wholesome wave georgia

FVRx Evaluation Report 2018

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This report was prepared by the Emory University Evaluation Team for Wholesome Wave Georgia.

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Program Description

Wholesome Wave Georgia's Fruit and Vegetable Prescription Program (FVRx®) for the year 2018 was conducted across 4 primary care clinic sites serving low-income communities in Atlanta, Athens, and Augusta, GA. Participants were eligible based on food insecurity and low-income level. This report summarizes the results from the baseline and endline evaluation of the 2018 FVRx ® Program. This multicomponent clinic-based program is intended to increase access to healthy foods among low-income Georgians. Over six months, patients received fruit and vegetable vouchers worth $1 per family member per day, redeemable at a local food retail site, as well as nutrition education, cooking classes, and, for some sites, group exercise classes. Eligibility criteria for participating in the program included screening positive for food insecurity (USDA 2-item screener), being 18 years or older, and currently receiving healthcare through the selected healthcare system.

Data Collection

Participants completed surveys at baseline and post-intervention (endline) to assess demographic characteristics, food security, self-efficacy and confidence around healthy eating, perceptions around access to fruits and vegetables, as well as fruit and vegetable consumption. At monthly visits, all sites collected information on both fruit and vegetable consumption as well as weight, waist circumference, and blood pressure. Some sites collected information on hemoglobin A1C measures as well.

Statistical Methods

Descriptive statistics (e.g., means, frequencies, cross-tabulations) were used to document program implementation, to assess baseline characteristics of FVRx program participants, and to describe any changes in key outcomes, such as frequency of shopping at farmers' markets, fruit and vegetable consumption, and body weight, from pre-test to post-test. Fisher's exact tests were used to estimate significant differences between those retained in the program compared to those who dropped out. Analysis of change from enrollment to endline was conducted for those with data at both time points using the Monte Carlo simulation of the Fisher's Exact test to assess change in frequencies for categorical data. Paired t-tests were used to test the significance of change in measurements for continuous outcomes including knowledge, confidence, fruit consumption, and vegetable consumption outcomes. Longitudinal approaches were used to analyze measurements collected on a monthly basis. Mixed models were used to create unadjusted and adjusted models with both fixed and random effects to control for variations across site and for the confounding presented by participant sex and age. Model specification was determined using the backwards elimination technique.

Participant Loss to Follow-up

The 2018 FVRx Program enrolled 243 participants, of which 190 were retained through the six-months (78% retention rate). A total of 235 participants completed the baseline evaluation and 155 participants completed the endline evaluation. Data presented in this report represent participants that completed both baseline and endline surveys, and excludes those that dropped out unless otherwise indicated. Return participants of the program (those who had completed the program during a previous year) were also excluded from the report. Details on the full cohort at enrollment can be found in the baseline report available from Emory, Wholesome Wave Georgia and Open Hand. Bias analyses (Appendix I) noted very little difference between participants retained in the program from those who dropped out.

Table 1. Participant Loss to Follow-up

Site	Baseline N	Endline N	% Difference
Overall	235	155	-34.0426
Athens	31	18	-41.9355
Augusta	42	31	-26.1905
Grady	114	83	-27.193
Good Sam - total	48	23	-52.0833
Good Sam - new participants	35	10	-71.4286

Demographics

The 2018 FVRx cohort represents a largely underserved population with 83% reporting a household income less than $2,000 monthly and over 50% reporting that they were enrolled in SNAP. Approximately one third of participants (33.1%) did not have any form of health insurance and 43% reported to be insured through Medicaid, Medicare, or other public insurance. Nearly one third of all participants received disability as their primary means of income and fewer than 18% of participants reported working full-time.

Figure 1. Overall health Insurance Status

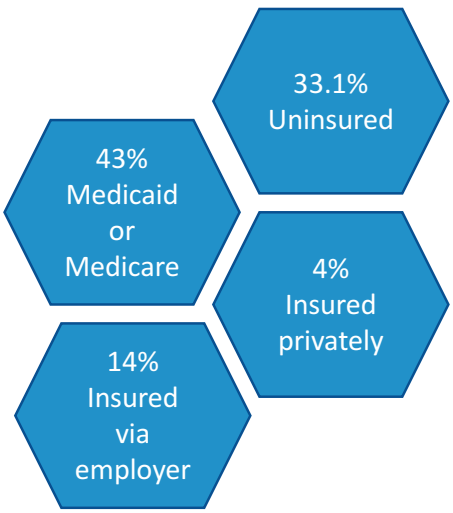
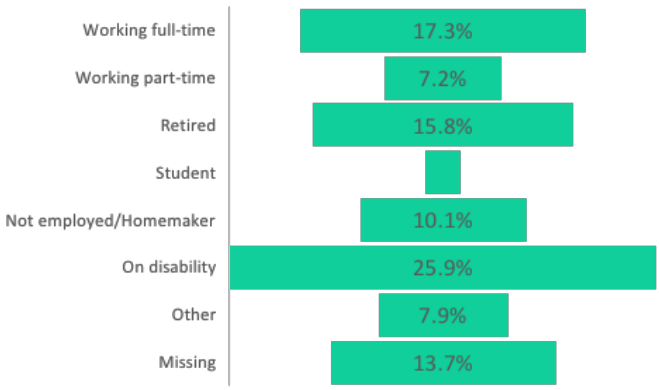


Figure 2. Employment Status



Demographics

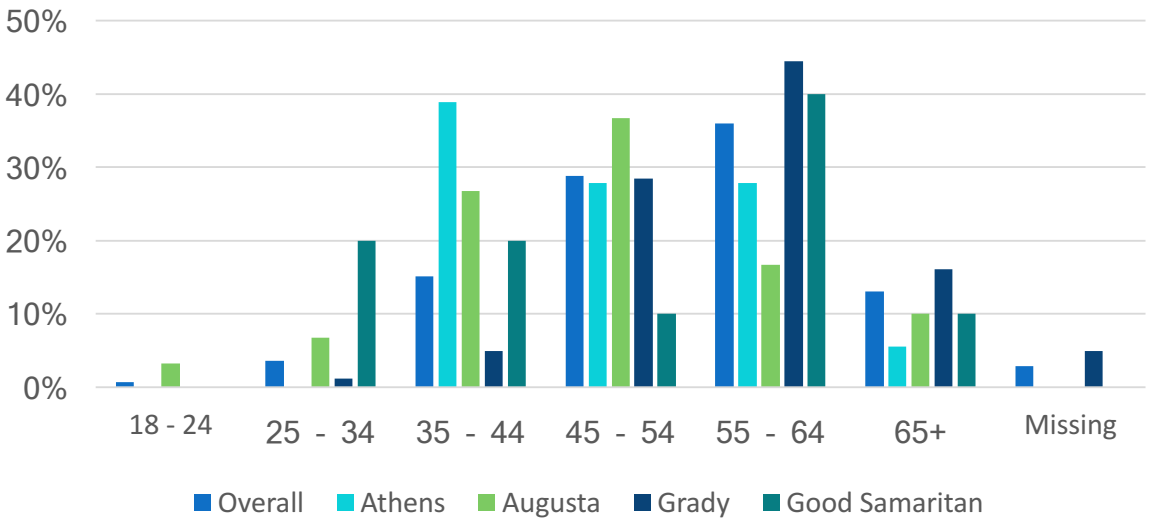
Participants were largely female (78.4%) and non-Hispanic African-American (79%) across all sites. Most participants fell between the ages of 45-64 years old (65%), with a slightly younger population in the Athens site and an older population in Grady cohorts. Overall, 41% of participants used public transportation to access the program, followed by driving a personal vehicle (34.5%), and receiving rides from someone else (13%).

Table 2. Reported participation in public assistance programs (n=139)

Race/Ethnicity	Overall (n=139)	Athens (n=18)	Augusta (n=30)	Grady (n=81)	Good Samaritan (n=10)
Non-Hispanic Black	79%	28%	73%	90%	100%
Non-Hispanic White	6%	17%	13%	1%	0%
Hispanic	9%	56%	7%	0%	0%
Other	5%	0%	7%	6%	0%
Missing	1%	0%	3%	3%	0%

Median household size: 3 people

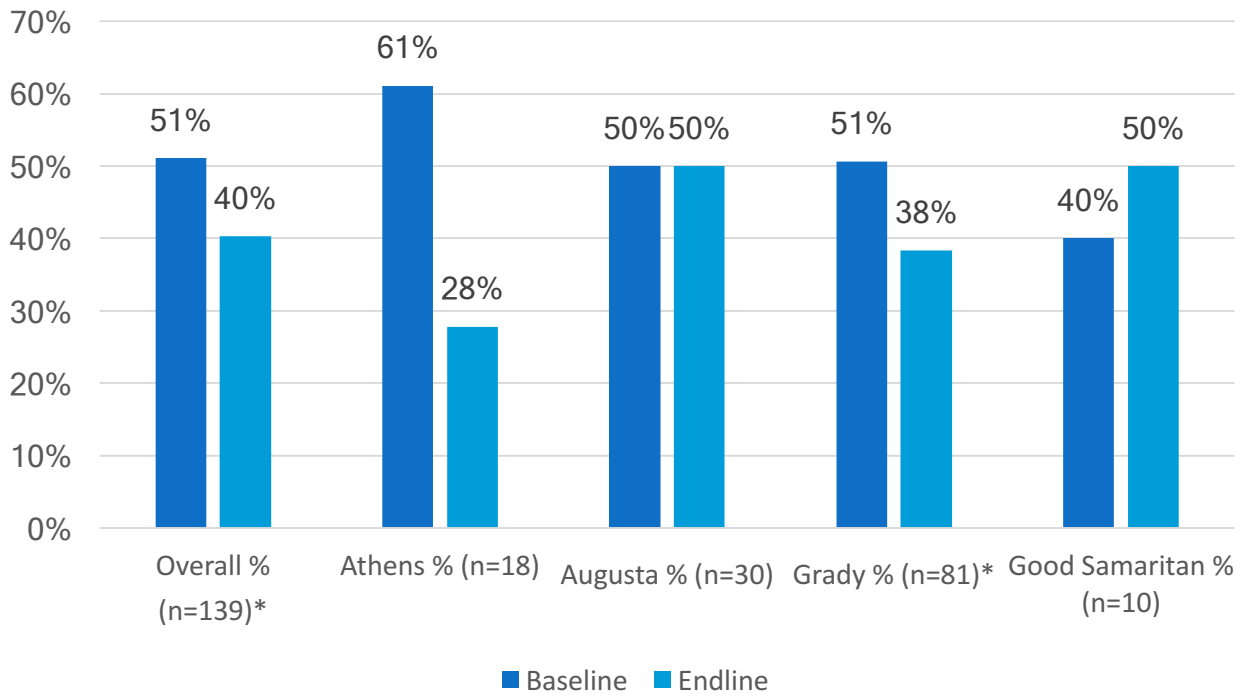
Figure 3. Age distribution of FVRx Participants



Food Security

Participants screened for food insecurity in the last 30-days at baseline and post-intervention. Evaluators used questions from the the USDA 6-item Food Security Screener and calculated food security status scores based on responses and statistical significance testing using the fisher's exact test. From baseline to the end of the program, the percentage of participants screening positive for food insecurity decreased significantly by 11% (significant at <.0001). Overall change and change by site in food insecurity is represented in Figure 4.

Figure 4. Change in food insecurity status from baseline to endline overall and by site



ER Visits and Medication Adherence

Participants were asked questions at baseline and post-intervention about emergency room visits in the past 6 months and changes in medication dosage in the past 3 months. A statistically significant reduction in overall ER visits was seen from baseline to endline (Figure 5) as well as a statistically significant increase in the percentage of participants reporting that their doctors had reduced their dose of medication in the past 3 months from baseline to endline (Figure 6). There was a statistically significant increase in participants reporting that they had skipped medication in the last 3-months from baseline to endline (Figure 7), with participants citing a variety of barriers including medication not being available at the pharmacy to medication recalls, to schedule disruption.

Figure 5. Frequency of participants reporting that visited the ER in the past 6 months (n=139)

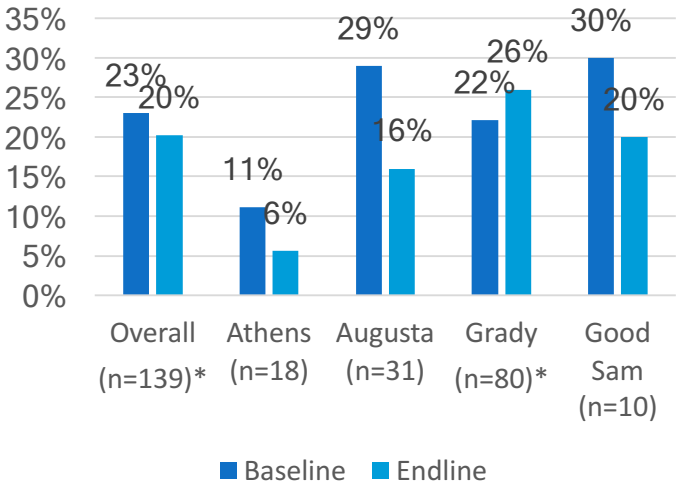


Figure 6. Frequency of participants whose doctors reduced medication from baseline to endline (n=139)

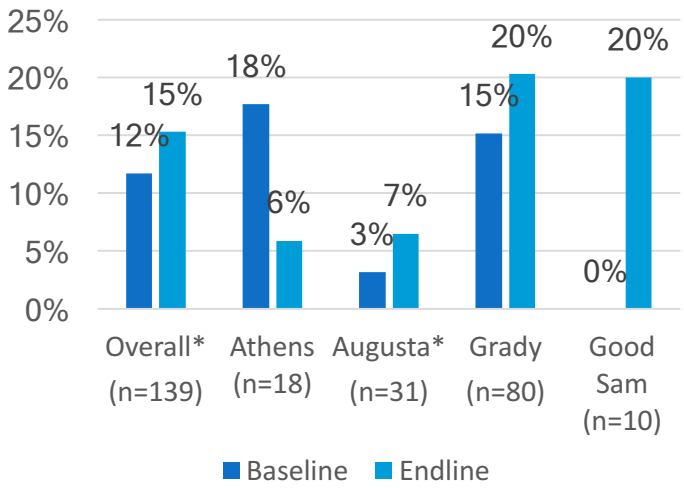


Figure 7. Frequency of participants reporting that they skipped medication in the past 3 months at baseline and endline (n=139)

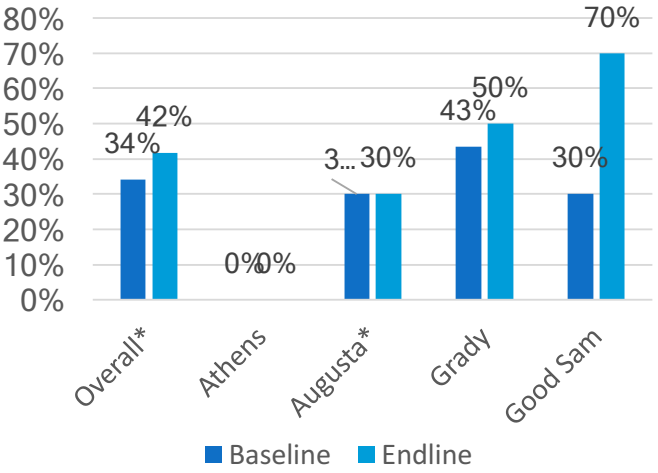
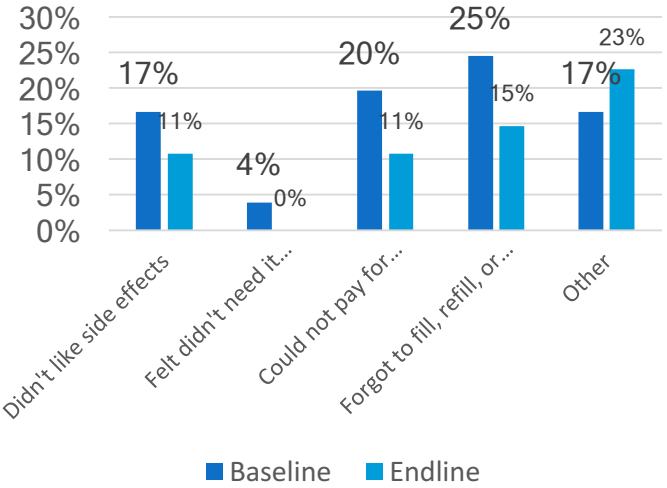


Figure 8. Feedback on why participants skipped medication (n=102)



Changes in Reported Diet

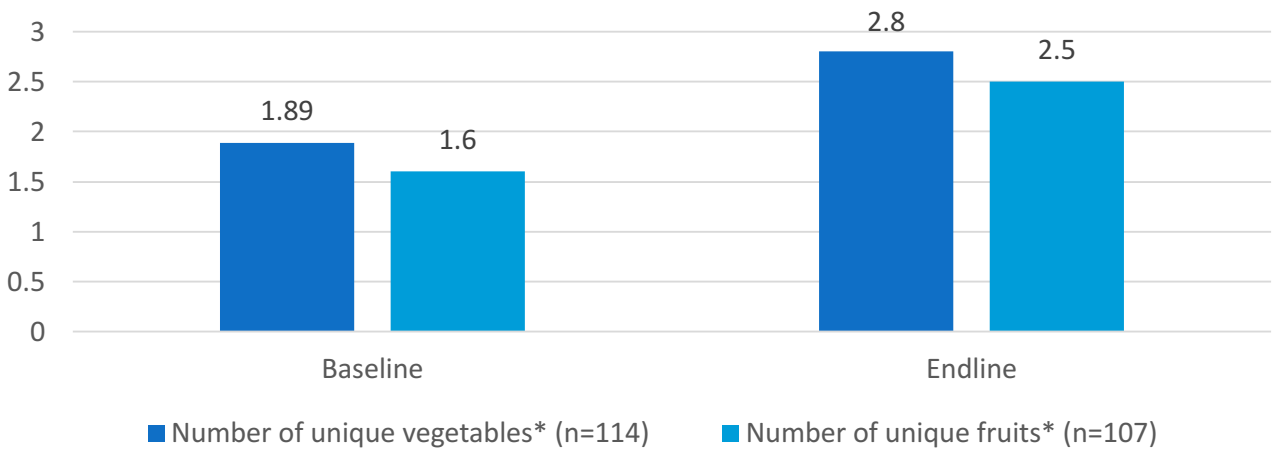
Participants were asked questions at baseline and endline about their fruit and vegetable consumption patterns. One method included listing all of the fruits and vegetables consumed in the previous 24 hours. The number of unique fruits and vegetables reported were tallied for each participant and the average number of unique fruits and vegetables calculated for baseline and endline. The mean number of unique fruits consumed in the previous 24 hours increased by 0.79 (95% CI 0.4, 1.2) and was statistically significant (paired t-test, p-value=0.0004). Similarly, the mean number of unique vegetables consumed in the previous 24 hours increased by 0.95 (95% CI 0.5, 1.4) and was statistically significant (paired t-test, p-value = <.0001) (Table 4).

Table 3. Number of unique fruits and vegetables consumed in the past 24 hours[1]

Characteristic	Baseline Median (IQR) and mean ± StDev	Endline Median (IQR) and mean ± StDev	% Mean Difference	Mean Change (95% CI)	P-Value
Number of unique vegetables (n=114)	2.0 (1.0, 3.0)	2.0 (2.0, 4.0)	48.1%	0.95	<.0001*
	1.89 ± 1.59	2.8 ± 1.7		(0.5, 1.4)	
Number of unique fruits (n=107)	1.0 (0.0, 2.0)	2.0 (1.0, 3.0)	53.1%	0.79	0.0004*
	1.6 ± 1.56	2.5 ± 1.40		(0.4, 1.2)	

[1] **Athens FV recall data not included in analysis**

Figure 9. Mean number of unique fruits and vegetables consumed in the past 24 hours



* Statistically significant at p < 0.05

Changes in Reported Diet

Participants reported a total of 68 unique types of vegetable at baseline (Figure 10) and 58 at endline (Figure 11), including misclassifications. Data represent the total baseline population, including those lost to follow up at endline. Overall there were 22 misclassifications of vegetables at baseline and 25 at endline. Commonly cited misclassifications for vegetables included listing white potatoes, legumes and beans, and pickled products such as olives and pickles.

Figure 10. Word cloud representing the frequency of types of vegetables reported during baseline 24-hour recall. (n=114)

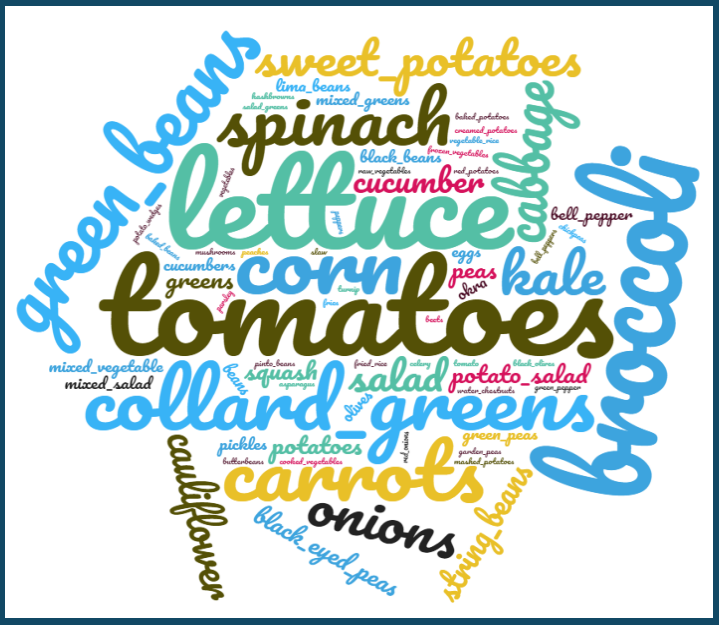
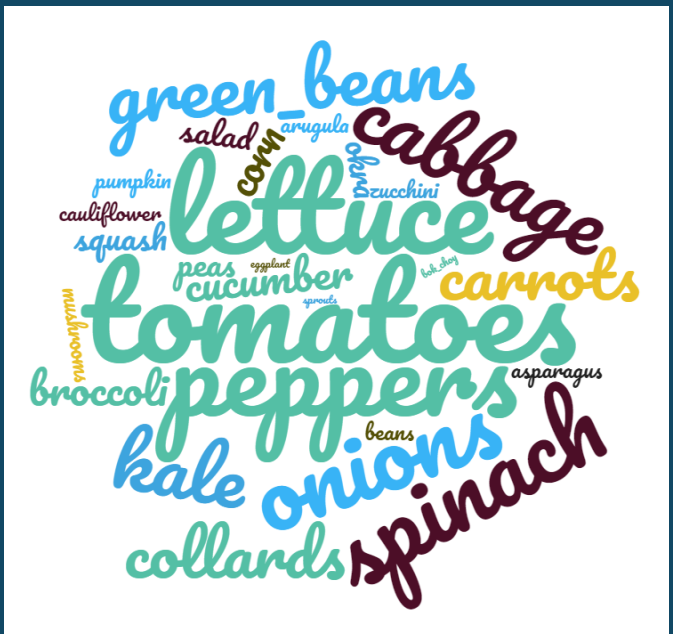


Figure 11. Word cloud representing the frequency of types of vegetables reported during endline 24-hour recall. (n=107)



Changes in Reported Diet

Participants reported a total of 40 unique types of fruit at baseline (Figure 12) and 43 unique types of fruit at endline (Figure 13), including misclassifications, of which there were 6 at baseline and 9 at endline. Commonly cited misclassifications for fruits were juice from concentrate, such as cranberry cocktail and tomatoes.

Figure 12. Word cloud representing the frequency of types of vegetables reported during baseline 24-hour recall. (n=114)

Figure 13. Word cloud representing the frequency of types of vegetables reported during endline 24-hour recall. (n=107)

Changes in Reported Diet

Participants were asked to report how frequently they consumed fruits, vegetables, and potatoes. The answer choices included *not at all*, *once a week or less*, *more than once a week*, *once a day*, and *more than once a day*. A score of 0 to 4 was given for each response with 0 indicating *not at all*, 1 indicating *once a week or less*, 2 indicating *more than once a week*, 3 *indicating once a day*, and 4 indicating *more than once a day*. Scores increased significantly for fruit, dark greens and other vegetables (e.g. carrots, sweet potatoes, broccoli, and green beans); scores for the frequency of eating fried potatoes also decreased significantly from baseline to endline.

Table 4. Consumption scores for fruit, vegetables, and potatoes at baseline and endline.

Characteristic	Baseline Median (IQR) and mean StDev (n=105)	Endline Median (IQR) and mean StDev (n=107)	Mean Change (95% CI)	p-value
Fruit	2.0 (1.0, 3.0) 2.2 ± 1.2	3.0 (2.0, 4.0) 2.8 ± 1.1	0.6 (0.4, 0.9)	<.0001*
Salad	2.0 (1.0, 2.0) 1.9 ± 1.0	2.0 (1.0, 3.0) 2.1 ± 1.0	0.2 (0.0, 0.4)	0.06
Dark green vegetables	2.0 (1.0, 2.0) 1.6 ± 0.8	2.0 (1.0, 3.0) 2.1 ± 1.0	0.5 (0.3, 0.7)	<.0001*
Other vegetables	2.0 (1.0, 2.0) 1.8 ± 0.9	2.0 (2.0, 3.0) 2.3 ± 1.0	0.4 (0.2, 0.6)	<.0001*
Fried potatoes	1.0 (1.0, 1.0) 1.1 ± 0.7	1.0 (0.0, 1.0) 0.9 ± 0.7	-0.16 (-0.3, -0.03)	0.02*
Non-fried potatoes	1.0 (0.0, 1.0) 1.0 ± 0.8	1.0 (0.0, 1.0) 1.0 ± 0.8	-0.03 (-0.2, 0.2)	0.75

Table 5. Consumption scores by site for fruit, vegetables, and potatoes at baseline and endline

Characteristics	Athens (n=18)			Augusta (n=31)			Grady (n=81)			Good Samaritan (n=10)		
	BL	EL	P-Value	BL	EL	P-Value	BL	EL	P-Value	BL	EL	P-Value
Fruit	2.4	3.2	0.01*	2.0	2.7	0.001*	2.3	2.8	0.005*	2.4	3.2	0.07
Salad	1.9	2.7	0.01*	1.8	2.0	0.4	1.9	1.9	0.8	2.3	2.7	0.3
Dark green vegetables	1.6	2.4	0.004*	1.8	2.0	0.09	1.6	2.1	0.0004*	2	2.6	0.1
Other vegetables	1.6	2.4	0.005*	1.9	2.4	0.1	1.7	2.1	0.003*	2.5	2.6	0.8
Fried potatoes	1.3	0.8	0.07	1.2	1.0	0.2	1	0.9	0.3	1.1	1.1	1
Non-fried potatoes	0.8	1.3	0.4	1.1	0.9	0.3	0.9	0.9	0.6	1.4	1.2	0.6

* Statistically significant at $p < 0.05$

Attitudes

Participants were asked to report the extent to which they believed that fresh fruits and vegetables were available in their neighborhood and to what extent they were affordable. There was a statistically significant change in responses from baseline to endline for both statements. There was a slight decrease in the number of participants reporting that fruits and vegetables were *never* easy to find in their neighborhood and a 9% increase in participants reporting that fruits and vegetables were *always* affordable.

Figure 14. Proportion reporting whether fresh fruits and vegetables are easy to find in their neighborhood* (n=139)

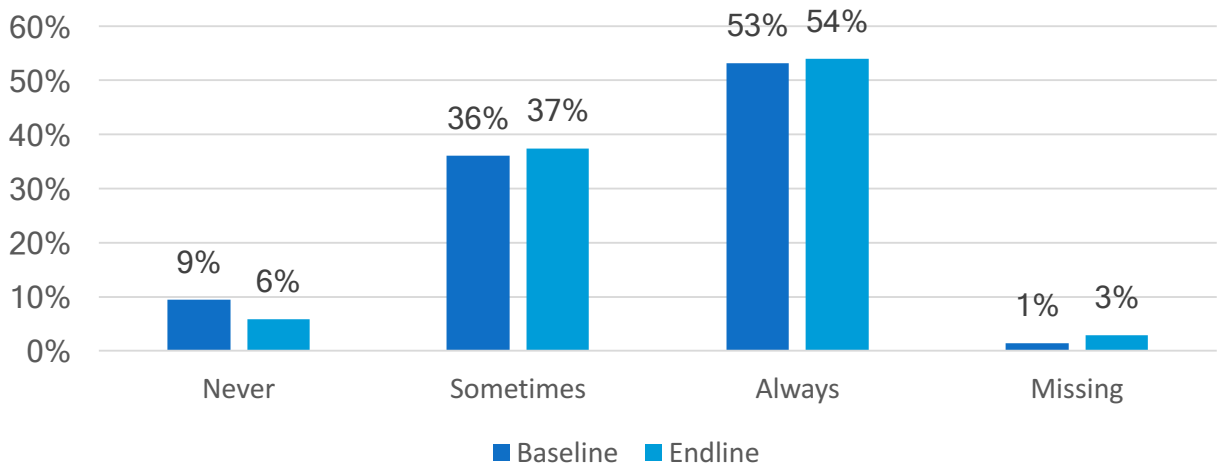
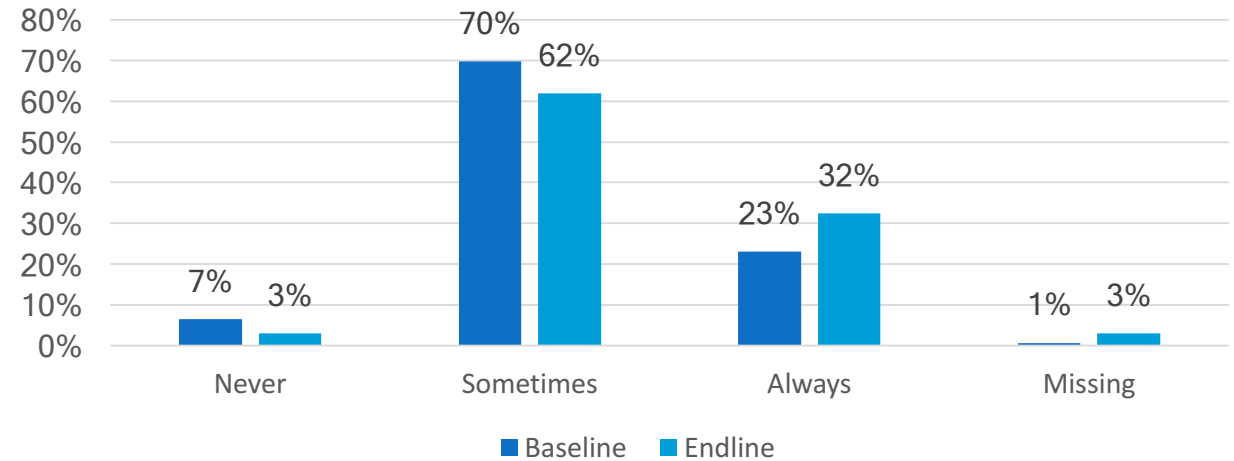


Figure 15. Proportion reporting whether fruits and vegetables are affordable* (n=139)



* Statistically significant at $p < 0.05$

Attitudes

Participants were also asked to report the extent to which they felt willing to try new foods. A statistically significant change was seen from baseline to endline; however this change was inverse to the desired outcome showing that participants reported a 13% decrease in being *always* willing to try new foods, while reporting a 9% increase in being *sometimes* willing to try new foods. Participants were also asked about their attitudes towards cooking. Statistically significant change was seen across cooking statements with an increase in participants responding *never* to statements about cooking being *frustrating*, cooking taking *too much time*, and cooking being *too much work* (Table 6).

Figure 16. Proportion reporting willingness to try new foods at baseline and endline* (n=139)

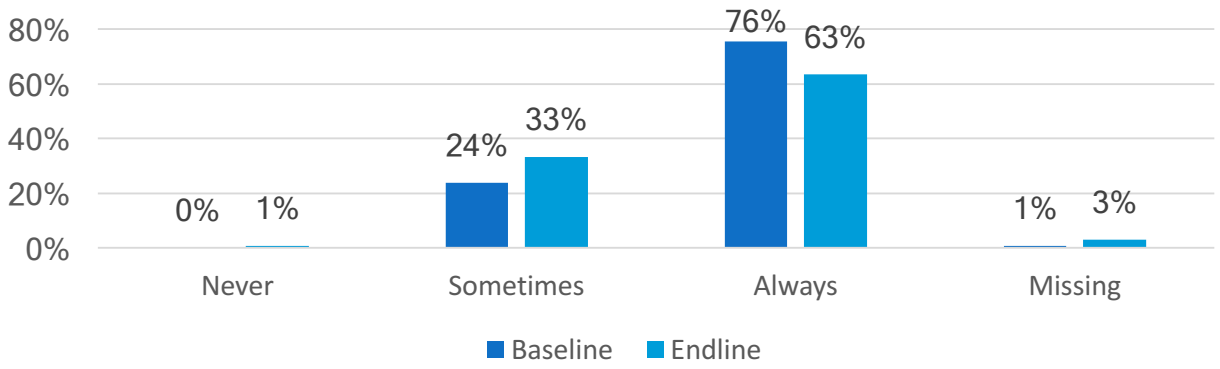


Table 6. Change in reported attitudes towards cooking from baseline to endline

	Overall Baseline (n=121)				Overall Endline (n=121)				P-Value
Statement	*Never*	*Sometimes*	*Always*	*Missing*	*Never*	*Sometimes*	*Always*	*Missing*	
Cooking takes too much time	46 (38.0%)	65 (53.7%)	7 (5.8%)	3 (2.5%)	51 (42.2%)	65 (53.7%)	4 (3.3%)	1 (0.8%)	*<.0001**
I think cooking is fun	4 (3.3%)	59 (48.8%)	58 (47.9%)	0 (0.0%)	2 (1.7%)	54 (44.6%)	64 (52.9%)	1 (0.8%)	*<.0001**
Cooking is frustrating	65 (53.7%)	46 (38.0%)	8 (6.6%)	2 (1.7%)	81 (66.9%)	34 (28.1%)	2 (1.7%)	4 (3.3%)	*<.0001**
It takes too much work to cook	59 (48.8%)	57 (47.1%)	5 (4.1%)	0 (0.0%)	72 (59.5%)	44 (36.4%)	4 (3.3%)	1 (0.8%)	*<.0001**

* Statistically significant at $p < 0.05$

Behavior Change

Participants were asked questions at baseline and endline related to their shopping behaviors, including how frequently they shop at different food retail outlets and how frequently they purchased fruits and vegetables from those retail outlets. Participants responding that they shopped at farmers markets increased by nearly 30%, however this change was not found to be significant. There was a statistically significant change in frequency of shopping at produce trucks/produce stands.

Figure 17. Change in farmers' market shopping behaviors from baseline to endline (n=139)

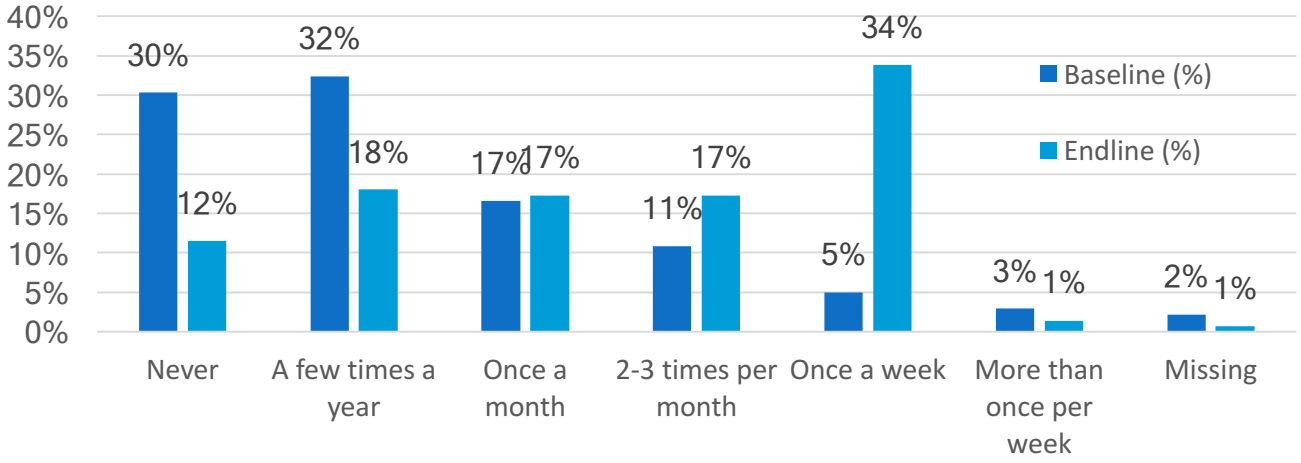
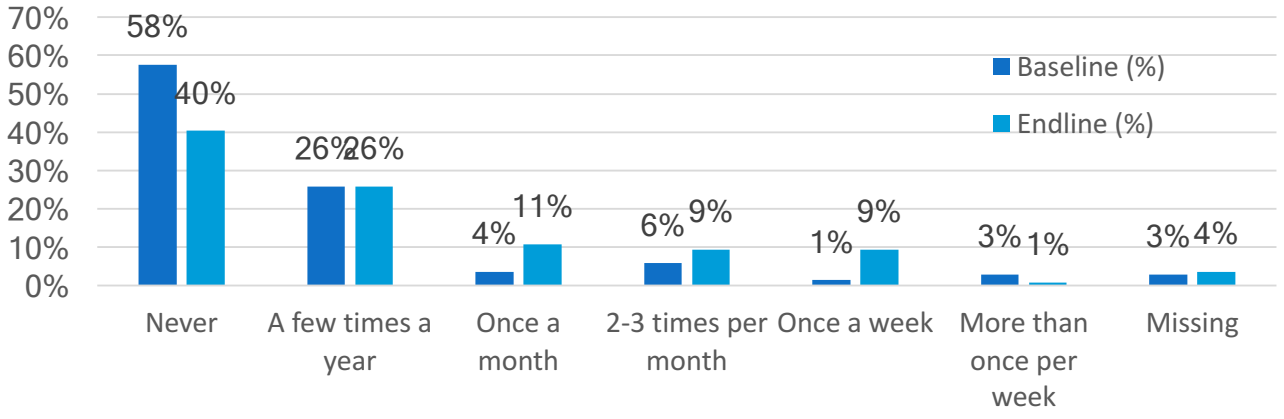


Figure 18. Change in produce truck/produce stand shopping behaviors from baseline to endline* (n=139)



* Statistically significant at $p < 0.05$

Behavior Change

Statistically significant change was seen in participants purchasing fresh fruits and vegetables in *Dollar Stores* and in *Convenience Stores/Gas Stations*. There was an increase (23%) in respondents reporting that they *always* or *most of the time* purchased produce at local farmers' markets, however this change was not found to be statistically significant.

Figure 19. Change in fruit and vegetable purchasing behaviors at Supermarkets/Grocery Stores (n=139)

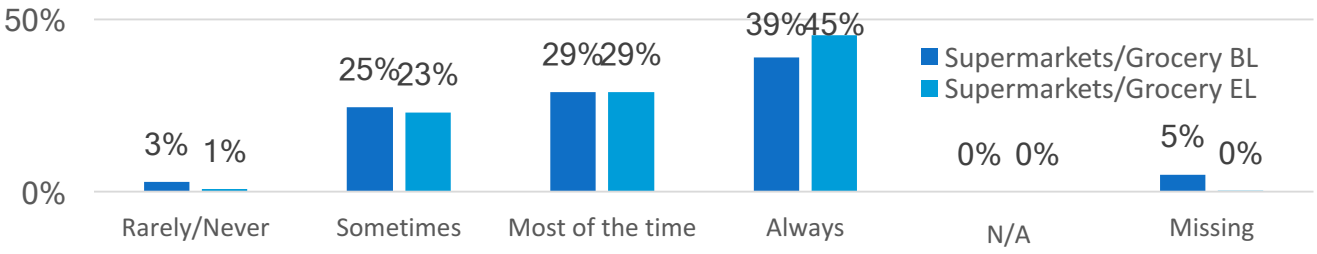


Figure 20. Change in fruit and vegetable purchasing behaviors at Dollar Store* (n=139)

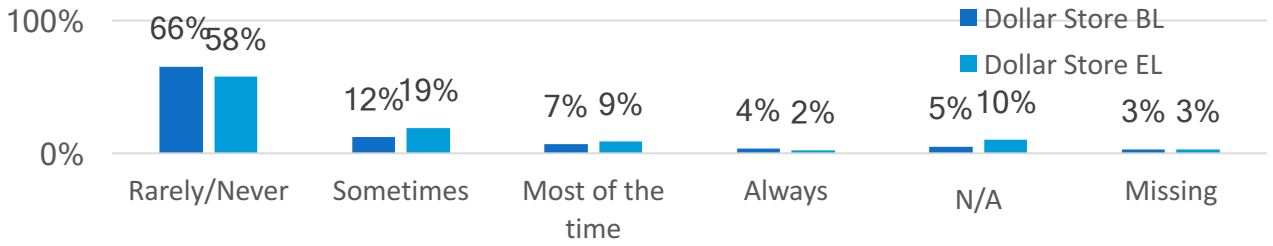


Figure 21. Change in fruit and vegetable purchasing behaviors at Local Farmers' Markets (n=139)

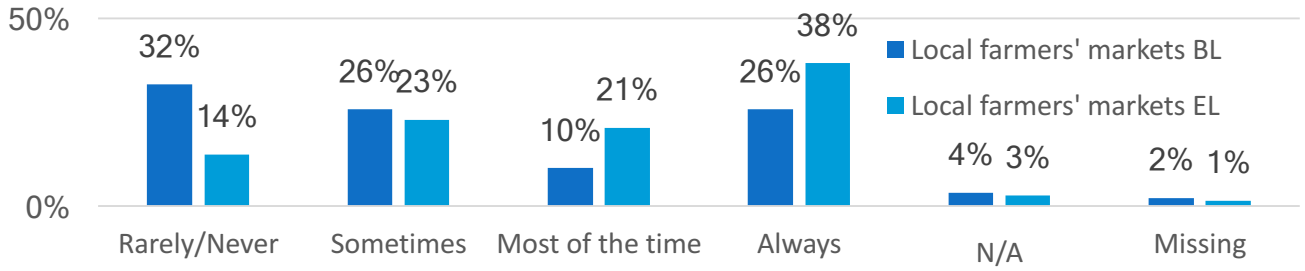
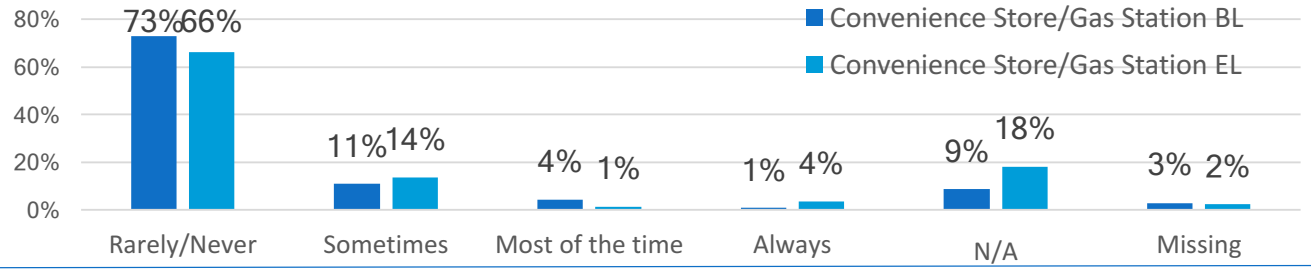


Figure 22. Change in fruit and vegetable purchasing behaviors at Convenience Store/Gas Stations* (n=139)

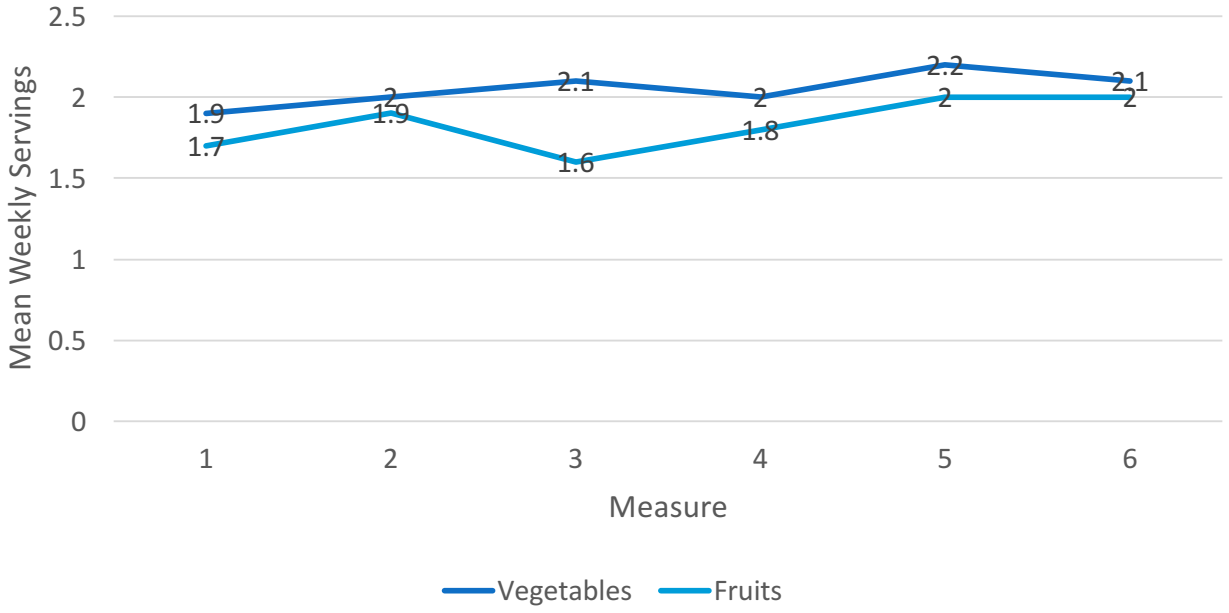


* Statistically significant at $p < 0.05$

Fruit and Vegetable Consumption - Monthly Measures

In addition to the fruit and vegetable consumption data collected at baseline and endline, fruit and vegetable consumption data were collected during the monthly clinical visits via self-report. Figure 20 shows mean reported fruit and vegetable consumption over the course of the program. Overall, weekly vegetable consumption increased by 10.5% on average and fruit consumption increased by 17.6% on average.

Figure 23. Mean servings of fruits and vegetables reported at monthly measures over course of program



Clinical Outcomes – Monthly Measures

Health indicators including weight, waist circumference and blood pressure were measured approximately monthly at each site. Overall, BMI went from 37 to 36.5, decreasing by 1.4% on average from baseline to the sixth monthly measurement (Note: N= 141 at baseline; N=57 at 6th reading). Waist circumference decreased from 45.3 to 43.8 inches, a 3.3% on average decrease from baseline to final measurement. The average hemoglobin A1c measures decreased from 8.51 to 8.17, approximately a 4% decrease baseline to final measurement for participants in the Grady Diabetes cohorts (n=26). No change in blood pressure was found from baseline to the end of the program.

Figure 24. Mean BMI across all sites at monthly measures

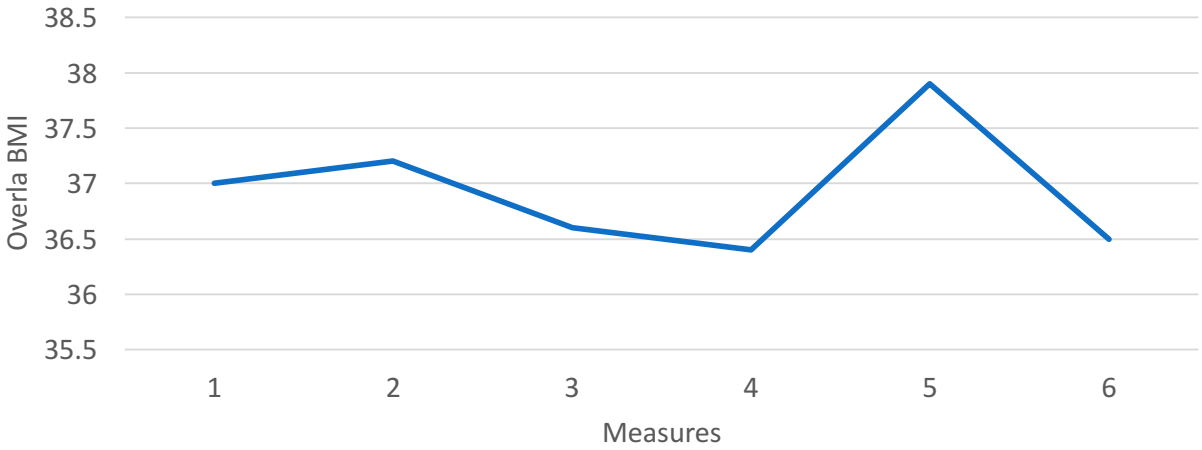


Figure 25. Overall hemoglobin A1c measures for Grady Diabetes cohorts (n=26)

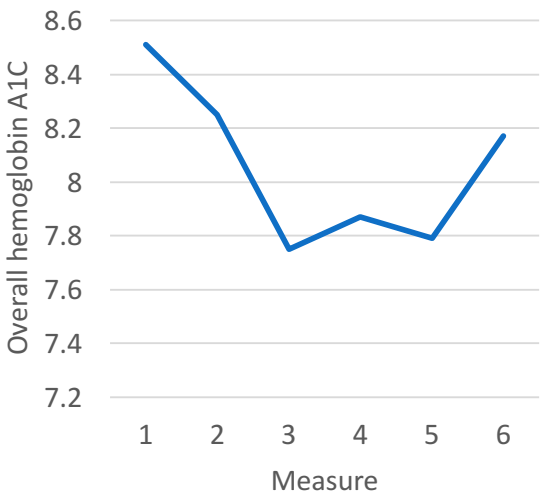
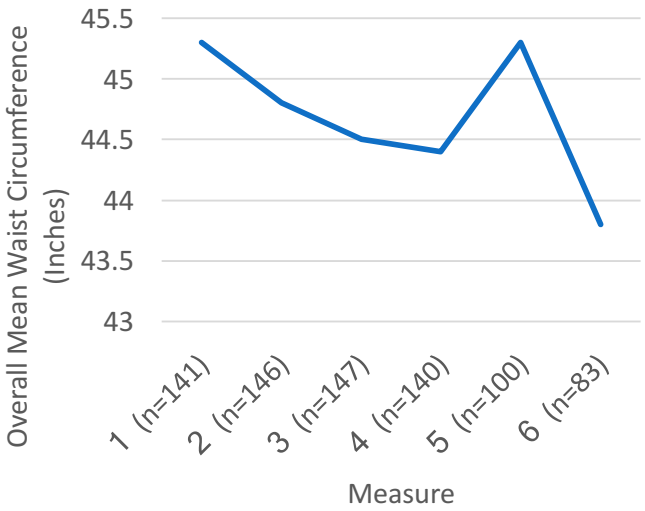


Figure 26. Mean waist circumference in inches across all sites at monthly measures



Clinical Outcomes – Monthly Measures

Models estimating change over time for monthly clinical measures are presented in Table 7. Unadjusted models estimate the change associated with the completion of each monthly visit. Adjusted models 2-4 control for variations due to program site, sex, and age. Fruit and vegetable consumption did not change significantly over time nor did BMI. Weight decreased significantly by an estimated -0.33 pounds per visit before adjustment. Holding site, sex, and age constant, weight was estimated to decrease significantly by -0.37 pounds per visit completed. By this estimate, a participant who completed 3 clinical visits would be expected to have lost one pound and a participant who completed the maximum of 6 clinical visits would be expected to have lost approximately two pounds. Waist circumference decreased significantly by an estimated 0.31 inches per visit in both adjusted and unadjusted models. We would expect a participant who completed 3 clinical visits to have a waist circumference decrease of 0.93 inches, and a participant who completed 6 clinical visits to have a decrease of 1.86 inches. Blood pressure and A1c measures did not change significantly over time but the overall trends are those of decreases.

Table 7. Effect of program on monthly-measured outcomes

Outcome	Observations	Unadjusted Change Over Time Model (95% CI)	Model 2 *	Model 3**	Model 4***
Fruit consumption (servings per day)	492	0.06 (-0.04, 0.16)	0.08 (-0.03, 0.19)	0.06 (-0.04, 0.17)	0.08 (-0.03, 0.18)
Vegetable consumption (servings per day)	537	0.01 (-0.09, 0.11)	0.01 (-0.10, 0.11)	0.04 (-0.10, 0.11)	0.00 (-0.11, 0.11)
BMI (kg/m2)	678	0.02 (-0.06, 0.11)	0.02 (-0.06, 0.11)	0.02 (-0.06, 0.10)	0.01 (-0.07, 0.10)
Weight (lbs)	757	-0.33 (-0.63, -0.03)	-0.33 (-0.63, -0.03)	-0.34 (-0.65, -0.04)	-0.37 (-0.67, -0.07)
Waist circumference (inches)	757	-0.31 (-0.41, -0.21)	-0.30 (-0.40, -0.21)	-0.30 (-0.40, -0.20)	-0.31 (-0.41, -0.20)
Diastolic blood pressure (mmHg)	754	-0.13 (-0.76, 0.49)	-0.23 (-0.85, 0.40)	-0.22 (-0.85, 0.41)	-0.23 (-0.88, 0.41)
Systolic blood pressure (mmHg)	754	-0.28 (-0.66, 0.10)	-0.25 (-0.63, 0.13)	-0.27 (-0.66, 0.11)	-0.25 (-0.65, 0.14)
Hemoglobin A1C****	139	-0.12 (-0.27, 0.03)	-0.12 (-0.28, 0.04)	-0.12 (-0.28, 0.05)	-0.15 (-0.32, 0.02)

*Model 2 controls for program site
** Model 3 controls from program site and sex
*** Model 4 controls for program site, sex, and age
**** A1C reported for Athens site and the DM1, and DM2 cohorts within the Grady site

Participant Feedback

In the post-program survey participants were asked to provide feedback on which FVRx redemption model they preferred and any changes they would suggest making to the program. Participant responses are represented in Tables 8-10 below. Note that each site was provided with unique response options and that Good Samaritan participants were able to select more than one response. Grady participants were asked to describe *why* they preferred their selected model of redemption. Those reporting that they preferred the farmers market cited that they appreciated the autonomy they had to "pick" and "choose" their fresh fruits and vegetables (Figure 25). While the majority of participants reported that they would make no changes to the program, some suggestions for improvements included longer class time, making the overall program longer, providing more cooking opportunities, and offering additional check-ins from program staff (Figure 26).

Tables 8,9,10. Participant preference for FVRx redemption model overall and across sites

Athens (n=18)	
I liked shopping at the farmers' market**	10 (55.6%)
I would prefer to redeem at another retail location****	6 (33.3%)
Missing	2 (11.1%)

Grady (n=81)	
I liked shopping at the farmers' market**	43 (53.1%)
I liked receiving pre-packed produce bags***	36 (44.4%)
Missing	3 (0.4%)

Good Samaritan (n=22)	
I liked shopping at the farmers' market	16 (72.7%)
I liked receiving pre-packed produce bags	10 (45.5%)
I would prefer to redeem at another retail location	11 (50%)
Missing	0 (0.0%)

*Augusta did not ask this question in their post-program survey

** Farmers markets were different at each site. Athens= Athens Farmers' Market; Grady = Fresh MARTA Markets; Good Samaritan= Good Samaritan on-site farm stand

***Only Grady and Good Samaritan received produce bags as a component of the program

**** Grady site participants were not provided with this response option.

Figure 27. Word cloud illustrating why Grady participants preferred redeeming FVRx vouchers at Fresh MARTA Market (n=81)

Figure 28. Word cloud illustrating what changes participants would make to the program (n=139)

Discussion

The 2018 FVRx program participants were demographically largely African-American females aged 45-64 who often reported using public transportation to access program resources. Through nutrition education and distribution of subsidies for fruits and vegetables worth $1 per family member per day, improvements in attitudes and perceptions around affordability of fruits and vegetables as well as cooking activities, consumption of fruits and vegetables, and food security were observed along with decreases in waist circumference and weight.

Unique FVRx nutrition and cooking curriculum focused on budget-conscious strategies for shopping and meal preparation is intended to address and improve perceived affordability and self-efficacy in cooking with fruits and vegetables. From baseline to the end of the program, attitudes around cooking improved significantly as did perceived access and affordability of fruits and vegetables. From baseline to endline, a smaller proportion of participants reported that fresh fruits and vegetables were never easy to find and a larger proportion of participants reported that fruits and vegetables were always affordable. A larger proportion of participants at endline also reported that cooking is always fun, cooking is never frustrating, and it is never too much work to cook. Additionally, increases in purchasing fruits and vegetables were observed at some retail outlets including farmers markets.

Participation in the program was associated with statistically significant reductions in weight and waist circumference. The pre- and post-survey measures estimate that fruit consumption significantly increased by an average of 0.79 servings per day and that vegetable consumption significantly increased by an average of 0.95 servings per day. In a systematic review, authors reported other nutrition interventions achieving increases in combined fruit and vegetable intake of an average 0.97 servings per day in populations of low-income adults. These interventions varied in approach, with multiple theories of change used to design interventions, but all largely involved nutrition education. By combining nutrition education, nutrition subsidies and healthcare provider linkages, the FVRx program managed to achieve increases of approximately 0.79 servings per day of fruit and 0.95 servings per day of vegetables, or a combined average of 1.74 servings per day. Based on the findings of this study, the FVRx program achieved nearly double the fruit and vegetable consumption increases of other interventions targeting similar populations.

Participants in the program reported to have experienced increased knowledge about healthy eating and reported that the class was a positive experience. Common difficulties participating in the program reported included timing of class form people with work during the week and limitations on variety and quality of the fruits and vegetables at redemption sites. Strengths of this program include the unique community-centered focus that allowed for each site to tailor the FVRx program to respond to specific needs of each community targeted by the intervention while providing uniform features of the program to all. Despite the differences in implementation across sites, there is an overall positive effect of the FVRX program for low-income adults in Georgia.

Limitations

This evaluation may be limited by several measurement and analysis constraints. The first major limitation is related to the self-report of key study variables. In self report designs, individuals tend to over report healthy behaviors, therefore, it is likely that fruit and vegetable consumption was overestimated in this analysis. Potential bias in measurements likely contributed to the difference in fruit and vegetable consumption estimates between baseline/endline and monthly data.

Slight variations are noted between monthly fruit and vegetable measures and those collected through baseline and endline surveys. This may be related to differences in the presentation of the questions and/or timing of these visits. In the baseline survey vegetables were reported in the following categories: dark green vegetables, other vegetables, fried potatoes, unfried potatoes whereas in the monthly survey, all vegetables were reported in one question. Additionally, some recall bias is expected in the reporting of dietary consumption due to various factors impacting an individual's ability to recall and report her average consumption for the specified recall period while accounting for day-to-day fluctuations in diet. Overall, however, the monthly estimates and baseline-endline estimates are largely in agreement. While the presentation of monthly fruit and vegetable consumption asks about the impact of each visit completed, the baseline-endline measures ask about change from the beginning of the program to the end of the program.

Additionally, in intervention studies it is common to see some effect even in groups who received no intervention (i.e. control groups). This evaluation did not include a control group to compare participants results to, making it impossible to adjust for this intervention effect. This may have led to an overestimation of the impact of the program on key outcomes. Further, the large variations in programmatic design across sites may have introduced bias into analysis. However, where possible and appropriate, confounding by site has been adjusted for in statistical models presented. The use of linear mixed models for monthly measurements requires the assumption that all variables are normally distributed. The skewness values for some variables modeled may be considered borderline non-normal by some definitions in the literature. However, despite these potential limitations, estimates reflect the most appropriate estimates based on available data.

Conclusions

Wholesome Wave Georgia's FVRx program demonstrates that a small financial incentive worth $1 per family member per day along with a 6-month educational intervention can effectively improve food security, attitudes towards cooking, and fruit and vegetable consumption in a low-income population.

Appendix I: Loss to Follow-up Bias Table

A total of 235 participants enrolled in the program and completed a baseline survey. After six-months of the program, 155 participants completed endline survey, 139 of which were completing the program for the first time (not returning participants). An attrition rate of 34% was observed overall across program sites. Participants that continued through the program and completed the endline survey were not found to be significantly different from participants that dropped out.

Characteristics	Participants at endline, n=139	Participants lost to follow-up, n=83	Fisher exact test P-Value
Race/Ethnicity			0.2277
Non-Hispanic Black	110 (79.1%)	73 (88.0%)	
Non-Hispanic White	8 (5.8%)	1 (1.2%)	
Hispanic	12 (8.6%)	6 (7.2%)	
Other	7 (5.0%)	1 (1.2%)	
Missing	2 (1.4%)	2 (2.4%)	
Sex			0.7021
Male	29 (20.9%)	19 (22.9%)	
Female	109 (78.4%)	64 (77.1%)	
Missing	1 (0.7%)	0 (0.0%)	
Age			0.148
18 - 24	1 (0.7%)	2 (2.4%)	
25 - 34	5 (3.6%)	9 (10.8%)	
35 - 44	21 (15.1%)	12 (14.5%)	
45 - 54	40 (28.8%)	23 (27.7%)	
55 - 64	50 (36.0%)	29 (34.9%)	
65+	18 (13.0%)	4 (4.8%)	
Missing	4 (2.9%)	4 (4.8%)	
Education			0.6129
Less than high school	18 (13.0%)	15 (18.1%)	
Graduated high school or obtained GED	44 (31.7%)	22 (26.5%)	
Some college or technical school	26 (18.7%)	14 (16.9%)	
Graduated two-year college or technical school degree	25 (18.0%)	12 (14.5%)	
Graduated from four-year college or technical school	15 (10.8%)	8 (9.6%)	
More than four-year college degree	8 (5.8%)	10 (12.1%)	
Missing	3 (2.2%)	2 (2.4%)	

Appendix I: Loss to Follow-up Bias Table Continued

Characteristics	Participants at endline, n=139	Participants lost to follow-up, n=83	Fisher exact test P-Value
Household Monthly Income			0.1575
< $1,001	50 (36.0%)	39 (47.0%)	
$1,001 - $1,300	33 (23.7%)	15 (18.1%)	
$1,3001 - $1,700	24 (17.3%)	12 (14.5%)	
$1,701 - $2,000	8 (5.8%)	0 (0.0%)	
$2,001 - $2,400	8 (5.8%)	3 (3.6%)	
$2,401 - $2,700	3 (2.2%)	2 (2.4%)	
$2,701 - $3,000	4 (2.9%)	2 (2.4%)	
$3,001 - $3,400	1 (0.7%)	1 (1.2%)	
≥ $3,400	7 (5.0%)	5 (6.0%)	
Missing	1 (0.7%)	4 (4.8%)	
Public Assistance			
WIC	6 (4.3%)	4 (4.8%)	1.0000
Food stamps (SNAP)	69 (49.6%)	45 (54.2%)	0.8603
Reduced Price or Free Lunch	18 (13.0%)	12 (14.5%)	0.9481
Free summer meals	5 (3.6%)	1 (1.2%)	0.5474
TANF/Cash assistance	3 (2.2%)	0 (0.0%)	0.5594
Head Start	3 (2.2%)	3 (3.6%)	0.6458
Food Pantry	23 (16.6%)	10 (12.1%)	0.6260
Food security status			0.2109
Not food insecure	68 (48.9%)	33 (39.8%)	
Food insecure	71 (51.1%)	50 (60.2%)	
Transportation			
Public transportation	56 (40.3%)	31 (37.4%)	0.7930
Driving personal car	65 (46.8%)	35 (42.2%)	0.5775
Rides from someone else	19 (13.7%)	15 (18.1%)	0.4420
Walking	7 (5.0%)	7 (8.4%)	0.3939
Taxi or Uber	12 (8.6%)	10 (12.1%)	0.4875