American Journal of
Preventive Medicine

RESEARCH ARTICLE

Farmers' Market Incentives for Low-Income Families: Who Uses, How Much, and Why

Howard P. Greenwald, PhD,[1] Ernie Tao, BS,[2] Gabrielle Tilley, MPP[3]

Introduction: Focusing on participation and utilization, this research helps to assess the potential impact and contributions of farmers' market incentive programs, often seen as means for improving nutrition and preventing disease among low-income families.

Methods: Evaluating the largest farmers' market incentive program in the U.S. (California *Market Match)*, this study used (1) 3 administrative databases (n=1,469, 6,799, and 30,506), (2) a participant survey (n=2,723), and (3) longitudinal interviews (n=163) with active and former participants. Quantitative data were analyzed with contingency tables and multiple regression. Qualitative data were coded into analytically significant themes. Data were collected in 2015−2018 and analyzed in 2018−2021.

Results: Participation was typically low and varied across localities (3.7%−19.8% of eligible families in a sample of ZIP codes). According to administrative records, market visits by participants in 2 California regions averaged 2.18 and 3.12 per season. However, 77.1% of participants in the shopper survey indicated that they were repeat customers, and 51.0% indicated that they were regular utilizers. Deterrents to utilization included perceptions of inconvenience and high prices but not availability of produce in the community or travel time to markets. Utilization was most frequent among Asian shoppers and residents of Southern California outside Los Angeles County.

Conclusions: Farmers' market incentive programs such as *Market Match* appear likely to benefit population health through a core of committed shoppers. Improvement in participation and utilization may be attained through a better understanding of the communities that the markets are intended to serve.

Am J Prev Med 2022;62(6):864−871.

INTRODUCTION

For decades, public policy in the U.S., Europe, and elsewhere has supported programs to promote healthful diets among low-income families.[1,2] Policymakers in the U.S. have sought to encourage greater consumption of fruits and vegetables through, among other means, incentives to shop at farmers' markets. On the basis of the largest farmers' market incentive program in the U.S., the research reported in this paper adds to the understanding of the actual and potential impact of farmers' markets through the assessment of participation and utilization in a diverse population and across localities and regions.

Numerous studies have illustrated the importance of nutrition in preventing disease and have shown disparities across income, ethnicity, and region.[3−5] Much research confirms the relationship between low income and poor diet and consequent incidence of obesity and specific nutrition-related diseases.[6−8] Nutrition-related diseases such as diabetes[9] and obesity[10] have been found to increase severity and mortality among patients with coronavirus disease 2019 (COVID-19).

From the [1]Sol Price School of Public Policy, University of Southern California, Los Angeles, California; [2]Geisel School of Medicine, Dartmouth College, Hanover, New Hampshire; and [3]The Los Angeles Trust for Children's Health, Los Angeles, California

Address correspondence to: Howard P. Greenwald, PhD, Sol Price School of Public Policy, University of Southern California, 650 Childs Way, Los Angeles, CA 90089. E-mail: greenwa@usc.edu.

0749-3797/$36.00
https://doi.org/10.1016/j.amepre.2021.11.023

Researchers have attributed these disparities not only to unaffordability but also to the unavailability of fruits and vegetables in low-income neighborhoods. Relationships between residence in food deserts and health risks have been reported widely,[11–15] particularly in areas of extreme poverty and rural communities.[16,17] In addition to farmers' markets, programs addressing these needs have included mobile outlets selling fruits and vegetables, community-supported agriculture, and incentives at grocery stores and supermarkets.[18–22] Researchers have reported increased consumption of fruits and vegetables among participants in these programs.[23–26]

However, research thus far has not provided a complete understanding of farmers' market utilization and how this may affect the contribution of farmers' markets to improved nutrition. Many studies have been small in scale,[20] have been carried out over brief periods,[24] or have been conducted at single markets or markets in close geographic proximity.[27,28] A number report low levels of utilization,[29–31] suggesting a special need for better understanding and means for attracting and retaining participants. The research reported in this paper helps to extend the current understanding by comparing program participation across racial groups not fully represented in earlier studies and among diverse localities and regions. The study adds to the understanding of barriers to utilization through intensive interviews of current and former shoppers.

METHODS

Study Sample

Data for this study were obtained in an evaluation of *Market Match*, a statewide farmers' market incentive program in California. Funding was provided by California tobacco tax revenues, which supported incentives to beneficiaries of the federal Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the U.S. Department of Agriculture's Food Insecurity Nutrition Incentive program for beneficiaries of the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps. Matching up to $10 in their SNAP funds or WIC coupons, participants received tokens or coupons exchangeable for fruits and vegetables at farmers' markets. Between 2015 and 2017, there were 276,688 visits to farmers' markets by *Market Match* participants. In 2017, a total of 293 farmers' markets offered *Market Match*, locally administered by 51 independent contractors.

The research team obtained data from (1) files compiled by *Market Match* contractors for administrative purposes on shopper activity and expenditures; (2) a survey of *Market Match* shoppers at 112 farmers' markets; and (3) intensive telephone interviews with current and former shoppers, including up to 4 follow-up contacts.

A total of 3 administrative databases comprising records of visits to farmers' markets were available to the evaluation team. These included the "Certification File" for Los Angeles County, the "Year-End Financial Report," also for Los Angeles County, and the "Market Visit Data File" for selected areas of California's Central Valley.

The Certification File for Los Angeles County contained 6,799 records of individuals certified to participate in the *Market Match* program for the 2017–2018 market season. Records for each participant contained their residential ZIP code, enabling the research team to link the file with Census data.

The Year-End Financial Report included a total of 30,506 *Market Match* transactions at all markets operating in Los Angeles County from July 2016 through June 2017. This file enabled the research team to compute the total number of individual shoppers and transactions, making possible the determination of the average number of market visits per shopper.

The Market Visit Data File comprised records of farmers' market visits made by each shopper in 2 large market areas in California's Central Valley between May and October 2015 (n=1,469). These records included the dates of each visit and whether each visit was a shopper's first versus a return visit.

Individuals in all these databases had unique identifiers (such as numbers assigned by program staff), enabling the research team to determine repeat shopping by individuals over specified time periods.

MEASURES

Between 2015 and 2017, shoppers were given written questionnaires as they arrived at tables in the farmers' markets where they received their coupons or tokens. Employing Sudman's procedures for controlling bias in intercept surveys,[32] the research team accrued 2,723 completed questionnaires. Requiring about 5 minutes for completion, the survey instrument covered demographics (race/ethnicity, age, sex); number of children aged <18 years living at home; perceptions of price and quality of produce at the market; whether the subject was a first-time shopper at the market and, if not, how many times she had visited the market in the past 30 days; and the importance the shopper placed on *Market Match* as a reason why she had come to the market that day. The survey was conducted in English, Spanish, Chinese, Vietnamese, and Arabic.

A cohort of 92 farmers' market shoppers was recruited for repeated, intensive interviews. These consisted of open-ended items and were conducted in English and Spanish. Potential interview subjects were recruited from among shopper survey respondents. A total of 163 intensive interviews were conducted.

Table 1 specifies the key questions on which the research reported in this paper focuses and the corresponding data sources used to address these questions.

Statistical Analysis

Shopper survey data were analyzed with an estimation of ordinary least squares models predicting the number of times respondents reported having used their WIC, SNAP, or other benefits at a farmers' market in the last

30 days. Logistic regression was used to predict regular shopping at the markets, dichotomously defined as having used benefits at these markets ≥3 times in the last 30 days. Data from the administrative records were analyzed by computing the mean numbers of visits within specified geographic areas and timeframes.

Qualitative data from the intensive interviews were analyzed by axial coding,[33] aggregating responses to open-ended questions into categories reflecting common underlying ideas and concepts (referenced as themes). Two members of the research team inspected written transcripts of the interviews; themes identified by each were compared for consistency and completeness.

University of Southern California IRB review determined that the study was exempt from the approval process.

RESULTS

Participation and utilization are outcome variables in the presented analysis. A *person* was defined as a participant if they had signed up at a farmers' market and shopped under *Market Match* at least 1 time. The terms *participant* and *shopper* are used interchangeably. Utilization denotes the number of times a participant attended a market during periods defined in the administrative data sets or, in the case of the shopper survey, the past 30 days.

Community-level rates of participation in *Market Match* were obtained within 14 selected ZIP codes in Los Angeles County. These ZIP codes were selected because the farmers' markets with the largest numbers of visits by *Market Match* shoppers were located within or adjacent to them. Participation rates were computed by dividing the number of families in *Market Match* in 2016–2017 (n=3,803 according to the Certification File) by the number enrolled in SNAP during that period (40,736 according to the U.S. Census American Community Survey). All families enrolled in SNAP were eligible for *Market Match*; many of those eligible for SNAP were also eligible for WIC. Across all ZIP codes (Table 2), the overall percentage of SNAP families participating in *Market Match* was 9.34; participation rates by ZIP code ranged from 3.73 to 19.78.

Table 1. Correspondence of Research Questions, Data Sources, and Data Elements

Research questions	Data source and data elements
Administrative records (data elements)	
Within the eligible population, what is the frequency of participation in *Market Match*?	Certification File: total program participants (linked via ZIP code with U.S. Census).
Among participants, what is the average number of visits to farmers' markets?	Year-End Financial Report: total program participants and total farmers' market transactions.
What percentage of participants make additional visits to farmers' markets after their first visit?	Market Visit Data File: total first-time and follow-up visits by individual participant.
Shopper survey (interview items)	
How do family needs affect *Market Match* utilization?	How important is *Market Match* in your decision to spend your . . . benefits at this farmers' market, instead of a store or another farmers' market? Response options: very - wouldn't have come otherwise; somewhat; not very; not at all.
	How many children under 18 live in your household?
How do perceptions regarding price and availability of fresh fruits and vegetables affect utilization?	Outside of this farmers' market, how easy or hard is it to buy quality fresh fruits and vegetables in your neighborhood? Response options: very easy, easy, difficult, very difficult.
	Compared with other places where you shop, are the prices of fruits and vegetables (in the farmers' market) . . . Response options: lower, about the same, higher.
Outcome measure: how often do shoppers attend farmers' markets (as conditioned by family need, perceptions of prices and availability, demographic features, and region of residence)?	Other than today, about how many times have you visited this farmers' market in the 30 days? Response options: none; once; twice; 3 or more.
Intensive follow-up (telephone) interviews	
What are the reasons for reduced shopping or leaving the program?	Sometimes people want to go to a local farmers' market — with or without *Market Match*–but can't go as often as they'd like. Have you ever wanted to go to (the market) but not been able to for any reason? When you weren't able to go to the market what were the reasons? Sometimes, people try *Market Match* at a local farmers' market and later stop going. Have you stopped going to the market for *Market Match*?

According to the 2015–2016 Year End Financial Report for Los Angeles County, 9,771 unique shoppers made 30,506 transactions at 39 markets in the period July 1–June 30. Accordingly, the average number of visits per shopper was 3.12. A *transaction* is defined as the exchange of SNAP or WIC benefits at the beginning of a shopper's market visit rather than purchases from an individual vendor.

In the Market Visit Data File, for May 2015 through October 2015, complete data were available for 1,469 individual Central Valley shoppers. Among these, 664 (45.2%) utilized *Market Match* for the first time. In this market season, the average number of visits per participant was 2.18; among first-time shoppers, 62.2% did not return after their first visit.

Participant characteristics, perceptions, and utilization are presented in Table 3. The vast majority of shopper survey respondents indicated that *Market Match* was a very important factor in using their SNAP or WIC benefits at the market and that they would not have come otherwise. Slightly more than half said that fresh fruits and vegetables were difficult or very difficult to find in their communities. A majority of shoppers thought that prices at the markets were either about the same or higher than those at other places where they shopped. A total of 77.1% of respondents to the shopper survey were repeat shoppers, reporting attendance at the market at least 1 other time in the past 30 days; 51.0% were considered regular utilizers, reporting attendance ≥3 times during that period.

Table 4 presents coefficients from an ordinary least squares equation predicting the number of times repeat shoppers indicated that they had used their benefits at the farmers' market in the past 30 days. Statistically significant predictors include considering *Market Match* a very important reason for attending and the number of children aged <18 years in the household. Perception that prices were higher than in the community was a strong, negative predictor of the times shoppers reported to have used the market. Perceived availability of fresh fruits and vegetables in the community was not a significant predictor, nor was travel time to the market.

Several demographic and geographic factors were represented as a series of dichotomous variables; coefficients on these variables reflect the differences from reference categories omitted from the equation. Only Asian shoppers differed from the reference category (multiple/other races), attending more frequently. Older shoppers (aged

Table 2. SNAP and *Market Match* Participants by ZIP Code

ZIP codes	Number of *Market Match* participants	SNAP enrollments	Percent SNAP participants in *Market Match*
90280	147	3,932	3.73
90034	162	819	19.78
90016	171	2,440	7.00
90022	176	2,405	7.31
90037	186	4,493	4.13
90255	188	3,547	5.31
91678	192	1,375	13.96
90002	209	3,337	6.26
90019	214	2,562	8.35
90006	240	2,653	9.04
91767	249	1,720	14.47
91766	332	3,072	10.80
90011	1,203	6,627	18.15
90007	134	1,754	7.63
Total	3,803	40,736	9.34

SNAP, Supplemental Nutrition Assistance Program.

Table 3. Respondent Characteristics: Farmers' Market `Survey (Percentages)

Survey questions	%
Market Match important: would not have come to the farmers' market otherwise	75.6
Difficult/very difficult to buy quality fresh fruits and vegetables outside farmers' market	54.4
Compared with those of other places, prices of fruits and vegetables at the farmers' market are	
Lower	28.5
About the same	41.9
Higher	29.7
Times visited the market in the last 30 days	
None	22.9
Once	9.6
Twice	16.5
Three or more	51.0
Because of *Market Match*, amount of fruits and vegetables bought each week has[a]	
Increased	71.4
Remained the same	26.9
Decreased	1.7
Sex (female)	79.8
Race	
Caucasian	31.3
African American	7.0
Latinx	35.9
Asian	13.1
Other/multi-racial	10.5
Age, years	
≤29	22.8
30–49	47.4
50–69	22.3
≥70	3.4
n	2,658

Note: Cases with missing data were omitted from the table.
[a]Repeat shoppers only (*n*=2,127).

Table 4. Regression Coefficients (OLS) Predicting Times Visited Market in the Last 30 Days

Variables	Coefficient	SE	*p*-value
How important *Market Match* is in visiting market	**0.106**	**0.038**	**0.01**
How difficult to buy quality fresh fruits and vegetables outside farmers' market	0.041	0.023	n.s.
Prices of fruits and vegetables at the farmers' market are higher than those of other places	**−0.093**	**0.027**	**0.01**
Number of children aged <18 years at home	**0.054**	**0.016**	**0.01**
Sex (female)	−0.071	0.052	n.s.
Race[a]			
Caucasian	0.038	0.068	n.s.
African American	−0.145	0.102	n.s.
Latinx	−0.038	0.077	n.s.
Asian	**0.162**	**0.081**	**0.05**
Age, years[b]			
30–49	−0.018	0.050	n.s.
50–69	**0.170**	**0.058**	**0.01**
≥70	**0.344**	**0.115**	**0.01**
California region[c]			
Bay area	−0.008	0.066	n.s.
Central valley	**−0.167**	**0.077**	**0.05**
Northern	−0.012	0.089	n.s.
South coast	−0.077	0.120	n.s.
Southern (other than Los Angeles County)	**0.349**	**0.104**	**0.01**
Number of market meetings	0.004	0.005	n.s.

Note: Boldface indicates statistical significance ($p<0.05$).
R square=0.048.
n.s., not significant; OLS, ordinary least squares.
[a]Ref: multi/other races, omitted from the equation.
[b]Ref: age ≤29 years, omitted from the equation.
[c]Ref: Los Angeles County, omitted from the equation.

50–69 and ≥70 years) reported more visits than the reference category (age ≤29 years). Relative to the residents of the geographic reference category, Los Angeles County, residents of California's Central Valley made fewer visits, whereas residents in Southern California areas other than those in Los Angeles made more visits.

Coefficients from a binary logistic equation predicting regular utilization (coded 1 if the shopper was found to have attended ≥3 times in the last 30 days, 0 otherwise) were similar to those in Table 4. Demographic and geographic background variables were the same in both the ordinary least squares and logistic equations. There was no evidence of multicollinearity among the predictor variables (intercorrelations were generally <0.3).

The intensive telephone interviews help to illustrate the quantitative findings. The themes expressed suggest a combination of extended purchasing power and valuation of healthful food as principal motivations for participation in the program. Interview subjects also expressed themes reflecting increased food security through the program: "Because of *Market Match* I am able to buy other things at the grocery store with my EBT (Electronic Benefits Transfer), because it extends my money." "I would have way more hungry days if it wasn't for *Market Match*."

"*Market Match* is extra money in my pocket—an incentive to buy more fresh, healthy foods."

The theme specifically indicating a combination of increased purchasing power and access to fresh fruits and vegetables was observed in 24.2% of the interviews. For some, this access facilitated a long-term commitment to healthy eating. As one shopper commented, "I've always eaten healthy but I am buying more now since I have more to spend."

Interviewers asked shoppers whether they utilized the markets less often than they preferred, and 70.6% said that they did. Inconvenience was cited by 57.1% of these respondents. Often, child-related engagements were reported to conflict with market days and hours. Under the convenience theme, interview respondents also mentioned the inability to purchase out-of-season items, which are available at conventional outlets.

The theme of insufficient funds (after expenditures outside the farmers' markets) as a barrier to utilization was expressed in 24.1% of interviews because *Market Match* shoppers exhausted WIC, SNAP, or other benefits late in the month. One participant said, "(My going to the market depends on whether) I am rationing food stamps. I need to make sure I have at least $10 left on EBT." More generally, another commented, "(The farmers' market) is too expensive. I get less food (than at the grocery store) for the same amount of money."

A minority (20.7%) of intensive interview respondents said that they had left the program entirely. Among these, nearly half (47.3%) said that they no longer qualified because of improved financial circumstances. Among those still eligible, the most common reasons for discontinuation were inconvenience of market days and times (42.1%) and high prices (26.3%).

DISCUSSION

Findings reported in this study confirm the limited participation and utilization reported in earlier studies as well as federal data.[29–31,34] Within a population confined to California but still more racially and geographically diverse than that of earlier studies, the investigation reported in this study found that Asian shoppers utilized the farmers' markets more frequently than Caucasian, Latinx, and African American shoppers. As in earlier

studies, the research reported in this paper found that participation differed strongly across local markets and that utilization differed significantly among geographically noncontiguous regions. The rates of participation and utilization were not explained by differences in the annual number of farmers' market meetings across localities.

Supplementing earlier studies, this research found evidence of a stable core of committed shoppers. Among shoppers encountered by survey personnel at the markets on any given day, most (77.1%) were repeat shoppers, having visited the market at least 1 other time over the past 30 days; a majority of the shoppers (51.0%) encountered by the survey team had visited the market on ≥3 occasions over this time period. Analysis of data from California's Central Valley in the Market Visit Data File found that a small percentage (4.2%) of all shoppers visited farmers' markets between 6 and 18 times in the 2015 season. Informal confirmation is provided by local program managers, who comment that most shoppers on any given day are regulars.

Low percentages of participation among eligible families and infrequency of visits to markets by many participants should not be taken as evidence of ineffectiveness. Dimitri et al.[35] have characterized farmers' market incentive programs as a "way to reach those already interested in healthy foods." Assuming that regular shoppers are those most interested in healthful food, this study adds to the evidence that *Market Match* enables a key group of this kind to maintain a diet rich in fruits and vegetables.

Perception of relatively high prices at farmers' markets by some shoppers is intuitively understandable as a barrier to utilization. Regression analyses in this study show perceived high prices as a strong, negative predictor of regular farmers' market shopping. No systematic effort was made in this study to compare prices at farmers' markets across ZIP codes and regions, but further research should use such a comparison as a possible explanation of geographic differences in utilization.

Also not covered in this study were potential differences in produces offered at markets. Compatibility of offerings with neighborhood food cultures and tastes should be considered by program operators. Of importance to all shoppers should be quality, freshness, and variety of items for sale. Evidence that markets in disadvantaged neighborhoods offer less variety than elsewhere has been reported.[36]

A surprising finding in this study was the relative unimportance of the availability of quality fresh fruits and vegetables for sale in the community. Perception of low availability in the community affected neither the number of visits made by participants nor whether individuals made ≥3 visits in the previous 30 days. These observations suggest limited applicability of the food desert concept in explaining participation or utilization of programs such as *Market Match*.

Limitations

Several limitations of this study must be acknowledged. Although widely used in market research, subject-encounter sampling is less reliable than other sampling methods. Shopper survey data were collected at only the largest markets participating in *Market Match* during the study. The volume of *Market Match* shopping at smaller venues was typically too low for adequate numbers to be accrued in the time available to survey personnel. In the qualitative data analysis, no subcategories for themes were developed nor was a formal codebook compiled; thus, the qualitative findings should be considered exploratory. Despite these concerns, the findings reported in this paper are consistent across the diverse methods used.

CONCLUSIONS

The research reported in this paper suggests that farmers' market incentive programs benefit population health most through the opportunities they offer to specific communities and committed shoppers. Although committed shoppers represent a small percentage of those who participate in farmers' market programs, this percentage might be increased. Race, age group, and location help to determine utilization, suggesting that program planners and operators take these factors into consideration in configuring outreach. Research on the compatibility of market features with community needs would have great value. Such research, for example, could determine which market days and times would be most convenient for potential shoppers, a dimension likely to vary among predominant age groups.

Finally, this study suggests the desirability of multiple means for incentivizing food security program beneficiaries to adopt healthful diets, including, for instance, programs based in supermarkets.[37] Although even in an environment with many alternatives, committed farmers' market shoppers may seek benefits specific to these outlets. For these shoppers, the social atmosphere and visual appeal of offerings may have special value. The scheduling of farmers' markets at specific days and times may act as a nudge[38] for the purchase of healthful foods.

CREDIT AUTHOR STATEMENT

Howard P. Greenwald: Conceptualization, Data curation, Funding acquisition, Formal analysis, Project administration, Writing-

original draft. Ernie Tao: Data curation, Formal analysis. Gabrielle Tilley: Data curation, Formal analysis, Supervision.

ACKNOWLEDGMENTS

This research took place under contracts from the Ecology Center (Berkeley, CA) with the University of Southern California and Evergreen Partners, S.A. (Seattle, WA).

No financial disclosures were reported by the authors of this paper.

REFERENCES

1. Black AP, Brimblecombe J, Eyles H, Morris P, Vally H, O Dea K. Food subsidy programs and the health and nutritional status of disadvantaged families in high income countries: a systematic review. *BMC Public Health.* 2012;12(1):1099. https://doi.org/10.1186/1471-2458-12-1099.
2. Thomson K, Hillier-Brown F, Todd A, McNamara C, Huijts T, Bambra C. The effects of public health policies on health inequalities in high-income countries: an umbrella review. *BMC Public Health.* 2018;18(1):869. https://doi.org/10.1186/s12889-018-5677-1.
3. Katikireddi SV, Skivington K, Leyland AH, Hunt K, Mercer SW. The contribution of risk factors to socioeconomic inequalities in multimorbidity across the lifecourse: a longitudinal analysis of the Twenty-07 cohort. *BMC Med.* 2017;15(1):152. https://doi.org/10.1186/s12916-017-0913-6.
4. National Center for Chronic Disease Prevention and Health Promotion. Division of Nutrition, Physical Activity, and Centers for Disease Control and Prevention. State indicator report on fruits and vegetables 2013. Atlanta, GA: Centers for Disease Control and Prevention; 2013. http://www.cdc.gov/nutrition/downloads/State-Indicator-Report-Fruits-Vegetables-2013.pdf. Accessed December 6, 2021.
5. Usual dietary intakes: food intakes, U.S. population, 2007–10. Epidemiology and Genomic Research Program. National Cancer Institute; 2020. https://epi.grants.cancer.gov/diet/usualintakes/national-data-usual-dietary-intakes-2007-to-2010.pdf. Updated October 31, 2019. Accessed April 12, 2020.
6. Darmon N, Drewnowski A. Does social class predict diet quality? *Am J Clin Nutr.* 2008;87(5):1107–1117. https://doi.org/10.1093/ajcn/87.5.1107.
7. Wang Y, Beydoun MA. The obesity epidemic in the United States — gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiol Rev.* 2007;29(1):6–28. https://doi.org/10.1093/epirev/mxm007.
8. Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic disparities in health in the United States: what the patterns tell us. *Am J Public Health.* 2010;100(suppl 1):S186–S196. https://doi.org/10.2105/AJPH.2009.166082.
9. Kumar A, Arora A, Sharma P, et al. Is diabetes mellitus associated with mortality and severity of Covid-19? A meta-analysis. *Diabetes Metab Syndr.* 2020;14(4):535–545. https://doi.org/10.1016/j.dsx.2020.04.044.
10. Poly TN, Islam MM, Yang HC, et al. Obesity and mortality among patients diagnosed with COVID-19: a systematic review and meta-analysis. *Front Med (Lausanne).* 2021;8:620044. https://doi.org/10.3389/fmed.2021.620044.
11. USDA Economic Research Service. Food Access Research Atlas. https://www.ers.usda.gov/data-products/food-access-research-atlas/about-the-atlas. Accessed February 11, 2022.
12. Chen D, Jaenicke EC, Volpe RJ. Food environments and obesity: household diet expenditure versus food deserts. *Am J Public Health.* 2016;106(5):881–888. https://doi.org/10.2105/AJPH.2016.303048.
13. Morland KB, Evenson KR. Obesity prevalence and the local food environment. *Health Place.* 2009;15(2):491–495. https://doi.org/10.1016/j.healthplace.2008.09.004.
14. Moore LV, Diez Roux AV, Nettleton JA, Jacobs DR Jr. Association of the local food environment with diet quality—a comparison of assessments based on surveys and geographic information systems: the multi-ethnic study of atherosclerosis. *Am J Epidemiol.* 2008;167(8):917–924. https://doi.org/10.1093/aje/kwm394.
15. Alcott H, Diamond R, Dube JP, Handbury J, Rahkovsky SM. Food deserts and the causes of nutritional inequality. *Q J Econ.* 2019;134(4):1793–1844. https://doi.org/10.1093/qje/qjz015.
16. Barker L, Crespo R, Gerzoff RB, Denham S, Shrewsberry M, Cornelius-Averhart D. Residence in a distressed county in Appalachia as a risk factor for diabetes, Behavioral Risk Factor Surveillance System, 2006-2007. *Prev Chronic Dis.* 2010;7(5):A104. PMID: 20712931. PMCID: PMC2938398.
17. Dean WR, Sharkey JR. Rural and urban differences in the associations between characteristics of the community food environment and fruit and vegetable intake. *J Nutr Educ Behav.* 2011;43(6):426–433. https://doi.org/10.1016/j.jneb.2010.07.001.
18. Leggat M, Kerker B, Nonas C, Marcus E. Pushing produce: the New York City Green Carts initiative. *J Urban Health.* 2012;89(6):937–938. https://doi.org/10.1007/s11524-012-9688-4.
19. Wetherill MS, Gray KA. Farmers' markets and the local food environment: identifying perceived accessibility barriers for SNAP consumers receiving temporary assistance for needy families (TANF) in an urban Oklahoma community. *J Nutr Educ Behav.* 2015;47(2):127–133.e1. https://doi.org/10.1016/j.jneb.2014.12.008.
20. Leone LA, Haynes-Maslow L, Ammerman AS. Veggie Van Pilot study: impact of a mobile produce market for underserved communities on fruit and vegetable access and intake. *J Hunger Environ Nutr.* 2017;12(1):89–100. https://doi.org/10.1080/19320248.2016.1175399.
21. Seguin RA, Morgan EH, Hanson KL, et al. Farm Fresh Foods for Healthy Kids (F3HK): an innovative community supported agriculture intervention to prevent childhood obesity in low-income families and strengthen local agricultural economies. *BMC Public Health.* 2017;17(1):306. https://doi.org/10.1186/s12889-017-4202-2.
22. Moran AJ, Gu Y, Clynes S, Goheer A, Roberto CA, Palmer A. Associations between governmental policies to improve the nutritional quality of supermarket purchases and individual, retailer, and community health outcomes: an integrative review. *Int J Environ Res Public Health.* 2020;17(20):7493. https://doi.org/10.3390/ijerph17207493.
23. Bowling AB, Moretti M, Ringelheim K, Tran A, Davison K. Healthy Foods, Healthy Families: combining incentives and exposure interventions at urban farmers' markets to improve nutrition among recipients of U.S. federal food assistance. *Health Promot Perspect.* 2016;6(1):10–16. https://doi.org/10.15171/hpp.2016.02.
24. Jilcott Pitts SB, Wu Q, Demarest CL, et al. Farmers' market shopping and dietary behaviours among Supplemental Nutrition Assistance Program participants. *Public Health Nutr.* 2015;18(13):2407–2414. https://doi.org/10.1017/S1368980015001111.
25. Olsho LE, Payne GH, Walker DK, Baronberg S, Jernigan J, Abrami A. Impacts of a farmers' market incentive programme on fruit and vegetable access, purchase and consumption. *Public Health Nutr.* 2015;18(15):2712–2721. https://doi.org/10.1017/S1368980015001056.
26. Savoie-Roskos M, Durward C, Jeweks M, LeBlanc H. Reducing food insecurity and improving fruit and vegetable intake among farmers' market incentive program participants. *J Nutr Educ Behav.* 2016;48(1):70–76.e1. https://doi.org/10.1016/j.jneb.2015.10.003.
27. Freedman DA, Flocke S, Shon EJ, et al. Farmers' market use patterns among Supplemental Nutrition Assistance Program recipients with high access to farmers' markets. *J Nutr Educ Behav.* 2017;49(5):397–404.e1. https://doi.org/10.1016/j.jneb.2017.01.007.
28. Pellegrino S, Bost A, McGonigle M, et al. Fruit and vegetable intake among participants in a District of Columbia farmers' market

incentive programme. *Public Health Nutr.* 2018;21(3):601–606. https://doi.org/10.1017/S1368980017003020.
29. Vericker T, Dixit-Joshi S, Taylor J, et al. The evaluation of food insecurity nutrition incentives (FINI) interim report. Washington, DC: U. S. Department of Agriculture, Food and Nutrition Service. https://www.fns.usda.gov/snap/evaluation-food-insecurity-nutrition-incentives-interim-report. Published May 2019. Accessed July 12, 2021.
30. Cohen AJ, Lachance LL, Richardson CR, et al. "Doubling up" on produce at Detroit farmers markets: patterns and correlates of use of a healthy food initiative. *Am J Prev Med.* 2018;54(2):181–189. https://doi.org/10.1016/j.amepre.2017.10.005.
31. Ratigan AR, Lindsay S, Lemus H, et al. Factors associated with continued participation in a matched monetary incentive programme at local farmers' markets in low-income neighbourhoods in San Diego, California. *Public Health Nutr.* 2017;20(15):2786–2795. https://doi.org/10.1017/S1368980017001549.
32. Sudman S. Improving the quality of shopping center sampling. *J Mark Res.* 1980;17(14):423–431. https://doi.org/10.1177/002224378001700402.
33. Strauss A, Corbin J. *Basics of qualitative research*. Los Angeles, CA: Sage, 1998.
34. U.S. Department of Agriculture. Food and Nutrition Service. USDA fiscal year 2019 year end summary. Washington, DC: U.S. Department of Agriculture, Food and Nutrition Service; 2019. https://fns-prod.azureedge.net/sites/default/files/resource-files/2019-SNAP-Retailer-Management-Year-End-Summary.pdf. Accessed May 4, 2020.
35. Dimitri C, Oberholtzer L, Zive M, Sandolo C. Enhancing food security of low-income consumers: an investigation of financial incentives for use at farmers markets. *Food Policy.* 2015;52:64–70. https://doi.org/10.1016/j.foodpol.2014.06.002.
36. Lowery B, Sloane D, Payán D, Illum J, Lewis L. Do farmers' markets increase access to healthy foods for all communities? Comparing markets in 24 neighborhoods in Los Angeles. *J Am Plann Assoc.* 2016;82(3):252–266. https://doi.org/10.1080/01944363.2016.1181000.
37. Rummo PE, Noriega D, Parret A, Harding M, Hesterman O, Elbel BE. Evaluating a USDA program that gives SNAP participants financial incentives to buy fresh produce in supermarkets. *Health Aff (Millwood).* 2019;38(11):1816–1823. https://doi.org/10.1377/hlthaff.2019.00431.
38. Thaler RH, Sunstein CR. *Nudge: Decisions About Health, Wealth, and Happiness*. London, United Kingdom: Prager, 2009.