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## Evaluation of a Peer-to-Peer Approach to Improve the Reach of Farmers' Markets among Low-income Populations

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# Evaluation of a Peer-to-Peer Approach to Improve the Reach of Farmers' Markets among Low-income Populations

## Abstract

Farmers' markets have been implemented to improve access to nutritious foods, yet use is low among people receiving Supplemental Nutrition Assistance Program (SNAP) benefits. This study's objectives were to assess the feasibility of implementing the FreshLink Ambassador intervention to promote use of farmers' markets located in high SNAP neighborhoods, describe information dissemination by Ambassadors, and evaluate intervention impact on SNAP use. The theory-based and data-driven intervention trained nine community residents as FreshLink Ambassadors in 2017; eight completed the study. Ambassadors conducted weekly outreach disseminating coupons to promote use of three intervention markets. Four comparison markets were selected to evaluate impact on SNAP use. SNAP sales from 2016 to 2017, standardized per vendor per market day open, were compared using paired and cluster-adjusted t-tests,  $p < .05$ . FreshLink Ambassadors conducted 155 outreach events reaching 1,138 people through coupon dissemination. The coupon redemption rate was 13.9%; redemption was significantly higher for people 50+ years of age, without children in the household, not currently receiving SNAP benefits, and living in the zip code with an intervention market. Intervention versus comparison markets had greater improvements in standardized SNAP sales (\$0.73 vs. \$0.44). These changes were not statistically significant but may be practically significant for farmers' market operations. Findings provide evidence that implementation of the peer-to-peer outreach approach was feasible and coupon redemption rates exceeded industry standards indicating the "product" promoted by FreshLink Ambassadors was considered advantageous. Future research is warranted to evaluate different strategies intended to promote social access to farmers' markets within a broader agenda to advance health equity.

## Keywords

Food Security; Supplemental Nutrition Assistance Program; Farmers' Market, Dissemination Science; Health Equity

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## **Evaluation of a Peer-to-peer Approach to Improve the Reach of Farmers' Markets among Low-income Populations**

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### **Abstract**

Farmers' markets have been implemented to improve access to nutritious foods, yet use is low among people receiving Supplemental Nutrition Assistance Program (SNAP) benefits. This study's objectives were to assess the feasibility of implementing the FreshLink Ambassador intervention to promote use of farmers' markets located in high SNAP neighborhoods, describe information dissemination by Ambassadors, and evaluate intervention impact on SNAP use. The theory-based and data-driven intervention trained nine community residents as FreshLink Ambassadors in 2017; eight completed the study. Ambassadors conducted weekly outreach disseminating coupons to promote use of three intervention markets. Four comparison markets were selected to evaluate impact on SNAP use. SNAP sales from 2016 to 2017, standardized per vendor per market day open, were compared using paired and cluster-adjusted t-tests,  $p < .05$ . FreshLink Ambassadors conducted 155 outreach events reaching 1,138 people through coupon dissemination. The coupon redemption rate was 13.9%; redemption was significantly higher for people 50+ years of age, without children in the household, not currently receiving SNAP benefits, and living in the zip code with an intervention market. Intervention versus comparison markets had greater improvements in standardized SNAP sales (\$0.73 vs. \$0.44). These changes were not statistically significant but may be practically significant for farmers' market operations. Findings provide evidence that implementation of the peer-to-peer outreach approach was feasible and coupon redemption rates exceeded industry standards indicating the "product" promoted by FreshLink Ambassadors was considered advantageous. Future research is warranted to evaluate different strategies intended to promote social access to farmers' markets within a broader agenda to advance health equity.

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The Centers for Disease Control and Prevention (CDC) identified increasing fruit and vegetable consumption as a "winnable battle" achievable through implementation of community-level initiatives such as farmers' markets (FM) targeting low-income populations disproportionately burdened by diet-related health conditions (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Centers for Disease Control and Prevention, 2009, 2013). These interventions have the potential to make healthy choices available, affordable, and easy to access, especially in communities with a limited number of food stores selling healthy products such as fruits and vegetables (Caspi, Sorensen, Subramanian, & Kawachi, 2012). In the research context of this study, efforts have focused on locating FMs in low-income neighborhoods, providing

financial incentives to reduce food costs, and requiring acceptance of Supplemental Nutrition Assistance Program (SNAP) benefits at FMs (Walsh, Taggart, Freedman, Trapl, & Borawski, 2015). These efforts are in response to the call to make healthy foods more available, affordable, and easy to access.

Recent evidence, however, suggests these efforts are not sufficient to increase the reach of FMs among people receiving SNAP benefits because they do not tap into social aspects of food shopping routines (Freedman, Blake, & Liese, 2013). A systematic review of factors influencing FM use found the social benefits of FMs such as camaraderie are less commonly endorsed in studies including low-income populations (Freedman et al., 2016). Other evidence suggests food shopping is a social experience motivated by opportunities for interaction (Cannuscio, Hillier, Karpyn, & Glanz, 2014; Monteban et al., 2018).

Peer-to-peer outreach is one approach to promote social access to FMs. This approach taps into the credibility and normative power of peers, empowers residents to organize and implement change, and allows for diffusion of information between peers who offer a favorable evaluation of the innovation (Hays, Rebchook, & Kegeles, 2003; Kegeles, Hays, & Coates, 1996; Li, Weeks, Borgatti, Clair, & Dickson-Gomez, 2012). In this research, a peer-to-peer dissemination approach was adapted to promote social access to FMs through the development and implementation of the FreshLink Ambassador intervention.

Informal referral networks are persuasive strategies for disseminating health behavior interventions, particularly among hard-to-reach populations. This active dissemination strategy facilitates the spread of an innovation (e.g., use of a FM) through centralized channels and networks by engaging people who influence attitudes, beliefs, norms, motivations, and behaviors of others (Valente & Pumpuang, 2007; Yuan et al., 2010). This strategy has been used with success in a variety of areas (e.g., tobacco, mammography, HIV, clinical practice) (Earp et al., 2002; Kelly et al., 1991; Lomas et al., 1991). However, peer-to-peer outreach approaches have not been systematically evaluated as a strategy to promote the use of FMs among low-income populations. Marketing and outreach strategies, in general, are understudied topics within FM implementation (Freedman et al., 2016).

Similar to other peer-to-peer outreach interventions, the FreshLink Ambassador intervention was informed by existing theories (Table 1). First, the intervention was based on diffusion theory, which avows that when peers adopt a behavioral innovation (e.g., FM use), others in their social networks will perceive the change as desirable and beneficial, and likewise adopt more rapidly (Rogers, 2003). Second, the FreshLink Ambassador intervention was informed by social capital theory, which suggests social networks (i.e., connections among people) are effective vehicles for transmitting information and influence, with that effectiveness being moderated by the social credentials of the messenger (i.e., FreshLink Ambassador) and reinforced through recognition that serves as a motivator for further dissemination (Lin, 2001). Qualitative social network analysis informing the FreshLink Ambassador intervention found that food shopping among people receiving SNAP benefits was a social experience, yet few social connections were identified with FMs versus higher levels of connectedness to other food stores such as convenience stores (Monteban et al., 2018).

Third, FreshLink was informed by principles of community engagement, which draws attention to the importance of indigenous models of change (Minkler & Wallerstein, 2003). These principles underpin peer-to-peer models. Finally, FreshLink was informed by social marketing theory, which highlights heterogeneity within targeted audiences such as people receiving SNAP benefits, thereby promoting the need for tailored messages for different

Table 1

*Core elements of the FreshLink Ambassador intervention based on concepts from existing theory.*

<b>4 Ps of Social Marketing + 1</b>	<b>Operationalization of “4 Ps” for FreshLink Ambassador Intervention</b>	<b>Relation to Concepts from Existing Theory</b>	<b>Example Intervention Activities</b>
<b>Product</b>	For what problem is a farmers’ market a solution?	Compatibility (DT)	Active listening, motivational interviewing
<b>Price</b>	What sacrifices or costs are people willing to exchange for the potential benefits?	Relative Advantage (DT)	Tailored message creation
<b>Place (+ People)<sup>a</sup></b>	Who are the people and organizations that are trusted and credible to share information to support change?	Social influence (SC), Social credentials (SC), Social connectedness (SC), Trialability (DT)	Outreach at key trusted spaces, Presence at farmers’ market
<b>Promotion</b>	What are communication objectives, how are these effectively conveyed, and what communication channels are most appropriate?	Exchange theory (SM), Audience segmentation (SM), Trialability (DT)	Role play, Observation, Co-Learning, Symbolic Cues, New Customer Coupon
<p><i>Note.</i> DT = diffusion theory; SC = social capital theory; SM = social marketing theory.  <sup>a</sup>The 4 Ps of Social Marketing focus on product, price, place, and promotion. The FreshLink Ambassador intervention added “people” as an additional aspect related to building trust and credibility of public health messages.</p>			

segments of the population. In other words, peer-to-peer outreach will require the use of different strategies to reach, for instance, people who have never been to a FM versus those who currently use FMs. Furthermore, social marketing theory draws attention to the “four P’s” related to product, price, place, and promotion that influence decision making for adopting a new health behavior (Lefebvre & Flora, 1988). Preliminary research informing the FreshLink Ambassador intervention found segmentation among people receiving SNAP benefits related to barriers and facilitators to integrating FM use into food shopping routines (Freedman et al., 2018; Monteban et al., 2018).

The FreshLink Ambassador intervention sought to translate lessons from other peer-to-peer dissemination approaches with the goal of increasing the reach of FMs among people receiving SNAP benefits. In this analysis, the objectives were to (1) assess the feasibility of implementing the FreshLink Ambassador intervention, (2) describe who received the information about FMs disseminated by FreshLink Ambassadors, and (3) evaluate the impact of the intervention on SNAP use at FMs before and after intervention implementation.

## Methods

### Study Design and Context

This study occurred in Cleveland, Ohio, USA using a quasi-experimental design involving three intervention FMs that each received a team of three trained FreshLink Ambassadors and four comparison FMs without Ambassadors. Eight FMs met eligibility criteria including: located in or adjacent to a census tract with  $\geq 30\%$  of the households receiving SNAP benefits, accepted SNAP benefits, offered a healthy food financial incentive program, and collected FM sales data using a standardized platform to allow for comparison over time. Given variability in organizational structures, three FM types were targeted: community-based, business district, and farm stand. FMs from each FM type were randomly selected to serve as an intervention site and the remainder were comparison sites. There was heterogeneity among the participating FMs related to type, years open, average number of days open per week, and average number of vendors per market day (Table 2).

### FreshLink Ambassador Intervention

Development of the FreshLink Ambassador intervention was guided by theoretical and empirical evidence deliberated and synthesized by a community-academic research partnership within the Prevention Research Center for Healthy Neighborhoods at Case Western Reserve University. A multicomponent framework of nutritious food access underpinned the intervention by drawing attention to the importance of social access to healthy food retailers (Freedman et al., 2013). Within the context of this research, economic and spatial-temporal barriers to FM use were already being addressed through implementation of financial incentive programs and strategic location of markets in high SNAP neighborhoods (Walsh et al., 2015). However, there was not a systematic approach to address social access to FMs among low-income customers.

As described in the introduction, development of the FreshLink Ambassador intervention was theory-based and data-driven. The intervention approach was informed by diffusion theory (Rogers, 2003), social capital theory (Lin, 2001) and social marketing theory (Lefebvre & Flora, 1988) and was based on principles of community engagement (Minkler & Wallerstein, 2003).

Table 2

*Characteristics of intervention and comparison farmers' market sites for the FreshLink Ambassador intervention, 2016 and 2017*

<i>Market</i>	<i>Market Type</i>	<i>Year Opened</i>	<i>Average Number of Days Open per Week<sup>a</sup></i>	<i>Average Number of Vendors per Market Day</i>			<i>P-value</i>
				<i>2016</i>	<i>2017</i>	<i>Year to Year Difference</i>	
<i>Intervention</i>							
<i>A<sub>i</sub></i>	Community-based	2011	1.0	8.4	6.5	-1.9	< .001
<i>B<sub>i</sub></i>	Farm Stand	2014	2.9	1.0	1.0	0.0	-
<i>C<sub>i</sub></i>	Business District	2013	0.9	15.9	19.1	3.2	< .001
<i>Comparison</i>							
<i>D<sub>c</sub></i>	Community-based	1995	1.0	68.6	65.6	-3.0	.07
<i>E<sub>c</sub></i>	Community-based	1932	2.0	13.7	12.0	-1.7	< .001
<i>F<sub>c</sub></i>	Business District	2008	1.0	23.3	32.1	8.8	< .001
<i>G<sub>c</sub></i>	Business District	2013	0.8	11.3	8.3	-3.0	.02

<sup>a</sup>Average number of days open per week during 18 week intervention timeframe

<sup>i</sup>Intervention farmers' market

<sup>c</sup>Comparison farmers' market

Table 1 highlights how these theories guided intervention development. For instance, FreshLink Ambassadors were trained in strategies to promote active listening and motivational interviewing to facilitate dialogue about the compatibility of a FM within existing food shopping routines. The intervention was informed by findings from other peer-to-peer outreach studies (Hays et al., 2003; Kegeles et al., 1996; Li et al., 2012). Findings from two formative studies and a pilot study aimed at describing segmentation within an urban SNAP population in terms of the main outcome behavior (i.e., SNAP use at FMs) and the role of social connections as a diffusion mechanism for influencing decision making about food procurement also informed the intervention approach (Freedman, Flocke, et al., 2017; Freedman et al., 2018; Monteban et al., 2018). Ultimately, the FreshLink Ambassador intervention had a goal to increase FM use among people receiving SNAP benefits through efforts to promote social access to FMs.

The intervention employed an experiential, team-based, and community-engaged approach to train community residents to become FreshLink Ambassadors. The training included 10 sessions (2 hours each) followed by three months (June-August 2017) of active outreach. Training sessions focused on increasing awareness of FMs and healthy food incentive programming and logistics, developing skills to create tailored conversations about the benefits of FMs, planning and implementing outreach events, and inviting people to a FM. The intervention manual is available upon request.

Active outreach included three types of events organized within one mile of the three intervention FMs with the goal of raising awareness about and building social connectedness to these markets. One-on-one events were conversations organized by FreshLink Ambassadors in their own environment mobilizing stronger social network ties to neighbors, family, or friends. Social service outreach included weekly information booths at three government agencies where social service benefits such as SNAP were administered. Community events were organized by research staff and assigned to FreshLink Ambassadors who coordinated small and large group activities in spaces where residents congregated such as food pantries, libraries, recreation centers, and school events. At all events, FreshLink Ambassadors were encouraged to facilitate meaningful conversations and information exchange about FMs and offered interested individuals a new customer coupon worth \$5 to trial one of the three intervention FMs. Each Ambassador could provide one coupon per person or one per household. The coupons expired on September 30, 2017, one month after active outreach concluded. FreshLink Ambassadors were also trained in human subjects research given their role in data collection related to intervention evaluation.

Recruitment of FreshLink Ambassadors occurred through fliers, newsletters, and informational meetings in the targeted neighborhoods supported by the study's community advisory board and partners. FreshLink Ambassador selection was based on applicant knowledge of and connections within the targeted neighborhoods, experience in community outreach and community-based initiatives, and ability to work with diverse groups. Ambassadors were paid for their time (about 4 hours per week for 16 weeks) with a monthly stipend for a total of \$900 per Ambassador. Additionally, Ambassadors received stipends during each month of outreach for a total of \$130 to buy fruits and vegetables at the three intervention FMs. These funds promoted integration of FMs by the Ambassadors who could then report first-hand experience with foods purchased.

## Data Collection

The study protocol was approved by the Case Western Reserve University Institutional Review Board. To assess feasibility of the intervention, we evaluated recruitment and retention of the FreshLink Ambassadors and conducted surveys after the 10 training sessions to assess effectiveness. The surveys included 10 closed-ended items about the session overall and 2-3 items about the objectives for the specific session, which were scored on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Example items included: “The objectives for the session were clearly stated,” and “Everyone was encouraged to actively participate.” One survey was conducted at the end of the training to capture overall satisfaction scored on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) and level of preparedness to conduct outreach as a FreshLink Ambassador on a 10-point scale (1 = not at all prepared, 10 = Extremely prepared). All evaluations included three open-ended questions to gather qualitative feedback. Additionally, we examined changes over time in the implementation context by documenting the number of market days open and the size of each market day, which was captured by extracting data about the number of vendors at each market day from a standardized system for recording FM sales data (Freedman, Hunt, Merritt, Shon, & Pike, 2017).

Outreach was recorded in two ways, which were used to describe who received the information disseminated by FreshLink Ambassadors. First, upon receipt of the new customer coupon, a brief survey was used to collect information about the recipient’s race, sex, SNAP status, presence of children in the household, and prior experience with FMs. All coupons had an ID that linked the coupon to a FreshLink Ambassador and an outreach event. Second, information about each outreach event was recorded including date, time, location, type, and activities; and a unique event ID was given to each event.

The main outcome for evaluating the impact of the intervention on SNAP benefit use at FMs was the number of SNAP transactions and the dollars of SNAP benefits spent at the study sites before (2016) and during (2017) implementation of the FreshLink Ambassador intervention. Data are focused on 18 weeks from June-September in 2016 and 2017. All market sales data were extracted from a standardized system for recording FM sales data (Freedman, Hunt, et al., 2017).

## Analysis

To achieve the first two study objectives, summary statistics were examined to describe recruitment and retention of FreshLink Ambassadors and training evaluations as well as characteristics of FM study sites, outreach by the FreshLink Ambassadors, and people reached through coupon dissemination. Chi-square tests were conducted to assess if demographic characteristics of people reached by the FreshLink Ambassadors were significantly associated with coupon status (distribution vs. redemption). To achieve the third study objective, paired t-tests were conducted to assess intervention effectiveness by comparing mean differences between each FM site related to the number of SNAP transactions and dollars of SNAP sales from June-September in 2016 and 2017. Cluster-adjusted t-tests were also conducted to examine mean differences between intervention and comparison sites after adjusting for clustering within each FM. Given variability in market types, the dollars of SNAP sales and number of SNAP transactions were standardized to account for the number of days open per week and number of vendors per week. Standardized change scores for SNAP sales and transactions between 2016

and 2017 were calculated and used for the between-group comparisons. Analyses were conducted in SPSS (v.24) or STATA (v.15). Statistical significance was determined at  $p < .05$ .

## Results

### Feasibility of FreshLink Ambassador Implementation

The goal was to recruit nine residents (three per intervention FM) to become FreshLink Ambassadors. A total of 13 people applied, 12 interviewed, and 9 were offered and accepted the position. One Ambassador did not complete the entire study due to extenuating circumstances. Overall, evaluations of the 10-session trainings indicated participants were satisfied. The highest overall mean score was for Session 9 (4.9 out of 5.0), which involved a dinner and team building activity with both the FreshLink Ambassadors and the farmers' market managers. Session 3, which was focused on developing ground rules and providing an overview on farmers' markets and the local healthy food incentive program, had the lowest overall mean evaluation score (4.1 out of 5.0). Although this was a relatively high score indicating overall satisfaction, participants reported they were least satisfied during this session with time management. At the end of the training, the mean overall satisfaction with the training was high (4.8 out of 5.0) and participants reported an average score of 8.8 on a scale from 1-10 in terms of how prepared they felt to do outreach as a FreshLink Ambassador.

Four FMs were selected to achieve the goal of three intervention sites; one site declined participation indicating an organizational adoption rate of 75%. Table 2 provides a summary of the intervention (Markets  $A_i$ ,  $B_i$ ,  $C_i$ ) and comparison (Markets  $D_c$ ,  $E_c$ ,  $F_c$ ,  $G_c$ ) FMs. Three markets ( $A_i$ ,  $D_c$ ,  $E_c$ ) were community-based (e.g., in a park), three ( $C_i$ ,  $F_c$ ,  $G_c$ ) were in a business district (e.g., at a hospital, public square), and one ( $B_i$ ) was a farm stand located on an urban farm. A comparison farm stand was originally selected for inclusion, however, due to changes in market management processes, SNAP sales data were not uniformly recorded for the comparison farm stand. Thus, the comparison farm stand was excluded from this analysis.

During the 18-week study timeframe (June–September), three markets ( $A_i$ ,  $D_c$ ,  $F_c$ ) operated one day per week for the entire timeframe and two ( $B_i$ ,  $E_c$ ) operated more than one day per week. Two markets were open for less than 18 weeks, resulting in an average number of days open per week of 0.9 and 0.8 ( $C_i$  and  $G_c$ , respectively). However, there were no within market changes from 2016 to 2017 in terms of the number of days open during the 18-week timeframe. Independent of the FreshLink Ambassador intervention, five of the markets had statistically significant changes in the average number of vendors per market day from 2016 to 2017 with three ( $A_i$ ,  $E_c$ ,  $G_c$ ) decreasing and two ( $C_i$ ,  $F_c$ ) increasing. Overall, the average number of vendors per market week ranged from one (i.e., farm stand) to 68.6.

### Information Dissemination by FreshLink Ambassadors

The FreshLink Ambassadors conducted 155 outreach events from June-August 2017 distributing 1,138 new customer coupons (Figure 1). The 98 one-on-one events resulted in distribution of 98 new customer coupons, which represented the most common outreach approach. The greatest volume of coupons ( $n = 630$ ), however, were distributed at the 28 community events. In total, 158 coupons were redeemed at an intervention FM resulting in an overall redemption rate of 13.9%. Coupons given out at one-on-one events were the most likely to be used with a redemption rate of 22.4% while 6.8% of the coupons given out at social service

sites were redeemed. Of the 158 redeemed coupons, about two-thirds came from individuals reached by FreshLink Ambassadors at community events. Thus, while one-on-one events yielded greater redemption rates, community events ultimately reached more individuals. There was a gradient effect between number of coupons distributed near each intervention FM and coupons redeemed at the corresponding market. The most coupons ( $n = 523$ ) were distributed by Ambassadors near Market B<sub>i</sub> and this market had the highest number of coupons redeemed ( $n = 68$ ). Market B<sub>i</sub> reported the greatest year-to-year difference in standardized SNAP sales (\$1.36 increase in sales per vendor per market day open), which was practically though not statistically significant.

Table 3 summarizes the characteristics of people reached by the FreshLink Ambassadors through receipt of the new customer coupon. Most reached were female (80.3%), black (59.5%), and received SNAP benefits (59.7%). Just under half (45.4%) of the coupons disseminated were to people who had never shopped at a FM. People who were older, without children in their household, were not currently receiving SNAP benefits, and lived in the zip code with a FreshLink intervention FM were significantly more likely to redeem their coupons.

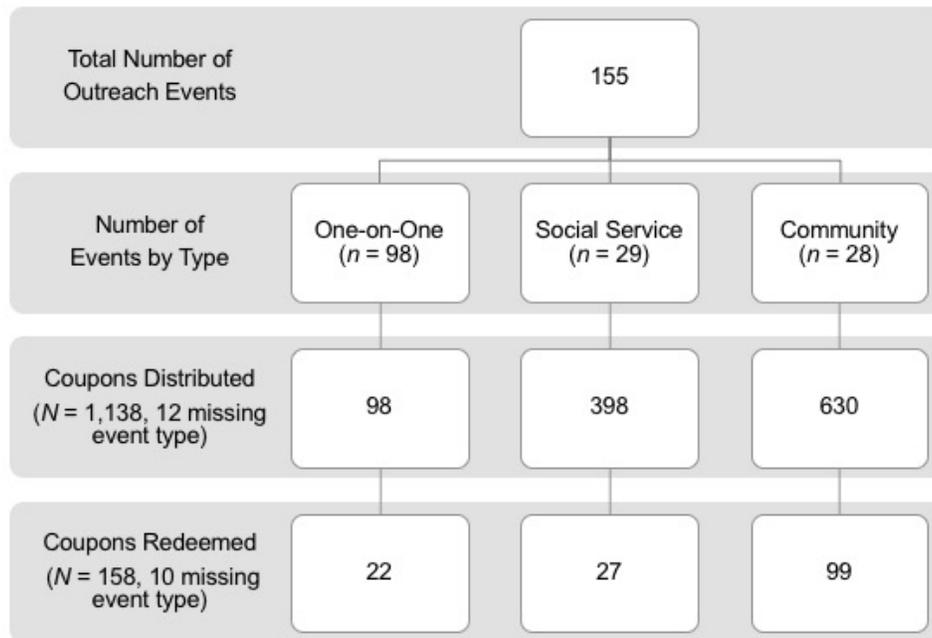


Figure 1. Summary of outreach events and new customer coupon distribution and redemption by FreshLink Ambassadors in 2017.

### Impact of Intervention on SNAP Use at Farmers’ Markets

Table 4 highlights changes in average SNAP sales and number of transactions comparing 2016 to 2017 trends. Both unstandardized and standardized estimates are reported. One intervention market (C<sub>i</sub>) reported a significant increase in the unstandardized average SNAP sales per week increasing from \$32.83 per week in 2016 to \$55.39 per week in 2017 ( $p = 0.02$ ). One comparison market (F<sub>c</sub>) reported a significant decrease in the standardized average number of SNAP sales

Table 3

*Characteristics of People Receiving and Redeeming Farmers' Market Coupon Disseminated by FreshLink Ambassadors, 2017<sup>a</sup>*

<i>Variables</i>	<i>Coupon Distributed</i>	<i>Coupons Redeemed</i>		<i>P value<sup>b</sup></i>
	<i>(N = 1,138)</i>	<i>Yes</i>	<i>No</i>	
	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	
Sex				
Male	196 (19.7)	28 (14.3)	168 (85.7)	.48
Female	797 (80.3)	99 (12.4)	698 (87.6)	
Age				
Less than 18	9 (0.9)	0 (0.0)	9 (100.0)	< .001
18-49	560 (52.6)	45 (8.0)	515 (92.0)	
50+	495 (46.5)	88 (17.8)	407 (82.2)	
Race				
White	193 (17.8)	30 (15.5)	163 (84.5)	.81
Black	647 (59.5)	80 (12.4)	567 (87.6)	
Hispanic/Latino	206 (19.0)	28 (13.6)	178 (86.4)	
Other <sup>c</sup>	41 (3.8)	4 (9.8)	37 (90.2)	
Ever Shopped at a FM				
Yes	562 (54.6)	72 (12.8)	490 (87.2)	.93
No	467 (45.4)	59 (12.6)	408 (87.4)	
Children under 18 in the household				
Yes	569 (52.7)	41 (7.2)	528 (92.8)	< .001
No	511 (47.3)	96 (18.8)	415 (81.2)	
Currently Receiving SNAP Benefits				
Yes	651 (59.7)	71 (10.9)	580 (89.1)	.02
No	440 (40.3)	69 (15.7)	371 (84.3)	
Living in Zip Code with a FreshLink Intervention FM				
Yes	316 (28.7)	61 (19.3)	255 (80.7)	< .001
No	784 (71.3)	84 (10.7)	700 (89.3)	

*Note.* FM = Farmers' Market; SNAP = Supplemental Nutrition Assistance Program; Total number of cases for each variable varies due to missing values.

<sup>a</sup>Column percentages are presented for coupons distributed and row percentages are presented for coupons redeemed.

<sup>b</sup>*P* values for differences in characteristics between coupons redeemed (yes versus no).

<sup>c</sup>Other category includes Asian, Native American, and multiple races.

Table 4

*Changes in SNAP Transactions and Sales from 2016 to 2017 at FreshLink Ambassador Farmers' Markets versus Comparison Farmers' Markets.*

<i>Market</i>	<i>Estimate</i>	<i>Average SNAP Sales</i>				<i>Average Number of SNAP Transactions</i>			
		<i>2016</i>	<i>2017</i>	<i>Year to Year Difference</i>	<i>p-value</i>	<i>2016</i>	<i>2017</i>	<i>Year to Year Difference</i>	<i>p-value</i>
A <sub>i</sub>	Unstandardized <sup>a</sup>	\$62.33	\$45.11	-\$17.22	0.17	6.22	4.89	-1.33	0.29
	Standardized <sup>b</sup>	\$7.30	\$7.29	-\$0.01	1.00	0.73	0.79	0.06	0.70
B <sub>i</sub>	Unstandardized	\$30.72	\$33.79	\$3.07	0.59	6.17	5.89	-0.28	0.77
	Standardized	\$10.27	\$11.63	\$1.36	0.48	2.06	2.01	-0.06	0.86
C <sub>i</sub>	Unstandardized	\$32.83	\$55.39	\$22.56	<b>0.02</b>	2.61	4.67	2.06	0.08
	Standardized	\$2.09	\$2.91	\$0.82	0.18	0.17	0.25	0.08	0.08
	Standardized	\$6.55	\$7.28	\$0.73	0.36	0.99	1.02	0.03	0.81
<b>Intervention Total</b>									
D <sub>c</sub>	Unstandardized	\$229.72	\$202.56	-\$27.17	0.51	13.11	14.44	1.33	0.40
	Standardized	\$3.39	\$3.18	-\$0.21	0.71	0.20	0.23	0.03	0.16
E <sub>c</sub>	Unstandardized	\$195.83	\$201.67	\$5.83	0.69	17.83	17.50	-0.33	0.76
	Standardized	\$7.17	\$8.44	\$1.27	0.07	0.66	0.73	0.08	0.18
F <sub>c</sub>	Unstandardized	\$38.56	\$53.67	\$15.11	0.33	3.94	3.28	-0.67	0.36
	Standardized	\$1.65	\$1.79	\$0.14	0.80	0.17	0.11	-0.06	<b>0.04</b>
G <sub>c</sub>	Unstandardized	\$9.89	\$11.28	\$1.39	0.70	1.06	1.00	-0.06	0.87
	Standardized	\$0.93	\$1.49	\$0.56	0.22	0.10	0.13	0.03	0.44
Comparison Total	Standardized	\$3.29	\$3.73	\$0.44	0.12	0.28	0.30	0.02	0.31

<sup>a</sup>Unstandardized estimates represent average SNAP sales and transaction per week during the 18 week timeframe in 2016 and 2017.

<sup>b</sup>Standardized estimates take into account heterogeneity of market size and duration. Standardized estimates represent SNAP sales and transactions per vendor per market day open during the 18 week timeframe in 2016 and 2017. For totals by group, only standardized values are reported due to heterogeneity of markets within each group.

Bold indicates  $p < 0.05$ .

per vendor per market day open, decreasing from 0.17 to 0.11 ( $p = 0.04$ ). Overall, both intervention and comparison FMs increased SNAP sales and transactions over time. Intervention FMs versus comparison markets had higher year to year improvements in standardized SNAP sales (\$0.73 vs. \$0.44) and SNAP transactions (0.03 vs. 0.02). These changes were not statistically significant but may be practically significant in terms of FM operations. For the between-group comparisons, there were no statistically significant differences in changes in SNAP sales and SNAP transactions from 2016 and 2017.

## Discussion

Results of the FreshLink Ambassador intervention provide evidence that community residents can be trained to conduct peer-to-peer outreach aimed at raising awareness about and promoting social connectedness to FMs located in neighborhoods with a high rate of residents receiving SNAP benefits. The FreshLink Ambassadors reached 1,138 people to disseminate information about FM locations, discuss barriers and benefits to FM use, and became a familiar contact at the intervention FMs. Building on social network theory, the true reach of the intervention is likely greater since each person interacting with a FreshLink Ambassador may have engaged in subsequent conversations about FMs. This intervention addressed a barrier found in prior research suggesting that SNAP benefit recipients are less likely to shop at a market if they were not aware of this neighborhood resource (Freedman et al., 2018; Freedman et al., 2016). Research also suggests food shopping is a social experience facilitated by connectedness to people in food procurement places (Cannuscio et al., 2014; Monteban et al., 2018). The FreshLink Ambassador intervention mobilized a peer-to-peer approach to address these barriers to FM use among people receiving SNAP benefits. Just under half of the people reached by the FreshLink Ambassadors had never shopped at a FM at the outreach intercept.

Two significant changes in SNAP use at FMs were found comparing within FM sales trends. One intervention FM experienced a significant increase in average SNAP sales per week resulting in a 69% improvement. One comparison FM experienced a significant decrease in the average number of SNAP transactions per vendor per day open resulting in a 35% decline. Although SNAP sales improved overall among both the intervention and comparison FMs, with higher levels of improvement in dollars of SNAP transacted per vendor per day open at the intervention FMs, these findings were not statistically significant. Findings should be interpreted within the context of SNAP trends in Ohio during the study timeframe. There was a 13% decline from 2016 to 2017 in the number of people receiving SNAP benefits in the county where the study occurred (Ohio Department of Job and Family Services, 2016, 2017). Thus, improvements in SNAP use at FMs in an overall declining SNAP context is a practically significant finding in this study.

The study has strengths and limitations. Community members served as researchers to promote trust and credibility, yet there is a risk of measurement bias by FreshLink Ambassadors and FM managers. Trainings, standardization of data collection, and quality control monitoring were used to reduce bias. While observers attended some of the outreach events, evaluation of the content of each interaction between an Ambassador and community member was not possible. Lack of information about why people did not use new customer coupons at a FM is another limitation. The use of a quasi-experimental design is a strength, however, given the realities of real-world implementation evaluation, there may be other factors influencing SNAP

sales trends that were not systematically measured. Not having a farm stand in the comparison group is another limitation.

### **Implications for Health Behavior Theory**

Based on pilot testing that informed the FreshLink Ambassador approach and principles of community engagement, an inclusive outreach model was used with the goal of raising awareness about FMs among everyone living in the targeted high SNAP neighborhoods. FreshLink new customer coupons were disseminated to those receiving and not receiving SNAP benefits. Using this approach, almost two out of three of the people reached by the FreshLink Ambassadors had SNAP benefits. This suggests a whole neighborhood approach is an effective way to guide outreach planning within high SNAP neighborhoods. Diffusion theory implies shifting behavioral norms such as increasing FM use will require about 16% of the population (e.g., residents in high SNAP neighborhood) to adopt the behavior (e.g., FM use) (Rogers, 2003).

Among those who were reached by the FreshLink Ambassadors, about 14% redeemed their new customer coupon at one of the intervention FMs. Redemption rates were highest for coupons distributed via one-on-one events (22%) and lowest for those distributed at events at social services sites (7%). This aligns with social capital theory, which avows stronger social ties exhibited in a one-on-one interaction may be more trustworthy and thus more likely to translate into action (Granovetter, 1973). The overall redemption rate was higher than the national average for coupon redemption (< 1%) indicating the “product” and “price” promoted by FreshLink Ambassadors were considered advantageous (Jones, Steward-Streng, Davenport, & Rogers, 2016). In contrast, most coupon distribution approaches use passive methods for dissemination with instantly redeemable coupons having the highest redemption rates (18%) while free-standing inserts have the lowest (0.4%) (Jones et al., 2016).

Theories informing this study organized within the “four P’s” of social marketing provide justification for higher coupon redemption rates within the FreshLink study (Lefebvre & Flora, 1988). The active dissemination approach by Ambassadors focused on messaging about how the “product” of a farmers’ market was compatible with existing food habits. Use of indigenous leaders serving as messengers addressed the importance of integrating into the intervention approach the “people” and “places” that may be more trusted and credible than outsiders. Finally, use of tailored messages by Ambassadors to reach different populations allowed for audience segmented “promotion” based on unique barriers and facilitators of FM use. Furthermore, the value of the FreshLink coupon was about five times higher than the national average for food-related coupons (\$5.00 versus \$1.11, respectively), which relates to the “price” aspect of social marketing (Jones et al., 2016). Future research is needed to examine whether instantly redeemable or differently valued coupons available at FMs may be an additional benefit to promote FM shopping behaviors. As other interventions seek to integrate coupons as a strategy for promoting health-seeking behaviors such as FM use, it will be important to explore emerging methods for distribution (i.e., digital coupons) that enable location-based dissemination (Pandey & Maheshwari, 2017).

FreshLink coupon redemption was significantly higher for people who were 50 years of age or older, without children in the household, not currently receiving SNAP benefits, and living in the zip code where a FreshLink FM was located. These findings corroborate prior research, which has found that FM shoppers tend to be older and only a small proportion of SNAP recipients choose to shop at FMs (Freedman et al., 2016; U.S. Department of Agriculture,

2018). While most outreach by the FreshLink Ambassadors occurred within one mile of the intervention FMs, outreach conducted at the social services sites resulted in connections made with people living in a broader geographic area. Individuals living outside of the intervention zip codes had additional barriers to accessing the intervention FMs that may be exacerbated by transportation constraints. Finally, findings suggest additional efforts, beyond the initial scope of the FreshLink Ambassador model, may be needed to support FM use among families with children juggling multiple demands (i.e., constrained free time) that limit capacity to integrate FM use into food shopping routines.

### Conclusion

This study provides evidence that implementation of the peer-to-peer outreach approach was feasible and redemption of new customer coupons disseminated by FreshLink Ambassadors exceeded industry trends for coupon redemption. While intervention FMs improved SNAP sales at greater levels compared to comparison FMs, the results were not statistically significant but may be practically significant in terms of FM operations. Future research is warranted to evaluate different strategies intended to promote social access to FMs as a part of a broader agenda to advance health equity.

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### References

- Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: What the patterns tell us. *American Journal of Public Health, 100*(Suppl 1), S186-S196. <https://doi.org/10.2105/AJPH.2009.166082>
- Cannuscio, C. C., Hillier, A., Karpyn, A., & Glanz, K. (2014). The social dynamics of healthy food shopping and store choice in an urban environment. *Social Science and Medicine, 122*, 13-20. <https://doi.org/10.1016/j.socscimed.2014.10.005>
- Caspi, C. E., Sorensen, G., Subramanian, S. V., & Kawachi, I. (2012). The local food environment and diet: A systematic review. *Health & Place, 18*(5), 1172-1187. <https://doi.org/10.1016/j.healthplace.2012.05.006>
- Centers for Disease Control and Prevention. (2009). *State indicator report on fruits and vegetables, 2009: National action guide*. Retrieved from <https://www.cdc.gov/nutrition/downloads/StateIndicatorReport2009.pdf>

- Centers for Disease Control and Prevention. (2013). *Winnable battles final report*. Retrieved from <https://www.cdc.gov/winnablebattles/report/docs/winnable-battles-final-report.pdf>
- Earp, J. A., Eng, E., O'Malley, M. S., Altpeter, M., Rauscher, G., Mayne, L., . . . Qaqish, B. (2002). Increasing use of mammography among older, rural African American women: Results from a community trial. *American Journal of Public Health, 92*(4), 646-654.
- Freedman, D. A., Blake, C. E., & Liese, A. D. (2013). Developing a multicomponent model of nutritious food access and related implications for community and policy practice. *Journal of Community Practice, 21*(4), 379-409. <https://doi.org/10.1080/10705422.2013.842197>
- Freedman, D. A., Flocke, S., Shon, E.-J., Matlack, K., Trapl, E., Ohri-Vachaspati, P., . . . Borawski, E. (2017). Farmers' market use patterns among Supplemental Nutrition Assistance Program recipients with high access to farmers' markets. *Journal of Nutrition Education and Behavior, 49*(5), 397-404.e1. <https://doi.org/10.1016/j.jneb.2017.01.007>
- Freedman, D. A., Hunt, A. R., Merritt, K., Shon, E., & Pike, S. N. (2017). Dissemination of technology to evaluate healthy food incentive programs. *American Journal of Preventive Medicine, 52*(3Suppl3), S309-S314. <https://doi.org/10.1016/j.amepre.2016.08.036>
- Freedman, D. A., Lee, E., Ohri-Vachaspati, P., Trapl, E., Borawski, E., Bess, K., & Flocke, S. (2018). Predictors of farmers' market shopping among people receiving Supplemental Nutrition Assistance Program benefits. *American Journal of Community Psychology, 61*(3-4). <https://doi.org/10.1002/ajcp.12245>
- Freedman, D. A., Vaudrin, N., Schneider, C., Trapl, E., Ohri-Vachaspati, P., Taggart, M., . . . Flocke, S. (2016). Systematic review of factors influencing farmers' market use overall and among low-income populations. *Journal of the Academy of Nutrition and Dietetics, 116*(7), 1136-1155. <https://doi.org/10.1016/j.jand.2016.02.010>
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology, 78*(6), 1360-1380.
- Hays, R. B., Rebchook, G. M., & Kegeles, S. M. (2003). The Mpowerment Project: Community-building with young gay and bisexual men to prevent HIV. *American Journal of Community Psychology, 31*(3-4), 301-312. <https://doi.org/10.1023/A:1023966905973>
- Jones, S., Steward-Streng, N., Davenport, M., & Rogers, D. (2016, April). *Promotion industry trends: A year in review*. Paper presented at the 2016 Inmar Analytics Forum, Winston-Salem, SC.
- Kegeles, S. M., Hays, R. B., & Coates, T. J. (1996). The Mpowerment Project: A community-level HIV prevention intervention for young gay men. *American Journal of Public Health, 86*(8), 1129-1136. [https://doi.org/10.2105/AJPH.86.8\\_Pt\\_1.1129](https://doi.org/10.2105/AJPH.86.8_Pt_1.1129)
- Kelly, J. A., St. Lawrence, J. S., Diaz, Y. E., Stevenson, L. Y., Hauth, A. C., Brasfield, T. L., . . . Andrew, M. E. (1991). HIV risk behavior reduction following intervention with key opinion leaders of population: An experimental analysis. *American Journal of Public Health, 81*(2), 168-171. <https://doi.org/10.2105/AJPH.81.2.168>
- Lefebvre, R. C., & Flora, J. A. (1988). Social marketing and public health intervention. *Health Education & Behavior, 15*(3), 299-315. <https://doi.org/10.1177/109019818801500305>
- Li, J., Weeks, M. R., Borgatti, S. P., Clair, S., & Dickson-Gomez, J. (2012). A social network approach to demonstrate the diffusion and change process of intervention from peer health advocates to the drug using community. *Substance Use and Misuse, 47*(5), 474-490. <https://doi.org/10.3109/10826084.2012.644097>

- Lin, N. (2001). *Social capital: A theory of social structure and action*. New York, NY: Cambridge University Press.
- Lomas, J., Enkin, M., Anderson, G. M., Hannah, W. J., Vayda, E., & Singer, J. (1991). Opinion leaders vs. audit and feedback to implement practice guidelines: Delivery after previous cesarean section. *Journal of the American Medical Association*, *265*, 2202-2207. <https://doi.org/10.1001/jama.1991.03460170056033>
- Minkler, M., & Wallerstein, N. (Eds.). (2003). *Community-based participatory research for health*. San Francisco, CA: Jossey-Bass.
- Monteban, M. F., Bess, K. D., Walsh, C. C., Baily, H., Flocke, S. A., Borawski, E. A., & Freedman, D. A. (2018). People and places shaping food procurement among recipients of Supplemental Nutrition Assistance Program (SNAP). *Health & Place*, *53*, 155-163. <https://doi.org/10.1016/j.healthplace.2018.08.003>
- Ohio Department of Job and Family Services. (2016). *Public assistance monthly statistics report, July 2016*. Retrieved from <http://jfs.ohio.gov/pams/Reports/PAMS2016-JULY.stm>
- Ohio Department of Job and Family Services. (2017). *Public assistance monthly statistics report, July 2017*. Retrieved from [http://jfs.ohio.gov/pams/PAM-2017-REPORTS/PAMS\\_July\\_2017.stm](http://jfs.ohio.gov/pams/PAM-2017-REPORTS/PAMS_July_2017.stm)
- Pandey, N., & Maheshwari, V. (2017). Four decades of coupon research in pricing: Evolution, development, and practice. *Journal of Revenue and Pricing Management*, *16*(4), 397-416. <https://doi.org/10.1057/s41272-016-0076-7>
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Valente, T. W., & Pumpuang, P. (2007). Identifying opinion leaders to promote behavior change. *Health Education & Behavior*, *34*(6), 881-896. <https://doi.org/10.1177/1090198106297855>
- Walsh, C. C., Taggart, M., Freedman, D. A., Trapl, E. S., & Borawski, E. A. (2015). The Cleveland-Cuyahoga County Food Policy Coalition: "We have evolved". *Preventing Chronic Disease*, *12*, 140538. <http://dx.doi.org/10.5888/pcd12.140538>
- Yuan, C. T., Nembhard, I. M., Stern, A. F., Brush, J. E., Krumholz, H. M., & Bradley, E. H. (2010). Blueprint for the dissemination of evidence-based practices in health care. *The Commonwealth Fund*, *1399*(86), 1-14.
- U.S. Department of Agriculture. (2018). *Comparison of SNAP authorized farmers and markets FY2012 and FY2017*. Retrieved from Washington, DC: <https://fns-prod.azureedge.net/sites/default/files/snap/SNAP-Farmers-Markets-Redemptions.pdf>