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Fruit and Vegetable Consumption, Household Food Insecurity, and SNAP Participation Among Attendees of Free Produce Events at Safety-Net Health Center Sites

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Abstract: Background/Objectives: Safety-net health centers are increasingly screening for food insecurity and providing patients with referrals to public assistance programs—e.g., Supplemental Nutrition Assistance Program (SNAP). However, not all individuals actively participate or are eligible for these programs. Onsite distributions of free produce at health center sites represent a promising alternative/complementary option for addressing this need. This study examines free produce events at these sites and their associations with attendees' food and vegetable consumption, household food insecurity, and SNAP participation (study outcomes). **Methods**: In 2024, an intercept survey was conducted with 497 adults attending produce events at 16 safety-net health center sites in Los Angeles County, California, USA. Descriptive analyses profiled these food events, gathering information on attendee characteristics. Multivariable regressions examined associations between event attendance and study outcomes. **Results**: Over 80% of attendees lived in food insecure households. Among those who were patients of the event site, 68% and 28%, respectively, indicated they received information about Medicaid and SNAP from the clinic staff. Compared to first-time attendees, those who attended produce events frequently consumed, on average, one additional serving of fruit and vegetable at day ($p < 0.000$). **Conclusions**: Offering free produce events at health center sites, where many attendees receive usual care, is a promising strategy for increasing healthy food access among safety-net populations. This underutilized approach is a viable intervention for addressing hunger and food insecurity, especially in circumstances where patients are not eligible for public assistance or nutrition incentive/produce pharmacy programs are not readily available.

Keywords: public assistance; free produce events; fruit and vegetable consumption; household food insecurity; SNAP participation

1. Introduction

Approximately 40% of households in the United States (U.S.) are food insecure, and about half of all adult Americans have one or more preventable chronic diseases—many of them are attributed to poor diet [1,2]. Recognizing their unique role in addressing social needs like food insecurity, safety-

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net health systems (e.g., low-income community clinics, Federally Qualified Health Centers) are increasingly screening for food insecurity and referring eligible patients to food resources—e.g., the Supplemental Nutrition Assistance Program (SNAP), local food pantries, and onsite food distribution events.

Although screening for food insecurity has been successfully integrated in many clinical environments, the same cannot be demonstrated for referring patients to relevant food resources after patient needs have been identified. Factors such as competing time demands on clinic staff, lack of knowledge about and access to appropriate wraparound services, and limited coordination of social services all impede optimal utilization of these strategies [3–5].

In some U.S. safety-net health systems, alternative interventions (options) such as food pharmacies and/or onsite food distribution events (on the campuses of health center sites) have gained popularity and greater acceptance as programs that can be facilitated by healthcare institutions. As "Food as Medicine" (FAM) interventions [6,7], these options frequently offer quicker and more convenient access to healthy foods as compared to traditional public assistance programs (including SNAP). Most patients, especially those with diet-related conditions such as prediabetes, type 2 diabetes, and/or hypertension, can access food immediately after visiting their healthcare provider, generally at the same location as the medical office, typically without need for additional travel [8,9]. An important aspect of these interventions is that they complement, rather than detract from, traditional public assistance; in most cases, they preserve the opportunity of eligible individuals' to still apply and obtain benefits from SNAP and other federally or state-funded programs.

Despite their promise, these alternative intervention options have faced numerous challenges in their implementation. For instance, to offer affordable, quality foods, reliable partnerships and coordination with community organizations (e.g., food pantries, food banks, others) are typically required, giving way to substantial amount of time, energy, and funding invested [10]. Sufficient real-world data to justify program continuation to clinic leadership is another major barrier. How these interventions affect target behaviors (e.g., fruit and vegetable consumption), address household food insecurity, and assure SNAP participation (i.e., actively enrolled and using the benefits) are generally not well-characterized in the literature [11,12]. This is especially so for food distribution events (i.e., facilitating free produce events at health center sites), a focus of this investigation.

This study addresses these gaps in nutrition and FAM practice, describing efforts of several health centers in Los Angeles County, California, USA, to integrate onsite produce events as an intervention strategy for helping patients manage their diet-related chronic conditions. In particular, the study examines whether frequency of attending free produce events at safety-net health center sites was associated with higher fruit and vegetable consumption, lower household food insecurity, and greater SNAP participation.

2. Materials and Methods

Setting and Context

In Los Angeles County, 41% of low-income households experienced food insecurity in the past year [13]. To help address this public health problem, the Los Angeles County Departments of Health Services (DHS) and Public Health (DPH) began screening patients for food insecurity within their ambulatory care network (i.e., safety-net health centers), hospital-based outpatient clinics, and community wellness centers—this effort started in 2019. Patients who screened positive for food insecurity were referred to relevant food resources (food pantries, food banks, SNAP, etc.) when needed. The goal of this screening and referral process was to assist DHS and DPH in identifying patients who may benefit from dietary strategies that can improve their chronic disease management. Not too soon after adoption of this clinic workflow, the County of Los Angeles Board of Supervisors issued a directive (Board motion) directing DHS and DPH to continue this effort and to look for future opportunities in which patient and community access to healthy food can be expanded [14]. In

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response to the motion, DHS and DPH formed the Los Angeles County Food Rx Collaborative (the "Collaborative"). This learning collaborative, launched in 2021, is designed to provide a regular forum for peer-to-peer learning and a protected space for developing and testing program strategies in the field. The Collaborative later invited and garnered the support of the University of California, Los Angeles (UCLA) DECIPHeR team, a group of experts that specializes in program implementation and evaluation. Among the salient questions that the DECIPHeR team helped answer for the Collaborative was whether or not free produce events at safety-net health center sites could lead to increased fruit and vegetable consumption, reduced household food insecurity, and/or active SNAP participation among the attendees. Between October 2020 and March 2025, 16 DHS and DPH health center sites facilitated a total of 944 onsite produce events, distributing >4 million pounds of produce to 831,903 people (217,791 households).

Data Collection

In 2024, a cross-sectional, intercept survey was administered to attendees of produce events facilitated by the 16 DHS and DPH sites. Attendees were approached by evaluation staff who were at the health centers on the day of the survey. As the events were open to the public, attendees included both community members and patients referred to these events by their healthcare providers. To satisfy eligibility, staff confirmed on paper that attendees were over the age of 18, resided in Los Angeles County, and had not completed the survey previously. Prior to starting the questionnaire, attendees were informed individually that the survey was voluntary and that participation would not affect their ability to receive free produce or other services at their usual care clinic site. The survey questionnaire was available in English and Spanish and was self-administered using pen and paper; evaluation staff were available onsite to assist attendees with the survey if they ran into difficulties. All attendees who completed the survey were given a $15 produce gift card as a token of appreciation and to help offset costs and time spent on completing the questionnaire.

Outcomes

This study focused on three outcomes (dependent variables) used in its multivariable regression analyses (models). First, fruit and vegetable consumption—this outcome was assessed by combining responses from two questions in the survey: (i) "On an average day, about how many servings of fruit do you eat? (1 serving is about the size of your fist)"; and (ii) "On an average day, about how many servings of vegetables do you eat?" Response categories included "None", "Less than 1", "1", "2", "3", or "4 or more." For analytic purposes, these responses were combined to generate a range of servings consumed, from 0 to 8. Second, household food insecurity was assessed using the six-item U.S. Food Security Module; psychometric properties and the utility of this tool are described elsewhere [15] (REF). Attendees who completed the survey were categorized as 'food secure' (scored 0 on the module) or 'food insecure' (scored 1-6 on the module). Finally, SNAP participation was defined as being 'enrolled and actively engaged' in this food stamps program, receiving benefits from it. In the survey, this outcome was asked as a 'yes' or 'no' question.

Independent Variables

The primary independent variable for this study was the frequency of attending free produce events at the 16 DHS and DPH health center sites. Attendees were asked "In the last 12 months, how many times have you (or anyone in your household) ever come to produce distributions at this location?" They were coded as "first time", "occasional (2-9 times)", or "frequent (≥10 times)" attendees.

To better understand the health center referral process, attendees who self-identified as a patient and had completed the survey were also asked about their participation in public assistance programs—i.e., whether or not they had received a referral to enroll in any of the listed programs: SNAP/CalFresh/Food Stamps, Medi-Cal, Special Supplemental Nutrition Program for Women,

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Infants, and Children (WIC), California Food Assistance Program, CalWorks (Temporary Assistance for Needy Families), Housing Assistance Programs (Section 8), Social Security Disability Income (SSI), and/or none of the above.

Covariates

Study covariates included gender (Female, Male), age (18-34, 35-64, >65), race/ethnicity (Hispanic or Latino/a/x, Black or African American, White, and Other or Multi-Race), household size (1-2 people, 3-4 people, 5-6 people, 7+ people), SNAP participation—enrolled and participating (yes, no), and whether attendees were patients of the health center site (yes, no). Event attendees were also asked if they or anyone in their household have been diagnosed with any of the following health conditions: heart disease, prediabetes, diabetes, hypertension (high blood pressure), or overweight/obese. Attendees who responded affirmatively, indicating they have at least one chronic health condition were coded as having a 'household chronic disease' whereas attendees indicating they had none were coded as not having a 'household chronic disease.' Because this variable was asked at the household level, it was not included in the multivariable regression analyses.

Analyses

A total of 497 event attendees completed the survey; this is approximately 30 surveys per site across the 16 DHS and DPH health center sites. Surveys with missing data for several covariates were excluded from the analyses (n ~ 70). Some covariates had missing data that were retained because they were key demographic variables—e.g., a missing category for age (n = 51) and one for race/ethnicity (n = 20). Descriptive analyses were performed to describe the study outcomes, independent variables (in particular, frequency of attending free produce events at safety-net health center sites), and covariates. Multivariable regression analyses (models) were constructed to examine the associations between attending free produce events and the three outcomes of interest: fruit and vegetable consumption, household food insecurity, and SNAP participation. All analyses were conducted using SAS Version 9.4 (SAS Institute Inc., Cary, North Carolina). All study materials and instruments (e.g., survey questionnaire) were reviewed and approved by the DPH Institutional Review Board (IRB) prior to field administration (IRB #2014-09-535).

3. Results

Study attendees were predominately female (75%) and Hispanic or Latino/a/x (81%) [Table 1]. Almost half were patients from the health center site facilitating the event. The attendees generally came from larger household sizes, with nearly 40% living in households of five or more people. Approximately 71% indicated they or someone in their household have been diagnosed with one or more chronic health conditions—heart disease, prediabetes, diabetes, hypertension (high blood pressure), overweight/obese.

When they were asked how frequently they attended produce events at their health center site, 24% of the attendees reported it was their first time, 54% came occasionally (less than one time per month), and 22% came frequently (about one time per month or more) [Table 1]. On average, attendees reported consuming 2.5 servings of fruits and 2.5 servings of vegetables a day. Over 80% lived in food insecure households. And only 23% reported they were enrolled and actively participating in SNAP.

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Table 1. Demographic and Other Characteristics of Individuals Who Attended Free Produce Events at Safety-Net Health Center Sites in Los Angeles County, California, USA, 2020-2025 (n=497).

Attendees	n	% or Mean (SD)
Gender		
Female	365	75.10
Male	121	24.90
Age		
18-34	36	7.2
35-64	255	51.3
>65	155	31.2
Missing	51	10.3
Race/Ethnicity		
Black or African American	25	5.03
Hispanic or Latino/a/x	404	81.29
White	25	5.03
Other (Asian, AIAN, Multi-racial)	23	4.63
Missing	20	4.02
Patient at this Health Center Location		
No	244	52.36
Yes	222	47.64
Household Size		
1-2 people	110	23.50
3-4 people	182	38.89
5-6 people	143	30.56
7+ people	33	7.05
Diet-Related Chronic Health Condition in the Household		
No, does not have any listed chronic conditions	144	28.97
Yes, has chronic condition	353	71.03
High blood pressure	240	48.29
Heart disease	47	9.46
Diabetes, borderline diabetes, pre-diabetes	225	45.27
Overweight/obesity	106	21.33
Frequency of Attending Free Food (Produce) Events		
This is their first time	120	24.44
Occasional (2-9 times)	263	53.56
Frequent (≥10 times)	108	22.00
Outcome Variables		
Fruit Servings	497	2.57 (1.16)
Vegetable Servings	497	2.54 (1.21)
Fruit + Vegetable Servings	497	5.11 (2.17)
Food Insecurity[A]		
No	81	16.30
Yes	416	83.70
Enrolled and Participating in the Supplemental Nutrition Assistance Program		
No	383	77.06
Yes	114	22.94

Note: SD = Standard Deviation. [A] Assessed using the six-item U.S. Food Security Module—"food secure": for those who scored 0 on the module; "food insecure": for those who scored 1-6 on the module.

Table 2. shows attendees' participation rates in public assistance programs and information about whether or not they were ever referred to apply and enroll in these programs. For those who self-identified as patients of the health center sites, 68% indicated they had received information and

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applied to Medi-Cal before, 28% had received information on SNAP, and 13% had received information on Supplemental Security Income (SSI); presently 72%, 26%, and 14% of this group reported being on Medicaid/Medi-Cal, SNAP, and SSI, respectively.

Table 2. Participation in Public Assistance Programs Among Patients of Safety-Net Health Center Sites in Los Angeles County, California, USA, 2020-2025 (n = 222).

	Ever received referral from healthcare provider to enroll and apply to program		Currently participates	
	n	%	n	%
Supplemental Nutrition Assistance Program (SNAP)/CalFresh/Food Stamps	63	28.38	58	26.1
Medi-Cal	150	67.57	160	72.0
Special Supplemental Nutrition Program for Women, Infants and Children (WIC)	9	4.05	7	3.15
California Food Assistance Program	0	0	3	1.35
CalWorks (Temporary Assistance for Needy Families)	9	4.05	3	1.35
Housing Assistance Programs (Section 8)	0	0	11	4.95
Social Security Disability Insurance (SSDI)	12	5.41	10	4.5
Supplemental Security Income (SSI)	30	13.51	32	14.41
None of the above	50	22.52	28	12.61

Table 3. shows the bivariate associations between frequency of attending the free produce events and fruit servings, vegetable servings, combined fruit and vegetable servings, household food insecurity, and SNAP participation. Compared to first-time attendees, those who attended occasionally or frequently had higher mean servings of fruit and vegetables on an average day. The associations between frequency of attending free produce events and household food insecurity and SNAP participation were not statistically significant.

Table 3. Average Fruit and Vegetable Servings Consumed, Household Food Insecurity, SNAP Participation by Frequency of Attending Free Produce Events at Safety-Net Health Center Sites in Los Angeles County, California, USA, 2020-2025.

	Fruit Servings Consumed		Vegetable Servings Consumed		Fruit + Vegetable Servings Consumed		Household Food Insecurity			SNAP Participation	
	Mean (SD)	p-value	Mean (SD)	p-value	Mean (SD)	p-value	No (%)	Yes (%)	p-value	No (%)	Yes (%)
Frequency of Attending Free Produce Events											
First time (ref)	2.26 (1.18)		2.19 (1.20)		4.45 (2.21)		14.17	85.83		75.00	25.00
Occasional (2-9 times)	2.64 (1.11)	0.003	2.57 (1.19)	0.004	5.21 (2.06)	0.001	16.35	83.65	0.586	76.85	23.15
Frequent (≥10 times)	2.79 (1.16)	0.001	2.90 (1.23)	<.0001	5.69 (2.25)	<.0001	15.74	84.26	0.739	77.95	22.05

Note: SD = Standard Deviation, SNAP = Supplemental Nutrition Assistance Program.

Table 4 displays the multivariable regression analyses (models) for the three study outcomes. Those who attended the free produce events frequently had, on average, one additional serving of fruits and vegetables a day ($p < 0.000$) than first-time attendees, after adjusting for covariates.

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Compared to females, males had fewer servings of fruits and vegetables ($p < 0.001$). Those aged 65+ had 0.64 ($p < 0.003$) more servings of fruits and vegetables and higher odds of SNAP participation (Adjusted Odds Ratio 2.35, $p < 0.004$) than working age adults (age group: 35-64).

Table 4. Associations between Frequency of Attending Free Produce Events at Safety-Net Health Center Sites and Attendees' Fruit and Vegetable Consumption, Household Food Insecurity, and SNAP Participation, Los Angeles County, California, USA, 2020-2025.

	Model 1[a]			Model 2[a]			Model 3[a]		
	Fruit and Vegetable Servings Consumed			Household Food Insecurity			SNAP Participation		
	Coef	SE	p-value	AOR	95% CI	p-value	AOR	95% CI	p-value
Frequency of attending free food events (ref = First time)									
Occasional (2-9 times)	0.53	0.22	0.016	1.52	[0.77, 3.01]	0.231	0.99	[0.56, 1.74]	0.960
Frequent (≥10 times)	1.00	0.26	0.000	0.64	[0.28, 1.43]	0.273	0.96	[0.49, 1.90]	0.908
Gender (ref = Female)									
Male	-0.69	0.21	0.001	0.69	[0.44, 1.36]	0.282	0.68	[0.40, 1.16]	0.159
Age (ref = 35-64)									
18-34	0.41	0.35	0.235	2.09	[0.87, 5.00]	0.099	1.07	[0.46, 2.53]	0.871
>65	0.64	0.21	0.003	0.63	[0.32, 1.25]	0.186	2.35	[1.32, 4.18]	0.004
Missing	0.38	0.34	0.269	1.75	[0.73, 4.17]	0.211	2.97	[0.98, 9.01]	0.055
Race/Ethnicity (ref = Hispanic or Latino/a/x)									
Black	-0.42	0.42	0.314	1.68	[0.55, 5.14]	0.365	0.25	[0.10, 0.64]	0.004
White	-0.54	0.45	0.226	0.36	[0.05, 2.78]	0.325	0.77	[0.25, 2.35]	0.639
Other	0.08	0.41	0.848	0.88	[0.24, 3.18]	0.839	0.44	[0.17, 1.14]	0.092
Missing	-0.49	0.67	0.458	0.64	[0.06, 7.31]	0.721	0.55	[0.12, 2.47]	0.432
Patient at this Health Center Location (ref = No)									
Yes	-0.17	0.18	0.352	0.88	[0.51, 1.51]	0.643	0.69	[0.43, 1.11]	0.125
Enrolled and Participating in SNAP (ref = No)									
Yes	0.07	0.22	0.739	0.58	[0.29, 1.19]	0.140	N/A	N/A	N/A
Household Size (ref = 1-2 people)									
3-4 people	-0.24	0.24	0.324	1.02	[0.51, 2.07]	0.949	1.47	[0.80, 2.70]	0.215
5-6 people	0.21	0.26	0.429	0.60	[0.27, 1.34]	0.210	1.87	[0.95, 3.65]	0.068
7+ people	-0.01	0.38	0.983	0.91	[0.29, 2.83]	0.865	1.05	[0.41, 2.69]	0.914
n	427			427			427		

Note: ref = reference category, Coef = Coefficient, SE = Standard Error, AOR = Adjusted Odds Ratio, SNAP = Supplemental Nutrition Assistance Program. a Multivariable regression analyses, after adjusting for independent variables and covariates.

4. Discussion

This study describes the demographic, health, and social characteristics of people who attended free produce events at safety-net health center sites in Los Angeles County, events facilitated by the single largest Medicaid-reliant health system in Southern California, USA (i.e., DHS). Nearly half of the attendees (48%) were patients of the health center sites that facilitated the events, while most (76%) reported being occasional (2-9 times) or frequent (≥10 times) visitors/beneficiaries of these food distributions. Most attendees who participated in the survey reported that they or someone in their

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household had at least one, if not more than one, chronic health condition(s), suggesting that this safety-net population has both high physical health and unmet social needs.

High frequency of attending free produce events predicted (was found to be associated with) increased fruit and vegetable consumption among the attendees in this study—the coefficients or apparent strengths of the relationship, as expressed in the model, approximately doubled from the 'occasional' to the 'frequent' category when compared to the reference group, first-time attendees. While it is beyond the scope of this study to draw meaningful inferences, an intriguing hypothesis is that extended participation or exposure to this FAM strategy could lead to sustainable improvements in diet quality, literally by increasing most adults' intake of fruits and vegetables by one additional cup a day. This finding intriguing because it may have future implications and applications for changing health behaviors, especially when considering that only 28% of adults in California presently meet the standard of eating fruits and vegetables five times a day [16].

Offering free produce events at safety-net health center sites has other key benefits as well. For instance, the strategy allows for more immediate consumer access to healthy food among safety-net populations who otherwise have high needs but low participation in public assistance programs. In this study, only about 23% of event attendees reported being enrolled and actively participating in SNAP, whereas nearly 87% indicated they were experiencing food insecurity. This mismatched ratio (disparity) between need (food insecurity) and remedy (public assistance usage) could help explain why a similar association between the frequency of attending free produce events at these sites and reduced household food insecurity or SNAP participation was not detected. More research on these interacting factors is clearly needed in order to better understand and elucidate how these nuanced complexities influence real world implementation and health impacts of this FAM strategy [17,18].

Limitations

This study has several limitations. First, the county of Los Angeles is a vast, diverse region in the U.S., anchored by a complex healthcare landscape that comprises 35+ health and clinic systems in the area [19,20]. From this diversity perspective, the sampled health center sites (n = 16) is a limited sample, representing only a non-generalizable cross-section of a larger, overall healthcare market in the region. Second, the study outcomes, particularly fruit and vegetable consumption, were largely self-reported, complicated by the fact that these event attendees received fresh fruits and vegetables for free. As such, they may have answered most of the survey questions with a biased viewpoint—i.e., predominantly favorable towards the program intervention. Finally, the cross-sectional nature of the investigation prohibits any meaningful inferences about trends, patterns, or other longitudinal effects related to the free produce events strategy. Nevertheless, the in-person intercept survey did allow DHS and DPH to capture previously unavailable information about attendees of these events. This information will be invaluable for informing program improvements in the future.

5. Conclusions

Safety-net health centers are increasingly screening for food insecurity and providing patients with referrals to public assistance programs like SNAP. Unfortunately, not all individuals actively participate in or are eligible for these programs. Hence, onsite distributions of free produce at low-income health center sites are becoming a promising alternative/complementary option for addressing this social need when traditional public assistance programming often falls short. This underutilized approach could and should be considered a viable FAM intervention for addressing hunger and food insecurity, especially under circumstances where patients are either not eligible or using public assistance or when nutrition incentive/produce pharmacy programs are not readily available.

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