences.

Study Limitations

The limitations of this research should be noted. The small sample size may have affected the ability to identify significant differences among the racial/ethnic groups. Furthermore, a larger sample size would have allowed us to make detailed comparisons of race/ethnicity by level of FV consumption frequency. The volunteer sample of SNAP participants and the low number of Hispanic and non-Hispanic Asian Link Match users who participated in the survey were key limitations. Because data were only collected from SNAP participants in Illinois who volunteered to complete the survey, findings may not be representative of all SNAP participants who utilize the Link Match program or farmers' market incentive programs outside of Illinois. Those who did not volunteer may be different with respect to their demographics, farmers' market shopping behaviors and attitudes, and FV consumption. If the sample sizes for Hispanic and non-Hispanic Asian Link Match users were larger, a more robust analysis could have been conducted considering the socio-cultural differences that exist among non-Hispanic Whites, non-Hispanic Blacks, Hispanics, and non-Hispanic

Asians. Although the survey featured several measures from validated surveys, the full survey was not piloted prior to this research study. The measures for FV consumption solely reflect the frequency of consumption in the prior 30 days. They do not provide insight to serving size, so we were unable to evaluate how participants' consumption aligns with dietary recommendations. Data on the age of each participating farmers' market, the demographics of its customer base, the demographics of the surrounding community, and the built environment of the surrounding community (eg, walkability, public transportation) were not collected. This data would have provided greater context to the findings on farmers' market shopping behaviors and barriers to using Link Match. Moreover, all data were self-reported by survey participants; self-reported data are often subject to misreporting and recall errors.

CONCLUSIONS AND IMPLICATIONS

In summary, racial/ethnic differences in the farmers' market shopping behaviors and frequency of FV consumption were observed among Link Match users in Illinois. These findings may be informative to researchers and community organizations that are developing new educational or outreach programs that intend to increase utilization of farmers' market incentive programs among low-income minority populations. Overall, additional research is needed to provide more context

to the health and nutritional implications of race/ethnicity in farmers' market and farmer's market incentive program usage among diverse low-income populations. Information on both the perceptions of farmers' markets and the impact of incentive program participation on food purchases and dietary intake across seasons would add much depth to the field's understanding of the benefits of farmers' market incentive programs. Currently, very little is known on how introducing a farmers' market incentive program to a low-income community differs given the community's racial/ethnic composition. Differential effects may be observed with respect to the food shopping behaviors and dietary intake. Therefore, future studies could consider evaluating the differential impact of using farmers' market incentive programs on the food shopping behaviors and dietary intake of several racial/ethnic groups over time to fill this key void in knowledge.

CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Singleton, Chatman, Spreen; Acquisition of data: Singleton, Kessee; Chatman; Spreen; Data analysis and interpretation: Singleton, Kessee; Chatman; Spreen; Manuscript draft: Singleton; Statistical expertise: Singleton; Acquisition of funding: Chatman, Spreen; Administrative: Singleton, Kessee; Chatman; Spreen; Supervision: Singleton, Chatman, Spreen

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