

# Impacts of Double Up SNAP Farmers' Market Incentive Program on Fruit and Vegetable Access, Purchase and Consumption

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## Abstract

**Background and Objective:** In response to low consumption levels of fruits and vegetables (F&V) by Supplemental Nutrition Assistance Program (SNAP) participants, the Community Food Bank of Southern Arizona created the Double Up SNAP (DUSP) farmers' market (FM) incentive program to examine its impact on awareness of and access to FM, and F&V purchase and consumption in Pima County, AZ.

**Methods:** Cross-sectional surveys were conducted at early and 9-11 months after implementation of DUSP program in two groups of SNAP recipients: DUSP customers and randomized non-DUSP food shoppers. All questionnaires assessed socio-demographic characteristics, awareness of DUSP program, perceived access to FM, and purchasing patterns as well as F&V consumption. Descriptive analyses were tabulated and linear regression was used to estimate the difference in F&V consumption trends in both groups after DUSP implementation.

**Results:** The introduction of DUSP was associated with greater awareness of FM; increased frequency and amount of F&V purchases; and increased self-reported number of F&V consumed and percentage of participants eating vegetables. However, our regression analysis did not detect impacts on frequency of F&V consumption and percentage of participants eating fruits

**Conclusion:** While our study provides promising evidence that use of FM incentives combined with cooking demonstrations and marketing can increase awareness and use of FM, additional research is needed to better understand impacts on F&V consumption.

**Keywords:** Farmers' market; Fruits and vegetables; Nutrition incentive; Low-income communities

## Introduction

In the United States, obesity is a major public health concern as about one-third of adults and 17% of children and adolescents are obese [1,2]. Several studies indicate an association between increased fruit and vegetable (F&V) consumption and reduced long-term obesity risk as well as reduced risk of heart disease and some cancers [3-6]. Nevertheless, American F&V consumption is well below levels recommended in federal dietary guidelines [7,8]. This discrepancy is particularly true among low-income families and participants in federal nutrition assistance programs like the Supplemental Nutrition Assistance Program (SNAP) who are less likely to meet recommended levels of F&V [9-11].

In response to this growing public health crisis, various approaches have been proposed to increase F&V consumption among adults. Most prominent among these approaches are targeted incentive or voucher programs to encourage F&V purchases [12,13]. Such programs make healthy foods like F&V more affordable compared with less nutritious choices by affecting relative prices and enhancing overall purchasing power [14]. Farmers' markets (FM) in particular have been targeted by a number of incentive

programs as ideal sources for fresh F&V within low-income settings [15-17]. Indeed, FM are recurring gatherings of farmers selling their food products, including F&V, directly to consumers while F&V consumption was also associated with FM shopping [18-20].

Because of the promise that farmers' markets hold for improving access to healthy foods in underserved areas, the Community Food Bank of Southern Arizona (CFBSA) used farmers' markets SNAP-matching as an intervention to increase intake, including a short-term pilot program in 2011-2012, with successful results. The most recent effort, started in 2015, has seen a 300% increase from the previous year in low-income shoppers utilizing SNAP benefits at the farmers' market located at the food bank. A 2013 survey conducted by CFBSA indicated that 94% of customers at this same market and 30% of customers at the downtown Tucson market received some type of food assistance through non-profits or government agencies, yet SNAP sales accounted for less than 3% of the total market revenue, indicating considerable barriers to these efforts [21]. The survey found that almost two-fifths of customers at the market held at the CFBSA want to see lower prices of produce.

Despite a desire to support a program that increases F&V consumption, CFBSA cannot sustain necessary incentive levels while also appropriately marketing and promoting the program to reach a critical threshold of SNAP customers at the FM. In 2016, CFBSA secured a USDA Food Insecurity Nutrition Incentive (FINI) Grant to continue SNAP-matching efforts and address the two barriers identified through the Double-Up SNAP pilot (DUSP) initiative: high prices and lack of awareness of SNAP-matching efforts. Under DUSP, SNAP participants received an incentive of \$1 dollar for every dollar of SNAP benefits spent on targeted F&V from participating vendors for a maximum of \$20. Cooking demonstrations were also provided every two weeks to increase the beneficiaries' knowledge about how to prepare healthy food options. Additionally, a strategic marketing and promotional campaign was used to narrow the knowledge gap regarding the program among SNAP customers. Although incentive programs at FM are growing as an approach to increase access to fresh F&V, little is known about their effects on F&V spending and intake [22]. In addition, few studies have used validated measurement tools to compare behaviors before and after program participation or a control group to validate causal inference. This paper aims to assess the effectiveness of DUSP in increasing awareness of DUSP program and access to FM, and increasing purchase and consumption of F&V.

## Materials and Methods

### Study Design, Target Population and Setting

The study was carried at two locations accessible to low-income residents: the Community Food Bank's main warehouse and Santa Cruz River Farmers' Market located in downtown Tucson. Eligibility criteria for participation included being over 18 years of age, a Pima County resident, and one of the primary food shoppers in the household. The data collection included two rounds of cross-sectional surveys of participants. The time periods were at an early stage of DUSP implementation (July-September 2016) and 9-11 months after implementation (April-June 2017). This study was approved by the Institutional Review Boards of University of Arizona. The study came under the "exempt" category of the regulations for research involving human subjects because it was conducted as part of an evaluation of a service project to improve the program. Verbal informed consent was obtained from all subjects.

### Data Collection

To accomplish this study, all farmers' market customers using electronic benefit transfer (EBT) cards (DUSP customers) were surveyed along with a random sample of primary household food shoppers (non-DUSP food shoppers) at baseline and at follow-up. For the DUSP customers, interviewers were stationed at an information table, approaching all eligible shoppers, potential participants in the markets, asking about their interest in participating, and offering a \$5 gift token as incentive for completion. As for the non-DUSP participants recruited in the waiting room of CFBSA main warehouse, interviewers approached every third person checking in at the CFBSA front desk, explained the purpose of the survey, and then asked individuals whether they would like to participate. If potential participants were interested, the survey instrument was administered. Due to the logistical challenges of conducting surveys in public places and the varying degrees of customer traffic, we did not gather information on the number of persons invited to participate and those who agreed or did not agree to participate. Thus, no response rate is reported.

All data were collected using a 32-questions pilot-tested survey addressing demographic information (race, gender, age, education and primary language spoken), awareness and understanding of the DUSP program, perceived access to FM, and purchasing patterns as well as F&V consumption. When possible, the questions were taken from well-validated existing surveys suitable for the study population, including the National Health and Nutrition Examination Survey (NHANES), and the National Cancer Institute's Food Attitudes and Behaviors Survey. Specifically, DUSP awareness and understanding were measured by asking 4 questions: 1. "How did you hear about the Double Up SNAP program?" 2. "How helpful was the information provided?" 3. "In the past month, have you observed a cooking demonstration at your market?" and 4. "Have the cooking demonstrations helped you learn any of the following?" Ten possible reasons for shopping and awareness of farmers' market promotions were also provided to FM customers and included convenient location; affordable price; variety of products; convenient hours of operation; DUSP program and acceptance of EBT cards. FM perceived access was measured by asking 2 questions: 1. "How long does it take you to get this market" (in minutes) and 2. "What kind of transportation do you usually use to get to this market?"

Purchasing patterns were assessed through three aspects: frequency of FM shopping and purchasing amount and types which were measured by asking 3 questions: 1. “Because of DUSP program rebates, is your family buying a larger amount of ..?” 2. “Because of DUSP program rebates, is your family eating a greater amount of ...?” and 3. “Because of DUSP program rebates, have you or your family tried any new or unfamiliar fruits or vegetables?” F&V intake information was collected using the risk factor surveillance system (BRFSS) which included only frequencies of fruit or vegetable and not portion size [22]. Respondents were asked how many times per day, week or month they consumed 100% pure fruit juices, fresh, frozen or canned fruits, cooked or canned beans, dark green vegetables, orange-colored vegetables, and other vegetables over the previous month. Reported daily frequencies of each fruit or vegetable were calculated by dividing weekly frequencies by seven and monthly frequencies by 30. Then, a composite daily frequency of fruit was calculated based on the sum of the 2 items while the composite daily frequency of vegetables from the 4 types of vegetables.

## Statistical Analysis

Data from this quantitative evaluation was synthesized on three outcome areas of interest (awareness and access, purchasing, and consumption) to provide a range of evidence on DUSP program impacts. For each set of groups, descriptive analyses were conducted, and categorical variables were expressed as percentages. Linear regression was used to estimate the difference in F&V consumption trends after DUSP implementation (number of F&V, frequency of F&V consumption and percentage of participants who consumed F&V in the last month). Specifically, the models were estimated in 3 specifications. In Specification 1, F&V consumption trends were observed over time in DUSP customers and were measured for non-DUSP participants in the specification 2, and both regressions were controlled for gender, age, race, and education. In specification 3, DUSP customers were compared to non-DUSP food shoppers, and controlled for gender, age, race, education and length of exposure to DUSP program (0=none, 1=0-3 months after implementation, 2=3-6 months after implementation, and 3=6-9 months after implementation). All analyses were completed by using STATA version 14 (Stata Corporation, College Station, Texas). Significance of standardized coefficients is reported at the 10%, 5%, and 1% probability levels.

## Results

Comparisons of baseline demographic characteristics showed that DUSP customers had greater education and tended to be younger compared to non-DUSP food shoppers, but were mostly over 42 years old. DUSP customers were also more likely to be white, female, while reporting English as their primary language. Similar demographic characteristics results were observed at follow-up. Overall, 353 customers were surveyed: 163 at baseline (56 DUSP customers and 107 non-DUSP food shoppers) and 190 customers at follow-up (53 DUSP customers and 137 non-DUSP food shoppers). However, of the 53 DUSP customers who completed the follow-up survey, 62.3% were new customers (n=33).

### Awareness of DUSP Program and Perceived Access to Farmers’ Markets

When asked the likelihood of shopping and awareness of FM promotions at baseline, one-third of DUSP respondents indicated the variety of products (35.7%) and better and fresher produce (33.9%) while only 23.2% were aware of county-wide efforts to promote FM. However, at follow-up, more than 40% of DUSP customers indicated that the DUSP program was a reason to go the FM. Better and fresher produce (43.6%) followed by the acceptance of EBT cards (37.3%) were additional reasons while 18.8% cited affordable price (Figure 1).

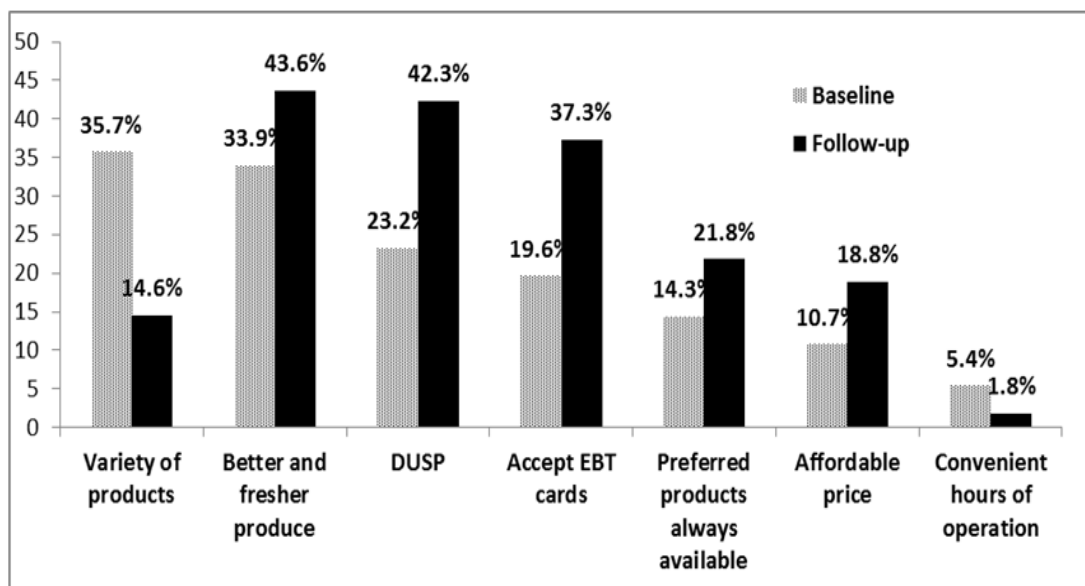


Figure 1: Farmers’ market DUSP Customers Likelihood of Shopping at farmers’ market

Most of DUSP customers heard about the program via word of mouth (55.4% vs. 58.6%), followed by informational pamphlet (16.1% vs. 31.8%), WIC case manager (14.3% vs. 23.6%), and social media/radio (8.9% vs. 12.8%), with greater prevalence at follow-up compared with baseline. And 92.8% of DUSP participants found the provided information helpful at follow-up compared with 78.9% at baseline. However, 60% of participants had never observed a cooking demonstration at the market. Reasons listed for not attending cooking demonstrations included being unaware of them (~60% in both years), not having the time (22.9% vs. 18.2%) and being uninterested in the demonstrations (17.1% vs. 21.2%). Furthermore, participants who have witnessed cooking demonstrations stated, at baseline and follow-up, that the demonstrations helped them discover new foods they liked (80% and 95%), and they learned new recipes (90.5% and 95.2%), and how to select produce (42.9% and 60%) (Table 1).

Questions	Proportion(%)	
	Baseline (n=56)	Follow-up (n=53)
<b>How did you hear about the Double Up SNAP program?</b>		
Mail	0	5.82
Informational pamphlet	<b>16.07</b>	<b>31.82</b>
Word of mouth	<b>55.36</b>	<b>58.55</b>
WIC case manager	14.29	<b>23.64</b>
Community service provider	5.36	3.64
Social media/radio	8.93	<b>12.82</b>
<b>How helpful was the information provided?</b>		
Very helpful	<b>72.22</b>	<b>73.21</b>
Helpful	6.67	<b>19.64</b>
Somewhat helpful	<b>19.26</b>	7.14
Not Helpful	1.85	0
Very unhelpful	0	0
<b>In the past month, have you observed a cooking demonstration at your market?</b>		
Yes	37.50	38.18
No	<b>62.50</b>	<b>61.82</b>
<b>Reasons listed for not attending cooking demonstrations</b>		
Unaware of cooking demonstrations	<b>60.00</b>	<b>60.6</b>
Not having time	22.9	18.2
Being uninterested in cooking demonstrations	17.1	21.2
<b>Have the cooking demonstrations helped you learn any of the following?</b>		
How to select produce	42.86	60
Nutrition	66.67	60
Recipes	90.48	<b>95.24</b>
New foods you like	80.00	<b>95.00</b>

**Table 1:** DUSP Awareness and understanding among DUSP customers

DUSP customers were also asked how long it would take to get to the FM to assess perceived geographic accessibility. At baseline, about 28.6% of respondents reported living less than a 10-minute car drive from the closest FM while 17.9% of them drove 11-20 minutes or 21-30 minutes. However, at follow-up, 24.5% of DUSP customers reported 11-20 minutes car drive while 16.9% of them drove 0-10 minutes and surprisingly 16.9% drove more than 30 minutes (Table 2).

Time	Transportation	Proportion (%)	
		Baseline (n=56)	Follow-up (n=53)
0-10 minutes	Walk	10.71	3.77
	Bike	5.36	0
	Bus/Street car	0	1.89
	Vehicle	<b>28.57</b>	<b>16.98</b>
11-20 minutes	Walk	0	0
	Bike	0	9.43
	Bus/Street car	0	1.89
	Vehicle	<b>17.86</b>	<b>24.53</b>

Time	Transportation	Proportion (%)	
		Baseline (n=56)	Follow-up (n=53)
21-30 minutes	Walk	0	0
	Bike	1.79	1.89
	Bus/Street car	3.57	3.77
	Vehicle	17.86	11.32
More than 30 minutes	Walk	0	0
	Bike	1.79	0
	Bus/Street car	3.57	7.55
	Vehicle	8.93	16.98

**Table 2:** Distance to farmers' market

## Purchasing Patterns

DUSP customers were asked about their frequency of FM shopping. More than 85% of the customers surveyed had been to the FM before. However, there were fewer customers who used SNAP and DUSP at the FM for the first time at follow-up compared to baseline. In addition, since becoming a DUSP customer, the majority of participants felt that their families ate more fruit (81.1% vs. 83.9%), more vegetables (84.6% vs. 89.3%) at baseline and follow-up. In terms of increasing the variety of foods purchased, 83.9% of participants reported having tried new or unfamiliar F&V since shopping at the market (Table 3).

Questions	Proportion (%)	
	Baseline (n=56)	Follow-up (n=53)
<b>Frequency of farmers' market shopping</b>		
This is the first time	12.50	9.43
Every week	44.64	39.62
Twice a month	23.21	26.42
Once a month	12.50	18.87
Every few months	7.14	5.66
<b>Because of Double Up SNAP program rebates, is your family buying a larger amount of any of the following?</b>		
Fruits	88.68	89.09
Vegetables	92.45	94.55
<b>Because of Double Up SNAP program rebates, is your family eating a greater amount of any of the following?</b>		
Fruits	81.13	83.93
Vegetables	84.62	89.29
<b>Because of Double Up SNAP program rebates, have you or your family tried any new or unfamiliar fruits or vegetables?</b>		
Yes	80.39	83.93
No	19.61	14.29
Not sure/Refused	0	1.79

**Table 3:** Purchasing patterns of DUSP Participants

## Consumption of Fruits and Vegetables

DUSP customers reported consuming a significantly ( $P < 0.01$ ) greater number of F&V (Table 4) and the percentage who reported eating vegetables was also greater from baseline to follow-up ( $P < 0.10$ ). However, there was no consistent pattern in frequency of F&V consumption (Specification 1). Furthermore, we did not observe significant greater F&V consumption among non-DUSP food shoppers (Specification 2). Consequently, when comparing both groups, there was differentially larger increases in number of F&V and percentage reported eating vegetables in DUSP customers as compared with non-DUSP food shoppers (Specification 3). However, the impact was not significant in any specification for frequency of F&V consumption. Finally, DUSP contributed to 37.7% improvement (32.1% vs. 20%) in the percent who consumed <1 fruit per day compared with a 21.7% improvement (53.8% vs. 42.3%) for non-DUSP food shoppers. Similarly 21.7% improvement in those who consumed vegetables (7.5% vs. 5.9%) less



than one time per day compared with a 5.5 percent improvement for non-DUSP (25.5% vs. 24.1%) (Figure 2).

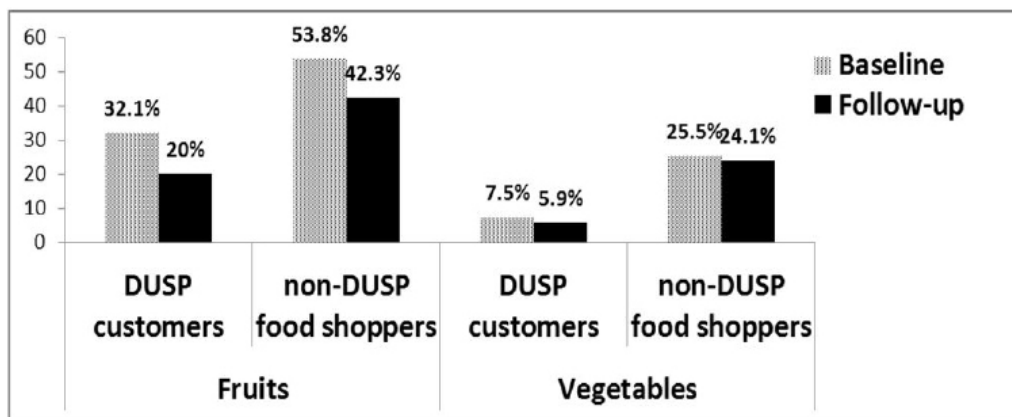


Figure 2: Consumed Fruits and Vegetables less than one time per day

	Specification <sup>a</sup>		
	1	2	3
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
<b>Number of fruits and vegetables</b>			
Fruits (range 0-2)	0.442***(0.067)	0.095(0.111)	0.871*(0.472)
Number of respondents	89	227	316
R <sup>2</sup>	0.076	0.159	0.132
Vegetables (range 1-4)	0.300***(0.080)	0.104(0.111)	0.359*(0.523)
Number of respondents	92	221	313
R <sup>2</sup>	0.023	0.062	0.038
<b>Frequency of consumption (times per day)</b>			
Fruits (range 0-5)	0.182(0.115)	-0.132(0.220)	0.580(0.753)
Number of respondents	101	239	340
R <sup>2</sup>	0.08	0.041	0.030
Vegetables (range 1-8)	-0.410(0.480)	-0.183(0.191)	-0.861(0.529)
Number of respondents	94	241	335
R <sup>2</sup>	0.042	0.012	0.030
<b>Percentage eating fruits and vegetable</b>			
Fruits	0.440(0.267)	0.647(0.432)	0.972(1.715)
Number of respondents	101	239	340
R <sup>2</sup>	0.372	0.277	0.083
Vegetables	1.034*(0.306)	-0.830(0.729)	3.841*(2.847)
Number of respondents	94	241	335
R <sup>2</sup>	0.735	0.494	0.101

SE: Standard error. \*P<0.10; \*\*P<0.05; \*\*\*P<0.01

**\*Specification 1:** Regression-adjusted difference in DUSP customers for gender, age, race, education

**Specification 2:** regression-adjusted difference in non-DUSP food shoppers for gender, age, race, education

**Specification 3:** Regression-adjusted difference in both groups for gender, age, race, education and time of exposure

**Table 4:** Impacts of DUSP on self-reported fruits and vegetables consumption

## Discussions

The current findings provided evidence that implementing a multicomponent FM approach that includes establishment of markets in low-income neighborhoods, acceptance of SNAP benefits for payment, cooking demonstration and greater availability of affordable and high quality healthy food may increase awareness of and access to FM among SNAP populations. Similar to Freedman *et al.* [24], we found increased FM use among DUSP customers while most participants valued the high quality and variety of produce sold at the selected markets. We also found an 18% increase in perceived access to FM, as measured by reported car drive distance to the nearest market. Indeed, at early implementation, about 45% of FM customers reported that the market where they were surveyed was over 10 min away for 52.8% after 9 months of implementation, suggesting that shoppers were willing to travel longer distances to reach FM if necessary. Prior research indicated that incentive programs like DUSP program can improve access to farmers’ markets by removing financial and logistical burdens for markets and participants in food assistance programs [25-28].

Similar to Olsho *et al.* [27], the introduction of DUSP program was found to be associated with increased frequency and amounts of F&V purchases. There were fewer customers who used SNAP and DUSP at the FM for the first time at follow-up compared to baseline, indicating a growing group of repeat customers year to year. Additionally, the majority of participants felt that their families ate more fruit (81% vs. 84%), more vegetables (85% vs. 89%), although the differences were not significant while about 84% of participants reported having tried new or unfamiliar F&V since shopping at the FM. While our analysis focused on effects of the incentive program on individual spending and shopping patterns, this finding is consistent with related work examining effects on spending from the perspective of the FM. For example, FM managers and vendors agreed that they made more money at the market and sold more F&V due to DUSP, and FM averaged greater daily SNAP sales from baseline to follow-up (data not shown). Freedman and colleagues similarly found increased use of all forms of food assistance at the FM associated with introduction of an incentive program [29].

Finally, we found evidence that DUSP can increase F&V consumption. DUSP participation was associated with a greater self-reported increase in number of F&V consumed as well as percentage of participants eating vegetables. DUSP also contributed to greater improvement in the percent who consumed <1 fruit or vegetable per day compared with non-DUSP food shoppers, which is impressive given the DUSP customers started at lower percentage and it is harder to lower low numbers. However, we did not find evidence of an association between DUSP use and frequency of F&V consumption or percentage of participants eating fruits. In theory, one would expect healthy food incentive program combined with education and marketing might have larger impacts [30,31]. One possible explanation is that some forms of incomplete understanding would lead to lower impacts. For example, while we found greater awareness of DUSP program, 60% of DUSP participants were not aware of cooking demonstrations at FM. Furthermore, 59%, 32% and 24% of DUSP customers reported having heard of the program through word of mouth, informational pamphlet and WIC case manager respectively at follow-up, and many of the responses seem inconsistent with plausible sources of information about DUSP (13% media; 6% mail; 4% community provider). This lack of awareness of the additional benefit offered by DUSP to support F&V purchasing could limit the nudging function of incentive interventions [32].

The potential that FM hold for improving access to healthy foods in underserved areas implicitly assumes that households can and will spend the incentive like cash. In theory, one would expect inframarginal households to spend the two resources equivalently, while one would expect extramarginal households to have a much higher marginal propensity to purchase food out of SNAP benefits than out of cash income. In practice, Breunig and Dasgupta [33] and Wide *et al.* [34] have noted that food stamp benefits are spent differently from cash income, even in households that appear to have some positive cash spending on food. Previous estimates also suggest that only about 20% of incremental SNAP benefits are spent on food [35], suggesting that DUSP may not change how much is spent but the way SNAP benefits are used can be influenced to purchase more FV. In addition, it is important to note that those who left SNAP between baseline and follow-up were not interviewed. It is possible that long-time SNAP participants could differ from those who have short participation spells. Finally, the scale of the program may be insufficient to generate impacts detectable at the community level. We were able to interview only 56 DUSP customers at baseline and only 35% at follow-up. In addition, the follow-up survey was conducted in April-June 2017 when FM was less active and overall differences could be influenced by seasonality. We may have detected a statistically significant impact either with a larger sample size, over several seasons or with a longer-term follow-up.

## Strengths and Limitations of the Study

Our evaluation design includes multiple, complementary components, each with its own unique strengths and limitations. Strengths of this study included the combination of extensive process evaluation, use of validated tools, cognitive assessment testing of surveys with the target population, and the use of control group. A limitation of this study was the small sample size that was not powered to determine effect sizes. Additionally, because the DUSP customers' survey was conducted on site at FM, these data cannot be used to answer questions about the broader community. Another potential study limitation is seasonality because data were collected during a single market season after program implementation. As well, like all self-reported data, survey responses may be subject to social desirability bias, in which respondent reports are influenced by norms about the most socially acceptable response to survey questions. We also cannot rule out the possibility of non-response bias due to differences in unobservable characteristics among DUSP customers or the impact of contextual and environmental policy differences related to non-DUSP food shoppers' characteristics that we did not measure. Nonetheless, we believe that this study provides insight into important barriers and facilitators to using FM for low-income families receiving government assistance. The DUSP customers and non-DUSP food shoppers' surveys incorporate detailed measures of FM and DUSP use, along with a wide range of outcome measures of interest, including awareness of and perceived access to FM, as well as self-reported F&V spending and consumption measures.

## Conclusion

The Double Up SNAP initiative showed promise as a year-round solution for increasing awareness of and access to FM, and F&V purchase and consumption in low-income populations. DUSP program is clearly valued by SNAP customers while understanding FM use patterns may inform future intervention efforts that are tailored for different populations receiving SNAP. Findings

from this research revealed that there may be an opportunity to be more explicit when healthy food incentives are distributed to raise awareness about the dietary benefits of this monetary intervention such as cooking demonstrations. They also illuminated the importance of integrating communication and outreach strategies into FM implementation. However, while results of this study support the value of continued research regarding the effectiveness of FM incentive programs, research is needed to better understand the most effective dissemination channels and messages to raise awareness about FMs and healthy food incentive programs among low income populations. Additional research is also needed to better understand impacts on outcomes such as fruit and vegetable consumption, and, ultimately, overall nutritional and health status. Further research on FM incentive programs should investigate longer - term effects and use large sample sizes. Therefore, translational research is needed to explore and evaluate different models for implementation, sustainability, and dissemination. Nonetheless, this evaluation is the first step towards finding common themes among SNAP customers who participated in the DUSP program evaluation at FM in the Pima County Area.

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