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# Impacts of a Community Supported Agriculture (CSA) Voucher Program on Food Lifestyle Behaviors: Evidence from an Employer-Sponsored Pilot Program

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**Abstract:** Community supported agriculture (CSA) programs have recently received attention for their potential to influence food lifestyle behaviors and health outcomes. We build on and expand inquiries into the relationship between CSA participation and behavior change by presenting the results from a controlled pilot study of first-time CSA shareholders. We offered 95 first-time shareholders a \$200 voucher to participate in a CSA. Prior to and immediately following CSA participation, these shareholders completed a survey on food lifestyle behaviors. Using econometric analyses, we measured shareholder behavior changes against an 82 person control group. All participants were drawn from a pool of individuals involved in a university wellness program. From these analyses, we identified potential benefits and changes to shareholders in four unique categories: (1) fresh versus processed food consumption; (2) food prepared at home versus away from home; (3) food purchasing behavior and interest in nutrition; and (4) self-reported health outcomes. Changes within these categories and differences between test and control were more strongly realized in shareholders who reported lower than average health prior to the CSA. We conclude with a discussion about the potential of incentivized CSAs to serve as a novel preventative health intervention.

**Keywords:** CSA; community supported agriculture; behavior change; food lifestyle behaviors; wellness

## 1. Introduction

Community Supported Agriculture (CSA) is unique direct-to-consumer (DTC) production and distribution model that may play an important role in expanding sustainable agriculture practices. As a localized DTC exchange, CSA may provide numerous unique benefits to communities, environments, and economies. From an economic standpoint, CSAs are designed to mitigate economic and production risks for producers. In an average CSA, consumers purchase a share of a farm's harvest prior to the growing season. Farmers then bring a box of seasonal produce to location that is convenient to the shareholders on a weekly or bi-weekly basis. A standard share costs between 500 and 800 dollars, and subscribers often pay this fee prior to the growing season or in a few installments. Subscribers share in the producers' production risks with this pre-payment [1,2]. From this, producers gain a clearer sense of the season's consumer demand and revenue streams and can plan production to meet the expectations of the shareholder. From an environmental perspective, CSA requires farms to diversify production and often involves organic production. Horticultural diversification may buffer

against risks associated with variable weather and lead to the perpetuation of agricultural biodiversity. Socially, CSAs emphasize relationship building between producers and CSA subscribers that may increase consumer literacy regarding agricultural and food issues.

In addition to engaging these customary dimensions of sustainability, CSAs also have a direct impact on the overall wellness of their users. An emerging body of literature, adeptly summarized by Vasquez et al. [3], considers how CSAs may provide opportunities for diet modification, health improvement, and behavior change [4–10]. When considered in contexts where participation is incentivized or part of a workplace wellness program, CSA's potential for transformation reaches into promising new social spheres. Understanding the convergence between ecological, social, and public health provides a more robust sense of the sustainability of the CSA production and exchange model.

This emerging research on CSAs and health is important to agricultural sustainability for a few reasons. First, it provides evidence that the structure of certain economic exchanges can affect the experiential, biophysical, and behavioral relationships between consumers and their food [1,6,8]. Second, by enumerating potential consumer benefits, researchers provide actionable data for producers and local food advocates to market CSAs and other forms of DTC food exchanges. Third, employers interested in introducing meaningful diet-related wellness benefits to their employees may become motivated to consider CSAs as part of their preventative health offerings. Finally, CSA-related health research can expand knowledge of and willingness to try CSAs on the part of new consumer groups, especially within workplace-sponsored programs. These final two points are critical as CSAs are generally considered a middle/upper-class phenomenon limited to consumers with a predisposition to alternative food systems or the financial ability to participate [7,11,12].

In this article, we present data from a pilot CSA voucher program we developed to measure the health and behavioral impacts of incentivized CSA. We offered \$200 to employees at the University of Kentucky to participate in a CSA program in exchange for taking pre- and post-CSA surveys. We recruited participants through the University's health and wellness program. Three participating farms offered subscribers in the pilot a standard CSA share (between \$500 and \$650) which they delivered each week for 22 weeks. Each farm chose the items that comprised their CSA box, but they had similar amounts and varieties of produce that changed according to the progression of the growing season. For example, an early season CSA share might include one bunch each of asparagus, chard, peas, spinach, beets, and kale and a head of lettuce. A late season share might include six ears of corn, four zucchini, four tomatoes, a bunch of beets, a quart of potatoes, a quart of mixed peppers, and one cabbage.

We used this pilot to establish a proof of concept for developing a more far-reaching incentive that would benefit employers and farmers. Employers, whether self-insured or using an independent insurer, are facing rising health care costs. These conditions may push employers to invest in wellness initiatives that reduce health risks and employees' household insurance costs. Researchers have documented wellness programs to generate positive returns of investment for employers by (1) reducing costs associated with healthcare and worker's compensation claims; (2) decreasing employee absenteeism; (3) improving worker satisfaction; and (4) increasing worker productivity [13–17]. CSA programs represent a promising option for wellness programming as they focus directly on increasing vegetable consumption in participants. As increased vegetable consumption is associated with decreased risk of cardiac disease, cancer, stroke, and other chronic diseases [18–20], the potential health impacts of employer CSA programs are compelling. Additionally, CSA participation is linked to broader behavior changes in how shareholders relate to their own health and consumption patterns [8]. While other researchers have explored various employee subsidy formats including a post-share purchase rebate, such as the FairShare program in Wisconsin [21], few have examined how CSA subsidy programs impact health related behaviors. For employers trying to justify investments in a subsidy, these impacts are critical to assess.

To address this lack of data regarding the behavior impacts of incentivized CSA participation, we collected survey responses from 90 first-time CSA participants enrolled in an employer sponsored

voucher program. Participants completed both a pre-CSA and a post-CSA survey that asked them to quantify the frequency of selected food related behaviors. We compare these responses to those of an 82 person control group to identify statistically significant changes in selected behavior indicators. By incentivizing participation and only recruiting those without experience in CSAs, we attempt to isolate changes that are associated with participation in a CSA incentive program. We hypothesize that first-time CSA shareholders will exhibit changes in behavior that are statistically different in magnitude compared to those in the control group. We conclude this paper with a discussion about further research and outreach needs—(1) to isolate the broader impacts of CSA incentive programs; (2) to theorize CSA incentive structures that lead to long-term program sustainability; and (3) to expand demand for CSA programs into consumer groups that are not familiar with the CSA concept. This discussion draws on the analysis of post-CSA survey evaluations of program effectiveness, focus groups, and interviews with various stakeholders.

### *Literature Review*

Researchers in sustainable agriculture often view production methods associated with short-chain, direct-to-consumer (DTC) transactions as critical to realizing agricultural sustainability. Localized exchanges may (1) increase the survival rates and economic well-being of producer enterprises; (2) provide food security for regional communities; (3) encourage consumers to consider the social, biophysical, and human conditions of food production; and (4) involve horticultural diversification practices to achieve both economic competitiveness and ecological resilience. By propagating novel and heirloom varieties of agricultural products, producers may be more competitive by offering a unique item into the market. Additionally, horticultural diversification serves as a form of in situ banking of genetic variations of common produce) [22–29]. As such, local food systems potentially introduce a measure of economic, ecological, and social sustainability into communities.

Community Supported Agriculture is often viewed as a unique DTC production model because of its potential capacity for strengthening small and medium farms, promoting diversified agriculture, and creating stronger relationships between producers and their communities [1,23,30,31]. Producers may also use CSAs as a cornerstone for diversifying their market channels. Assured income from CSA subscriptions may allow producers to experiment with a few crops for wholesale level production or to disengage from market channels with smaller margins. Much research on CSAs, then, focuses on the transformative potential of CSAs from the perspective of the producer. This is undoubtedly important, but for CSAs to be more broadly transformative of local food economies and social relations, producers would also benefit from research that elucidates critical issues related to marketing CSAs, increasing consumer demand for and knowledge of CSAs, and sustainable economic CSA models.

Fortunately, many researchers are considering these issues. For instance, Galt has identified divergent characteristics associated with CSAs that have become economically viable and those which lead to farmer self-exploitation [32]. Vassalos, Gao, and Zhang have shown trends and challenges associated with shareholder retention [33]. Guthman, Morris, and Allen [34] as well as Macias [12] detail the barriers involved in including CSAs as a strategy for creating food security among low-income consumers. These studies provide a critical perspective to understand the significant challenges CSA operators must address before the model might contribute to social and economic sustainability. While our manuscript (and broader research project) engages with these specific issues, our current focus is more limited. We seek to identify data and narratives related to an employer voucher program that are compelling to those institutions and consumer bases that are less familiar or experienced with CSAs.

One area of inquiry that is quite powerful in attracting interest and investment in CSAs is related to this model's potential impact on health and behavior changes. In conversations with wellness, medical, and public health professionals, any interventions or programs that encourage consumers to increase their vegetable consumption are worth considering. With this in mind, we developed a CSA voucher program with a pre- and post-CSA survey component that measures behavioral indicators

related to food and health choices. Instead of focusing on the social, economic, and environmental impacts of CSAs, we examine transformations in the relationship between individuals and their food.

This approach is well-supported by nascent, yet compelling, work by various scholars who have observed a positive impact of CSAs on participating shareholders. Research on the impact of CSA participation on consumers' food lifestyle behaviors has been underway for the last 15 years [3]. Surveying a small sample ( $n < 25$ ) of shareholders from a CSA in Ohio and Wisconsin, respectively, Goland [7] and Russell and Zepeda [9] found evidence that CSA involvement was associated with changes in food preparation and consumption.

Additionally, both Cohen et al. [5] and Wilkins et al. [10] observe a sustained increase in vegetable consumption in separate surveys of CSA shareholders in New York State. The latter study takes the unique step of offering a subsidy to low income residents to broaden their sample. Similarly, Landis et al. [35] and Vasquez et al. [36] find significant increases in vegetable servings in CSA shareholders compared with a control group in North Carolina and Minnesota respectively. Part of the explanation for CSA-related behavior changes relies on economists' discussions of consumer subscription behavior. In these studies, consumers are motivated to capture full value from their subscription through behavior modification. They tend to consume more of a product through subscription than they would through spot market choices [37–39]. This has an interesting application to food and health lifestyle choices that are highly desired by employers. As CSA farms typically require pre-payment and have a unique, repetitive delivery structure, they potentially induce employee behavior modification in a unique and positive way [8]. Together, this literature suggests that CSA participation may encourage behavioral change relating to food procurement, preparation, and consumption.

However, many studies tend toward observations of behavior change in CSA shareholders who joined CSA on their own initiative, or who have a predisposition toward alternative/local food systems. We wanted to understand how different consumer and income groups might respond to their first experience in a CSA. As such, our CSA voucher pilot was an attempt to compel individuals who might have financial concerns about the upfront payment of the CSA, or who might have less knowledge of the CSA model, to participate. Our assumption is that employees in such a program hold different preferences than traditional CSA shareholders who join without an incentive [4,21]. Wilkins et al. utilize a similar methodology by subsidizing shareholders and examining changes in the consumption of different types of vegetables [10] while Vasquez measures similar changes using pre- and post-tests with controls but without an incentive intervention [36].

We also wanted to structure our inquiry to be conducive to econometric analyses. Many of the studies above involve a deep qualitative analysis of the behavioral changes and attitudes of CSA participants in small sample sizes. For example, Goland [7] and Russell & Zepeda [9] provide compelling details regarding changes in shareholder behaviors. We draw from these studies and attempt to confirm these observations using larger samples and standardized surveys. Our study is unique in that we seek to isolate the effect of the CSA model by examining new shareholders' behaviors versus a control population in a subsidy program. This later consideration is critical in assessing the potential health impacts of participation on individuals less able to meet CSAs' high initial buy-in cost and individuals who are not early-adopters of the CSA model (i.e., 'foodies').

Our approach of incentivizing shareholder participation from under-represented consumer groups reflects the current evolution of CSA distribution, marketing, and financing models. While the standard model centered on the direct interaction of one farm with shareholders, multi-farm CSAs are emerging to pool resources from farms with different strengths. Other CSAs take the offer of short-season programs, winter CSAs, or meat/egg/dairy add-ons to supplement the common 20–25 week summer CSA. Others involve installment payments, income-based sliding-scale costs, or *a la carte* purchases to offset the high upfront costs of the subscription [2,40]. These financial innovations, in particular, are critical to farms looking to broaden their subscriber base, which is generally observed to be more affluent or to hold specific food-oriented values that favor alternative food networks [7,11,31].

In short, our pilot project extends other researchers' observations on CSA-associated health behavior changes while considering ongoing CSA market evolution to identify strategies for promoting CSA expansion among new institutions and communities. In particular, we sought to engage wellness programs in our research program to produce data of potential interest to employers or organizations that invest in preventative health activities. As we discuss next, these considerations informed our project design.

## 2. Materials and Methods

In order to evaluate the specific impact of the CSA structure on shareholder behavior change in an employer wellness program, our pilot program offered a \$200 voucher to individuals who had never been part of a CSA. All participants were selected from a wellness program at the University of Kentucky. These individuals were given the opportunity to select a CSA program of their choice from three participating farms. These participants were then asked to complete pre- and post-CSA surveys which measured different health-related behaviors. Additionally, we compared survey responses to those of an 82-person control group drawn from individuals in the same wellness program who were interested in participating, but who were not given the voucher or option to participate. We asked identical questions on pre- and post-CSA surveys as well as between the test and control groups. As 90 new shareholders participated in this program, we designed the voucher pilot to provide a more controlled and broader analysis of the first-time shareholder experience as it relates to food related behavior.

Although we had previously measured behavior changes in long-time CSA shareholders that had self-selected in a CSA without an incentive [4], we expected these more experienced individuals to hold significantly different food and health lifestyle choices compared to a population of employees induced by a voucher program. While we recognize that participants in this pilot exhibit some degree of self-selection, our approach aimed to (1) induce participation among individuals who had less knowledge about or experience with alternative food systems and (2) simulate an employer program that would involve a similar recruitment and participation method. First-time shareholders were a mix of those actively seeking to maintain a high level of health and those who were just beginning develop a healthy lifestyle. We explicitly examine the differences in response to CSA from both categories as a way to control for different levels of experience in the wellness program and in health condition prior to the CSA program. We also used a control group from the same population to compare shareholders' responses in our analysis.

The University of Kentucky administers its own health plans and wellness program. Administrators of the benefits program were interested in the potential wellness impacts of this program. Depending on the results of this pilot, the University and other employers with wellness programs might consider subsidizing their own CSA programs. In other words, our goal was to evaluate the impact of a CSA program on a new consumer segment that was not part of the CSA early-adopter community. By excluding individuals who had in previous years self-selected into a CSA without any type of voucher or subsidy (i.e., long-time early-adopter shareholders), we sought to more clearly portray how an employer incentive program might impact a more general employee population.

Finally, we held one focus group in August of 2016 with 10 pilot project participants to speak about their experience in the voucher program, to describe the changes they observed in their food lifestyle, and to identify strategies to make CSA voucher programs more appealing to individuals who are not predisposed to supporting alternative food systems. We note some of these observations when discussing the results of the surveys.

### 2.1. Participant Recruitment

To recruit participants, administrators at the University of Kentucky's employee wellness program invited ~1500 employees in the winter of 2014/15 to view information related to the CSA voucher program. If interested, these employees filled out a form expressing their interest. These employees

were all participants in the wellness program's free health screening program. Exactly 255 individuals expressed their interest in the program and, from this group, 180 individuals were randomly offered a voucher. Those who were not offered a voucher (75 individuals) were offered an opportunity to complete two short surveys for a \$45 payment as part of the control group. Additionally, some participants who declined the voucher offer were randomly given the option to be part of the control group, which allowed us to compare individuals who accepted and declined a voucher and identify important factors in their decisions. Overall, we had 90 individuals accept the voucher and complete both surveys and 82 individuals complete the control surveys. We had 82 individuals complete the control survey, 40 of whom declined an original voucher offer.

This design allowed for an in situ investigation into the potential lifestyle changes induced by participation in a subsidized CSA. As the offered voucher did not cover the full cost of an annual CSA subscription, participants were required to contribute a majority portion of the share cost. Participants were offered the choice to pay the remaining subscription cost or decline the voucher, following the subscription format consistent with general CSAs. As such, recruitment into the treatment or control group was partially, but not perfectly, randomized.

While a full-cost voucher could have permitted completely randomized recruitment, this approach is not consistent with how employer-backed CSA voucher programs function and would be of limited use for evaluating the potential impacts of a CSA incentive program in a similar institution. Additionally, a full-cost voucher would provide little motivation for a shareholder to regularly pick up and use their share. Based on economic studies of subscription-related behavior [37–39], a full-cost approach would likely lose participants as the season continued and produce results biased toward those who self-selected to consistently participate. By requiring an initial-buy in, our approach better ensures that participants follow through with the full CSA experience as they are compelled to attain their money's worth of products.

Once recruited, voucher recipients enrolled directly in one of three local CSAs. After they completed an initial survey in April 2015, we sent their voucher payment directly to the farm and the farm was then responsible for collecting the remainder of the payment from the study participant. The shareholder then received their CSA share weekly from May until mid-October. This share did not differ qualitatively from non-voucher share. After the season, both control and treatment groups received the follow-up survey.

## 2.2. Survey Design

We designed our pre- and post-CSA surveys to be identical and allow for analytic comparison. The experimental design involves an untreated control group design with dependent pretest and posttest samples, following Shadish et al. [41]. In the post-CSA survey, we did not remind respondents of their previous responses. Participants in the CSA and control group received the same questions as well. All surveys were administered through SurveyMonkey, an online survey development tool. In particular, the key variables came from a review of the health outcomes of CSA literature [4–10]—especially those summarized in Vasquez et al. [3]. In a review of this literature (as discussed in Section 1), researchers were interested in behavior changes within the following four categories: (1) fruit and vegetable versus processed food consumption; (2) food prepared at home versus away from home; (3) food purchasing behavior and interest in nutrition; and (4) self-reported health outcomes. Questions were randomized in distribution to mitigate order response bias.

For the first category, the survey asked shareholders to quantify their daily fruit and vegetable consumption and indicate how frequently they ate salads and processed foods. For the second category, the survey asked shareholders to indicate how frequently they engaged in certain food at-home behaviors (e.g., preparing dinner) and away-from-home behaviors (e.g., expenditures and visits to restaurants). The third category asked shareholders about changes in their purchases of organic or locally marketed food as well as discussing and reading labels for nutritional information. These questions seek to (1) understand how CSA participation may affect market engagement and

(2) approximate how consumers internalize health-related messages gained by or associated with direct interactions with farmers and organic produce. Finally, the fourth category of questions measure self-reported health outcomes, including annual visits to the doctor or health clinic, monthly pharmacy expenditures, and a self-reported health measure.

For most questions, respondents estimated how many times during a month (or year, when applicable) that they engaged in certain behaviors. They selected from the following seven discrete choice categories: almost never, 1–2 times, 3–4 times, 5–6 times, 7–8 times, 9–10 times, more than 10 times. In other questions, respondents would input a numeric estimate for questions seeking to estimate daily servings of fruits and vegetables, expenditures at pharmacies and restaurants, and annual visits to doctor or health clinic. Another set of questions asked participants whether they had experienced any changes within the past six month related to specific behavioral indicators. These were rated on a 7 point Likert scale where 1 = no change, 4 = some change, and 7 = significant change. Finally, the survey collected additional demographic data including household income, number of years in a CSA, and the age, education and sex of the respondent.

### 2.3. Analytic Approach

We employ three distinct procedures to estimate the impact of the CSAs on participants' food lifestyle behaviors. First, we examine the program participants (henceforth, the test group) on their own. We apply a two-sample mean-comparison test (i.e., *t*-test) to compare the test groups' frequency of food lifestyle behaviors before the CSA intervention (April 2015) and after the CSA intervention (October 2015). Each *t*-test is naturally paired since responses of before- and after-behavior come from each member of the test group.

Second, we use a combination of ANOVA and Tukey Tests to compare changes in behavior between the test group and the subsample of those not participating in the program (henceforth, the control group). For this analysis, we split the test group into two subgroups according to their initial self-assessment of health condition prior to the CSA season. Individuals who scored their health low or average (1–3 on a 5 point Likert scale) were put into the low health test group (N = 54). Those who scored their health as good or excellent (4 or 5 on the same scale) were placed into the high health test group (N = 39). We considered using other ways of determining health groupings including biometric and health record data. These other approaches would have provided a more biophysically objective delineation of health groups. At the same time, obtaining access to these medical records was a limiting factor and would have likely limited interest in participation in our study. Instead, we chose a simpler self-classification during the pre-test stage to determine general behavioral effects after CSA treatment. As participants perceptually measure their own behaviors in our surveys, their self-assessed health state provides a similar type of datum.

Using the same lifestyle behaviors, we first calculate the difference in behavior frequency over the course of CSA participation (i.e., after-behavior—before-behavior). We then employ ANOVA and Tukey tests to compare the mean difference in the frequency of each food lifestyle behavior indicators between two test groups and the control group (N = 82).

We analyze the variation in the same behavior difference scores using an ordinary least squares (OLS) linear regression procedure to control for endogenous factors that may be associated with certain behavior change. Each regression contains an identical set of independent variables. All indicator differences were regressed against the following and described in Table 1:

$$\Delta INDICATOR_i = F(CONTROL_i, LHT_i, HHT_i, GENDER_i, AGE_i, INCOME_i, EDUCATION_i)$$

**Table 1.** Description of Regression Variables.

Variables	Description	Data Type
$\Delta$ INDICATOR	change in food lifestyle indicator $i$	
CONTROL	Reference population (control group) for each indicator $i$	Binary
LHT	Low health test (shareholder) group for each indicator $i$	Binary
HHT	High health test (shareholder) group for each indicator $i$	Binary
GENDER	'Male' as the reference group for each indicator $i$	Binary
AGE	Years of age of each respondent for each indicator $i$	Continuous
INCOME	Thousands of dollars in respondent income for each indicator $i$	Continuous
EDUCATION	Respondent education, <four year degree as the reference group	Binary

To ensure OLS regressions were appropriate for analysis, we produced a Pearson's Correlation Matrix using the above independent variables and selected behavior variables. Most correlations were under 0.20, though the correlation between the education and income variables was 0.32. We also tested for collinearity by generating a Variance Inflation Factor (VIF) for each independent variable. The VIF for each variable was  $>1.4$ . Taken together, these data suggest that our model (which measures the difference between pre- and post-CSA behavior) mitigates issues of autocorrelation and autoregression. A further consideration is that  $r$ -squared measures for each regression ranged between 0.03 and 0.18. Low  $R^2$  values are common in self-reported behavior regression models due to the myriad of complex biological, behavioral and social factors that influence these behaviors. The intention of our models is to examine the potential health impacts on the shareholder of various behavior changes, rather than forecasting specific magnitudes of behavior change. As such, we used regression analyses to isolate the condition of shareholding by controlling for demographic effects and incorporating data from the control group. Combined with the results of ANOVA and  $t$ -tests, we argue that the OLS regression approach is appropriate to understand the role CSA shareholding plays in modifying complex human behavior.

### 3. Results

#### 3.1. Summary Statistics of Control and Test Groups

Table 2 displays the summary statistics of our control and test groups. The average CSA shareholder in our pilot (i.e., individual in the test group) is 45 years old and female (71%) with an annual household income of \$101,000. Additionally, this test group is highly educated with the majority holding either a 4 year (31%) or advanced degree (55%). Individuals in the control group were similar on average, except that the group's average annual household income was \$68,000—considerably lower. This income disparity may be partially explained by household size—single-person households comprised 13% of the test group but 25% of the control group—and education may also impact this difference. Single individuals often mentioned in comment sections of the survey that they were unable to take advantage of the CSA due to the lack of a smaller share option. For context, the average CSA shareholder is older, more likely to be female, more educated, and considerably wealthier than the average Kentuckian [42,43]. Some of these differences may be location specific, though Russell and Zepeda [9] also observed that their CSA shareholder respondents were skewed older, Caucasian and female. Goland [7] characterized CSA shareholders as being relatively wealthy and well-educated. Bougherara et al. [44] also found similar significant differences in income between CSA and non-CSA households. The CSA voucher concept is designed to diversify the demographics of the average shareholder to put them closer to the general population.



**Table 2.** Group Summary Statistics.

	Control	Low Health Test Group	High Health Test Group	Total Test Group
N	82	54	39	93
	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)
% Female	0.68 (0.047)	0.71 (0.46)	0.71 (0.46)	0.71 (0.46)
HH income (\$)	68,395 (37,224)	92,653 (52,513)	113,194 (60,764)	101,353 (56,732)
Age (years)	46 (12)	44 (10)	48 (11)	46 (11)
Household Size	2.43 (1.23)	2.78 (1.27)	3.03 (1.10)	2.89 (1.20)
Education				
High school	0.43	0.13	0.16	0.14
College Degree	0.24	0.33	0.28	0.31
Grad/Prof. Degree	0.33	0.54	0.56	0.55

### 3.2. T-Tests Comparing Test Group's "Before" and "After" Behavioral Responses

Table 3 presents the results from the set of paired *t*-tests that compare self-reported measures of food lifestyle behaviors for shareholders before and after the CSA season. This table, then, shows in isolation how first-time shareholders in a CSA voucher program observe their behaviors to have changed. The 'Before CSA' and 'After CSA' columns display the frequency of behavior at that point in time. The paired differences column presents changes in the frequency of behavior (i.e., After CSA—Before CSA) across the sample N. Since the *t*-test assumes equal variances, the final column indicates where variances were significantly different from each other between After CSA and Before CSA measures.

These results show a few clear trends with 19 of the 30 behavior indicators suggesting statistically measureable changes in behavior. First, shareholders exhibited a significant decrease in processed food consumption with snack foods and meals decreasing to 5.3 and 4.8 times per month respectively from a pre-CSA rate of 6.4 and 5.9 times. Additionally, shareholders ate 4.5 servings of vegetables per day compared to 4.0 prior to their subscription. They also increased salad consumption from 7.8 to 8.5 times per month.

While most 'food away from home' indicators did not change dramatically, shareholders decreased restaurant expenditures from \$45 to \$34 per week and noticed a recent increase in cooking skills from a score of 3.4 to 4.0. This later indicator was scored on a Likert scale from 1–7 with 1 = no change, 4 = some change, and 7 = significant change.

In terms of food purchasing and interest in nutrition, shareholders increased their purchasing of local and organic items (outside of the CSA arrangement) by almost two more times per month for each variable. They also noted an increase in awareness of food sourcing (3.6 to 4.6 on seven point Likert scale). From a health perspective, they associated their CSA experience with an overall increase in their assessment of their own health (from 3.4 to 3.7 on a five point scale where 0 = poor, 3 = average, and 5 = excellent) and a decrease in pharmacy expenditures from \$24 to \$16 dollars per week. Finally, they exhibited recent positive changes to digestive health and energy though these scores were not quite at the 'some change' threshold of the seven-point scale.

**Table 3.** Shareholder Test Group Before and After *t*-Tests of Food Lifestyle Behaviors.

Behavior Indicators	Before CSA		After CSA		Paired Diff		Paired <i>t</i> -Test		Unequal Variances
	Mean	Std. Err.	Mean	Std. Err.	Mean	Std. Err.	Sig	<i>t</i> -Score	
<b>Vegetables versus Processed Food</b>									
Eat processed snack foods <sup>a</sup>	6.39	0.43	5.30	0.44	−1.09	0.38	<b>0.005 ***</b>	2.85	
Eat processed foods for meals <sup>a</sup>	5.92	0.40	4.75	0.41	−1.17	0.41	<b>0.006 ***</b>	2.83	
Eat salads <sup>a</sup>	7.76	0.35	8.48	0.33	0.72	0.43	<b>0.097 *</b>	−1.68	
Avg. daily fruit and vegetables servings <sup>b</sup>	4.01	0.25	4.52	0.24	0.51	0.31	<b>0.102 *</b>	−1.65	
Less Consumption of Processed foods <sup>c</sup>	3.62	0.22	4.23	0.19	0.61	0.26	<b>0.019 **</b>	2.40	
<b>Food Away from Home</b>									
Eat breakfast at restaurants <sup>a</sup>	1.87	2.79	2.37	3.16	0.50	0.32	0.126	1.55	
Eat dinner at restaurants <sup>a</sup>	5.75	0.36	5.63	0.36	−0.12	0.35	0.742	0.33	
Eat in the car <sup>a</sup>	2.24	0.33	2.71	0.38	0.46	0.39	0.236	−1.19	
Greater Cooking Expertise <sup>c</sup>	3.42	0.21	4.02	0.20	0.60	0.25	<b>0.020 **</b>	2.37	
Prepare dinner at home <sup>a</sup>	11.68	0.25	11.39	0.32	−0.29	0.35	0.404	−0.84	x
Weekly expenditure at restaurants <sup>d</sup>	45.49	4.19	33.57	3.08	−11.92	3.17	<b>0.000 ***</b>	−3.75	x
<b>Food Purchasing and Interest in Nutrition</b>									
Read nutrition labels <sup>a</sup>	8.26	0.39	8.66	0.36	0.40	0.41	0.328	−0.98	
Discuss nutrition with friends & colleagues <sup>a</sup>	5.04	0.41	5.80	0.42	0.76	0.43	<b>0.080 *</b>	−1.77	
Buy organic foods <sup>a</sup>	4.06	0.38	5.56	0.45	1.50	0.41	<b>0.000 ***</b>	−3.65	
Buy food marketed as locally produced <sup>a</sup>	5.37	0.36	7.16	0.40	1.79	0.45	<b>0.000 ***</b>	3.96	
Greater Nutritional Awareness <sup>c</sup>	3.94	0.22	4.38	0.20	0.43	0.27	0.116	1.59	
Greater Awareness of Food Sources <sup>c</sup>	3.56	0.23	4.57	0.21	1.01	0.26	<b>0.000 *</b>	3.84	
Greater Engagement with peers <sup>c</sup>	2.86	0.20	3.63	0.21	0.78	0.26	<b>0.004 ***</b>	2.97	
<b>Health Outcomes</b>									
Fewer Doctors' Visits <sup>c</sup>	2.48	0.21	2.08	0.18	−0.40	0.24	<b>0.095 *</b>	−1.69	
More active <sup>c</sup>	3.53	0.23	3.39	0.18	−0.14	0.25	0.564	−0.58	x
Weight Loss <sup>c</sup>	3.00	0.22	2.76	0.19	−0.24	0.25	0.338	−0.96	
Better Digestive Health <sup>c</sup>	3.03	0.20	3.54	0.21	0.51	0.25	<b>0.042 **</b>	2.07	
Fewer OTC Meds <sup>c</sup>	1.97	0.18	2.21	0.19	0.24	0.22	0.275	1.10	
Fewer Prescription Meds <sup>c</sup>	1.81	0.17	1.66	0.16	−0.16	0.21	0.451	−0.76	
Improved Fitness <sup>c</sup>	3.12	0.22	3.29	0.19	0.17	0.25	0.508	0.67	
Increased energy <sup>c</sup>	2.87	0.21	3.43	0.19	0.57	0.24	<b>0.019 **</b>	2.39	
Enhanced Positive mood <sup>c</sup>	3.22	0.21	3.46	0.17	0.23	0.26	0.363	0.91	x
Monthly expenditure at the pharmacy <sup>e</sup>	23.89	3.85	16.33	2.34	−7.56	3.54	<b>0.035 **</b>	−2.14	x
Annual visits to doctor or health clinic <sup>f</sup>	2.56	0.25	2.86	0.20	0.30	0.20	0.134	−1.51	x
Self-Evaluated Health <sup>g</sup>	3.37	0.09	3.68	0.09	0.31	0.08	<b>0.000 ***</b>	3.89	

Legend: \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ . Bold numbers highlight statistical significance. Note: N = 90 for all *t*-tests. Measures: <sup>a</sup> Times per month; <sup>b</sup> Daily Servings; <sup>c</sup> Rating of change over past 6 months (1 = No change to 7 = Sig. Change); <sup>d</sup> \$/week for individual; <sup>e</sup> \$/month for individual; <sup>f</sup> visits/year; <sup>g</sup> 1 = Poor to 5 = Excellent.

### 3.3. ANOVA and Tukey Tests on Differences between Pre- & Post-CSA Measures for Control and Test Groups

In Table 4, we present the results of between-group differences of the changes in behaviors from before to after CSA participation. The Tukey's test involves a pairwise comparison of each group against all others. The analyses allow us to further segment shareholders into two groups based on their pre-CSA self-assessments of health. The lower health test group (LH) corresponds to individuals who answered 'extremely poor', 'poor', or 'average' in a question asking them to assess their health. The higher health test group (HH) corresponds to individuals answering 'good' or 'excellent'. Group means were calculated by subtracting the pre-CSA behavior frequencies for each individual from their post-CSA frequencies. We averaged these differences for each group.

**Table 4.** Group Comparisons of Behavior Differences via ANOVA and Tukey Tests.

Behavior Indicator	Control	Low Health Test	High Health Test	p Value
	Mean	Mean	Mean	
<b>Vegetables Versus Processed Food</b>				
Processed Snacks	0.57 <sup>a</sup>	−1.05 <sup>b</sup>	−1.14 <sup>b</sup>	0.0178
Processed Meals	0.60 <sup>a</sup>	−1.13 <sup>b</sup>	−1.21 <sup>b</sup>	0.0099
Salad Consumption	−0.30	1.16	0.12	0.0969
Daily Fruit/Vegetable Servings	−0.79 <sup>b</sup>	0.73 <sup>a</sup>	0.21 <sup>ab</sup>	0.0435
Less Consumption of Processed Foods	−0.30 <sup>b</sup>	1.04 <sup>a</sup>	0.03 <sup>ab</sup>	0.0050
<b>Food Away From Home</b>				
Breakfast at Restaurants	0.70	0.45	0.57	0.8743
Dinner at Restaurants	0.84	−0.28	0.12	0.1315
Eat in the car	0.93	0.33	0.65	0.6515
Greater Cooking Expertise	−0.55 <sup>b</sup>	0.77 <sup>a</sup>	0.37 <sup>ab</sup>	0.0034
Prepare Dinner at Home	−0.21	−0.25	−0.50	0.8338
Weekly Expenditure at Restaurants	0.02 <sup>b</sup>	−18.69 <sup>a</sup>	−2.67 <sup>b</sup>	0.0012
<b>Food Purchasing and Interest in Nutrition</b>				
Read Nutrition Labels	−0.41	0.69	0.00	0.2202
Discuss Nutrition with Peers	−0.08	0.64	0.92	0.3858
Buy Organic Food	0.11 <sup>b</sup>	1.98 <sup>a</sup>	0.85 <sup>ab</sup>	0.0167
Buy Food Marketed as Local	0.36	2.09	1.38	0.0728
Greater Nutritional Awareness	−0.45 <sup>b</sup>	0.75 <sup>a</sup>	0.00 <sup>ab</sup>	0.0178
Greater Awareness of Food Sources	−0.41 <sup>b</sup>	1.29 <sup>a</sup>	0.63 <sup>a</sup>	0.0001
<b>Health Outcomes</b>				
More Active	−0.41 <sup>ab</sup>	0.37 <sup>a</sup>	−0.84 <sup>b</sup>	0.0225
Better Digestive Health	−0.41 <sup>b</sup>	0.85 <sup>a</sup>	0.05 <sup>ab</sup>	0.0087
Improved Fitness	−0.41 <sup>b</sup>	0.56 <sup>a</sup>	−0.37 <sup>ab</sup>	0.0269
Increased Energy	−0.30 <sup>b</sup>	0.61 <sup>a</sup>	0.50 <sup>ab</sup>	0.0392
Annual Doctor Visits	−0.24	−0.33	−0.26	0.9500

Superscripts represent statistically significant differences between scores based on Tukey Multiple Means test at 5%. Indicators labeled ab are not statistically different from indicators labeled with only an a or b, whereas indicators represented by only an a or b are statistically different from each other.

From these data, it is possible to observe a few between-group differences. The strongest differences between the shareholder groups and the control were related to processed versus fresh food consumption. Both shareholder groups exhibited decreases in the consumption of processed snacks and meals compared to the control. For both indicators, the test groups decreased by at least one serving per month while the control group increased by 0.5 servings. The LH shareholder group also noted an increase of one serving of vegetables per day—significant compared to the control which decreased by nearly a serving per day.

Second, for food away from home behaviors, the LH shareholders observed a recent increase in cooking expertise (0.77) compared to the control group (−0.55) and a decrease in restaurant expenditures (−\$19 per week) compared to both other groups (control = no change, HH = −\$2.67). Third, in the food purchasing and interest in nutrition category, both CSA groups increased their

purchasing of organic food (outside of the CSA), though the LH group (+2.00 per month) was the only to show statistical difference from the control (no change).

Finally, the LH group identified recent positive changes in nutritional awareness, digestive health, fitness, and energy compared to the control group. The HH group joined the LH group in recent changes in their awareness of local sourcing issues. Overall, group mean comparisons indicate that the LH group experienced the most significant changes in behavior compared with the control group.

#### 3.4. OLS Regression on Pre-/Post-CSA Difference for Each Behavior for Control and Test Groups

The ANOVA and Tukey Tests results in Table 4 do not account for other factors which may influence individuals' activities. To control for these factors, we subjected the pre- and post-CSA differences to OLS regressions to determine which factors may help explain variation in observed behavior change. The coefficients for each independent variables identify the effect of that variable on each dependent variable (i.e., behavior indicator) regressed. In this analysis, we are most concerned with the effect of the two shareholder variables on the behavior indicator. If either shareholder variable is marked as significant in the model, then shareholding had a statistically measurable increase or decrease compared to the control condition. Table 5 summarizes these results.

The regression coefficients in Table 5 suggest that CSA participation frequently translated into a change in many of the behavior indicators examined. Further, these changes were more likely to be observed by shareholders who initially classified their health as 'poor' or 'average' (LH). In other words, relative to those who reported 'good' or 'excellent' health (HH) prior to joining a CSA, lower health shareholders regularly reported on average greater changes following CSA completion.

Both low health (LH) and high health (HH) shareholders recorded statistically significant healthy changes in their consumption of processed meals. According to the coefficients generated in this regression, CSA shareholders exhibited a decrease of at least 1.8 servings per month of processed meals when other factors are controlled. Regression models also indicate a significant increase in ratings (on a seven-point Likert) of 0.86 for the HH group and 1.39 for observing recent changes in awareness of food sourcing issues. The model also notes a recent increase in energy with their Likert score increasing by 0.86 and 0.82 for the LH and HH groups respectively for this indicator.

The LH group, however, note many additional positive changes that were not observed by the HH group. In the vegetable consumption category, the LH group ate 1.9 more salads per month compared to their pre-CSA intake. The HH group averaged a 0.9 salad increase, though this was not significant in the model. Similarly, the LH group had an overall increase of 1.3 servings of vegetables per day while the HH group's increase of 0.8 servings per day was not significant. The LH group also rated recent intake of processed foods to have decreased with a change of 1.1 on the seven-point scale.

For the food away from home category, the model shows that individuals in the LH group reduced their weekly expenditures at restaurants by \$16.30 per week and had recently gained cooking expertise with an increase of one point on the Likert scale. They also observed greater nutritional awareness (rating of recent changes increase of 0.9), engagement with peers on nutrition topics (rating increase of 0.9), and increases in purchasing of foods labeled as local or organic (rating increase of 1.6 and 1.3 respectively). Finally, this group felt that they had been more active since joining the CSA, observed better digestive health, and improved their overall fitness (rating increases of 0.8, 1.3, and 0.9 respectively). Taken together, these data indicate that CSA participation was part of a broader shift in health behaviors among those who considered themselves to be in poorer health prior to joining a CSA.

**Table 5.** OLS Regression on Behavior Differences Before and After Community Supported Agriculture (CSA) Participation.

Behavior Indicators	Independent Variables							R <sup>2</sup>
	Constant	Low Health Test Grp.	High Health Test Grp.	Female	Age	Income	College Degree	
<b>Vegetables versus Processed Food</b>								
Eat processed snack foods <sup>a</sup>	0.753 (2.287)	−1.109 (0.747)	−1.227 (0.820)	−0.838 (0.706)	0.04 (0.029)	−0.004 (0.007)	−0.074 (0.102)	0.065
Eat processed foods for meals <sup>a</sup>	−3.729 (2.280)	−1.917 ** (0.744)	−1.835 ** (0.818)	0.83 (0.704)	0.024 (0.029)	−0.01 (0.006)	0.206 ** (0.102)	0.098
Eat salads <sup>a</sup>	1.049 (2.33)	1.865 ** (0.763)	0.873 (0.838)	0.483 (0.721)	0.016 (0.030)	−0.003 (0.007)	−0.141 (0.105)	0.059
Avg. daily fruit and vegetables servings <sup>b</sup>	−1.826 (2.159)	1.196 * (0.705)	0.767 (0.774)	−0.117 (0.667)	0.005 (0.027)	−0.001 (0.006)	0.067 (0.097)	0.031
Less Consumption of Processed foods <sup>c</sup>	−1.700 (1.433)	1.131 ** (0.468)	−0.007 (0.514)	0.260 (0.443)	0.021 (0.018)	0.006 (0.004)	−0.006 (0.064)	0.078
<b>Food Away from Home</b>								
Eat breakfast at restaurants <sup>a</sup>	0.376 (1.656)	−0.306 (0.538)	0.036 (0.591)	−0.167 (0.509)	0.017 (0.017)	0.000 (0.005)	−0.024 (0.084)	0.012
Eat dinner at restaurants <sup>a</sup>	2.045 (1.94)	−1.112 * (0.635)	−0.432 (0.697)	−0.268 (0.600)	−0.009 (0.025)	−0.007 (0.006)	−0.011 (0.087)	0.047
Eat in the car <sup>a</sup>	0.989 (2.315)	−0.246 (0.756)	0.056 (0.830)	0.124 (0.715)	0.008 (0.029)	−0.005 (0.007)	−0.015 (0.104)	0.009
Prepare dinner at home <sup>a</sup>	−1.443 (1.544)	−0.296 (0.504)	−0.279 (0.554)	0.256 (0.477)	−0.006 (0.020)	0.000 (0.004)	0.084 (0.069)	0.012
Greater Cooking Expertise <sup>c</sup>	−2.338 * (1.405)	1.122 ** (0.459)	0.757 (0.504)	0.872 ** (0.434)	0.012 (0.018)	0.002 (0.004)	0.034 (0.063)	0.092
Weekly expenditure at restaurants <sup>d</sup>	7.559 (18.074)	−16.300 *** (5.902)	0.582 (6.480)	−6.709 (5.582)	0.252 (0.229)	−0.078 (0.052)	−0.586 (0.808)	0.116
<b>Food Purchasing and Interest in Nutrition</b>								
Read nutrition labels <sup>a</sup>	−2.804 (2.133)	1.191 * (0.697)	0.342 (0.765)	−0.132 (0.659)	0.031 (0.027)	−0.007 (0.006)	0.101 (0.095)	0.036
Discuss nutrition with friends & colleagues <sup>a</sup>	−6.630 *** (2.309)	0.666 (0.754)	0.428 (0.828)	0.2 (0.713)	0.055 * (0.029)	−0.006 (0.007)	0.261 ** (0.103)	0.067
Buy organic foods <sup>a</sup>	−3.598 * (2.130)	1.294 * (0.696)	0.417 (0.763)	0.944 (0.658)	−0.001 (0.027)	0.002 (0.006)	0.179 * (0.095)	0.078

Table 5. Cont.

Behavior Indicators	Independent Variables							R <sup>2</sup>
	Constant	Low Health Test Grp.	High Health Test Grp.	Female	Age	Income	College Degree	
Buy food marketed as locally produced <sup>a</sup>	−2.694 (2.569)	1.568 * (0.839)	1.297 (0.921)	0.101 (0.793)	0.03 (0.032)	−0.007 (0.007)	0.127 (0.115)	0.043
Greater Nutritional Awareness <sup>c</sup>	−2.4598 * (1.446)	0.920 * (0.472)	0.198 (0.519)	0.169 (0.447)	0.023 (0.018)	0.004 (0.004)	0.037 (0.065)	0.057
Greater Awareness of Food Sources <sup>c</sup>	−1.335 (1.344)	1.386 *** (0.439)	0.862 * (0.482)	−0.244 (0.415)	0.014 (0.017)	0.003 (0.004)	0.016 (0.060)	0.100
Greater Engagement with peers <sup>c</sup>	−4.025 *** (1.396)	0.861 * (0.456)	0.072 (0.501)	0.330 (0.431)	0.033 * (0.017)	0.003 (0.004)	0.117 * (0.062)	0.095
<b>Health Outcomes</b>								
Fewer Doctors' Visits <sup>c</sup>	0.959 (1.431)	−0.272 (0.467)	0.184 (0.513)	0.111 (0.442)	−0.020 (0.019)	−0.001 (0.004)	−0.018 (0.064)	0.015
More active <sup>c</sup>	−2.076 (1.304)	0.709 * (0.426)	−0.664 (0.468)	0.183 (0.403)	0.026 (0.016)	0.000 (0.004)	0.026 (0.058)	0.066
Weight Loss <sup>c</sup>	0.294 (1.425)	0.714 (0.465)	−0.168 (0.511)	0.340 (0.440)	−0.004 (0.018)	0.001 (0.004)	−0.063 (0.063)	0.038
Better Digestive Health <sup>c</sup>	0.097 (1.378)	1.293 *** (0.450)	0.548 (0.494)	−0.525 (0.426)	0.016 (0.017)	−0.001 (0.004)	−0.052 (0.062)	0.06
Fewer OTC Meds <sup>c</sup>	−2.498 ** (1.252)	−0.032 (0.409)	0.340 (0.449)	0.590 (0.387)	0.020 (0.016)	−0.005 (0.034)	0.093 * (0.056)	0.053
Fewer Prescription Meds <sup>c</sup>	−2.001 (1.212)	−0.297 (0.396)	0.183 (0.435)	0.628 * (0.374)	−0.001 (0.015)	−0.003 (0.003)	0.099 * (0.054)	0.043
Improved Fitness <sup>c</sup>	−1.029 (1.292)	0.928 ** (0.422)	−0.062 (0.463)	0.499 (0.399)	0.014 (0.016)	0.000 (0.004)	−0.021 (0.058)	0.062
Increased energy <sup>c</sup>	−1.089 (1.330)	0.860 ** (0.434)	0.816 * (0.477)	0.176 (0.410)	0.031 * (0.017)	−0.001 (0.004)	−0.043 (0.060)	0.063
Enhanced Positive mood <sup>c</sup>	−1.843 (1.340)	0.334 (0.438)	0.283 (0.481)	0.259 (0.414)	0.028 * (0.017)	−0.002 (0.004)	0.022 (0.060)	0.029
Monthly expenditure at the pharmacy <sup>e</sup>	10.697 (17.697)	−3.708 (5.736)	0.021 (6.263)	−1.535 (5.399)	−0.346 (0.221)	−0.085 * (0.051)	0.542 (0.785)	0.054
Annual visits to doctor or health clinic <sup>f</sup>	−1.044 (1.056)	−0.16 (0.345)	−0.075 (0.379)	0.289 (0.326)	−0.005 (0.013)	−0.001 (0.003)	0.06 (0.047)	0.016

Legend: \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$  Bold numbers highlight statistical significance. Numbers in (parentheses) are standard errors for each coefficient. Measures: <sup>a</sup> Frequency of Behavior per month; <sup>b</sup> Daily Servings; <sup>c</sup> Change over past 6 months (1 = No change & 7 = Significant Change); <sup>d</sup> \$/week for individual; <sup>e</sup> \$/month for individual; <sup>f</sup> visits per year. Notes: Control is the reference for group dummy variables; N for all regressions is 153, except pharm (N = 152).

It is difficult to separate out whether CSA participation was used to reinforce already existing motivation to improve health in each individual, or whether the CSA initiated these other changes. It is likely a combination of both as individuals must initially commit to paying up front for a CSA subscription. As such, shareholders must be oriented to improving health to some degree to take on the task of picking up, preparing, and using their CSA box. When we examine the ‘factors causing employees to initially join the CSA’ question responses, however, health change categories scored lower than other considerations. Table 6 shows these groups had similar motivations for becoming shareholders. Both groups identified ‘access to better quality food’, ‘supporting local farmers’, and ‘helping their family to eat better’ as their top reasons for joining a CSA. Both groups also listed ‘access to new food varieties’ and ‘feeling that organic food was safer’ in their top five reasons. Losing weight occupied the middle of these factors for the LH group while it was the third lowest concern for the HH group. HH employees considered ‘supporting local farms and farmers’ and ‘feeling like organic was safer’ as more important factors in joining a CSA compared to the LH group. These group differences do not suggest that (1) shareholders were prioritizing health issues when joining the CSA voucher program or that (2) LH and HH groups differed in their motivations to subscribe.

**Table 6.** Reasons for Joining CSA—First Time Shareholders.

What Factors Caused You to Join Your CSA Initially? (7 POINT LIKERT)	Low Health Shareholders N = 54	High Health Shareholders N = 39
	Mean	Mean
Wanting access to better quality food	6.39	6.54
Helping my family eat better	6.18	5.97
Wanting to support local farms and farmers	5.76 <sup>b</sup>	6.44 <sup>a</sup>
Wanting access to new foods varieties	5.31	5.28
Felt like organic food was safer	5.09 <sup>b</sup>	5.51 <sup>a</sup>
Wanting to lose weight	5.09	4.25
Helping the environment	4.51	5.20
Wanting knowledge about how my food is produced	4.33	5.07
Getting engaged with a like-minded community	3.57	4.05
A specific health concern	3.46	3.26

Superscripts represent statistically significant differences between scores based on Tukey Multiple Means test at 5%. Indicators labeled ab are not statistically different from indicators labeled with only an a or b, whereas indicators represented by only an a or b are statistically different from each other.

#### 4. Discussion

CSAs have the potential to positively impact employee shareholders’ food lifestyle behaviors across a variety of indicators. The program appears to be particularly impactful for those who felt they were in poorer health prior to participation. Our results show that first-time shareholders increase their fruit and vegetable consumption by over half a serving per day on average relative to consumption before joining the CSA. This change is over one serving per day (compared to control) when isolating low health participants. As shareholders’ average pre-CSA consumption was four servings per day, this extra serving puts them at or near what researchers believe is a critical produce consumption threshold for positive long-term health outcomes. Public health researchers associate vegetable consumption, especially five servings or more per day, with decreased risks of cardiac disease, cancer, stroke, and other chronic diseases [18–20]. Other researchers [5,10] noted similar changes in vegetable servings, though these studies considered shareholder groups with longer-term involvement in the CSA model. These changes in vegetable consumption are perhaps not surprising, but they are important when considering the potential benefit of a CSA as a health intervention. They also parallel patterns of behavior change in long-time CSA shareholders observed in a previous study [4]. We used the same survey as in our pilot survey to examine the behavior changes of long-time shareholders of the same CSA farms. While offering a similar pre-/post-CSA question structure, these data were gathered through one survey. This long term shareholder survey was an attempt to baseline the

perceptions of these shareholders regarding specific behaviors they felt were directly impacted by CSAs. In that study, long-time shareholders estimated an average overall increase in fruit/vegetable consumption of two servings per day after joining their CSA and a current consumption level of six servings per day. This difference, when compared to our pilot first-time shareholders, may be related to long-term involvement in a CSA, where shareholders continue to gain knowledge on how to prepare and consume a CSA box in a timely manner [8]. This difference in produce consumption levels may also be due to a difference in consumer attitudes. Longer-term CSA members are early adopters of this food exchange relationship. As such, they may have different food-related values than our first-time pilot shareholders.

Nevertheless, first-time shareholders in our pilot study showed an overall increase in produce consumption, especially those individuals in the lower health test group, which was significantly different from the control group as indicated by both Tukey's tests and regressions. Similarly, shareholders increased salad consumption by around one per month, which while not an extreme change, indicates an overall favorable disposition toward vegetable consumption. Again, these increases are as large as two salads per month in the LH test group when other factors are controlled.

While we are in the process of collecting longer-term survey data on these pilot individuals, at this point it is evident that the CSA experience affected at least a measurable increase in vegetable consumption in shareholders compared to the control. This change, like many other measured behaviors, is most strongly felt by the low health group, which suggests enormous potential for CSAs as a health intervention—especially when looking across the range of potential health-related behaviors impacted.

While the increase in vegetable consumption is a critical benefit of CSA participation, shareholders engage in a broader set of systemic food and health lifestyle changes while enrolled in CSAs. This can be attractive to employers exploring wellness interventions that can help employees with lower initial health make positive changes toward wellness and support healthy employees to reinforce positive wellness choices. The restaurant expenditure decreases are particularly compelling. Though other food away from home measures were statistically unchanged, the sharp decrease in spending and greater cooking expertise, especially in the LH group, suggests that certain shareholders were substituting restaurant trips with at home meal preparation. This particular change is supported by other measures. Shareholders in general exhibited a strong shift away from processed foods for meals and snacks and a recent increase in food preparation expertise.

These changes are consequential and run counter to broader food trends in industrial nations, especially the substitution of fresh with processed food [45–47]. Restaurant foods are generally more calorie dense and served in larger portions than meals cooked at home [48,49]. Any decreases in restaurant visits, especially during the CSA season, may have positive health benefits, at least in terms measured by caloric intake.

Shareholders are compelled by the CSA to use their full share by virtue of the subscription-based purchasing model. In survey comments and follow-up focus group conversations, participants likened the CSA experience to a weekly puzzle in which they were motivated to use their full share. The CSA challenged new shareholders to get creative with their food preparation. Many explained that this challenge made them explore new recipes on their own or use farm-provided suggestions for preparation. This increase in cooking expertise, significant in our survey analysis, confirms the observations of other researchers [9,50] who demonstrate shareholders developing skills in response to the CSA experience. Additionally, pilot shareholders discussed their own motivations and strategies for avoiding waste of their share, which became a challenge due to their receipt of a large volume of produce at one point in time. As such, the shareholders noted that structure of the CSA experience influenced their weekly strategies of food consumption and acquisition.

Employee shareholders increased their purchasing of organic and local food categories and gained an awareness of food sourcing issues, particularly within the LH group. These changes suggest that new shareholders are exposed to a set of resources that facilitate and encourage behavior modifications.



Some of these resources are directly related to the program such as farmer conversations and CSA newsletters. Others resources were more indirect or self-motivated such as searching for new recipes online or joining Health & Wellness sponsored cooking/nutrition classes and webinars. These new resources in part ease the challenges associated with receiving a different variety of vegetables each week. The iterative structure of the CSA and its ever-changing composition requires participants to engage in a reflexive education process [8]. CSA participation potentially provides new information about vegetable production and preparation, new motivation due to changed tastes and perceptions of the food system, and new skills regarding preparation and preservation of previously unfamiliar foods. By experiencing new varieties, classes (heirloom, organic, etc.), and combinations of produce, shareholders may develop a preference for different types of food, some of which might only be available seasonally or through alternative food market channels [51]. Additionally, as CSAs require a direct interaction between shareholders, other subscribers, and producers, shareholders may begin to value different aspects of food production. Again, our pilot shareholders became increasingly aware of food sourcing issues.

Finally, the up-front subscription and payment for an unknown array of produce may restrict choice in what types of food a subscriber consumes [9] and act as a strong motivator to avoid wasted food. By changing consumer experiences of food types and market exchanges, CSAs may generate shareholder interest in other direct-to-consumer venues such as farmers' markets or community based retail cooperatives [31,51,52]. In other words, shareholders' CSA experience entangles food related behavior in a broader array of social relationships.

Behavior changes, as noted, were most significant in individuals reporting the lowest health. This is a critical observation for personnel in employee benefits and H&W programs as the transformative potential, in terms of health and behavior changes, seeming affects those in with the most health risk. It is, however, worth noting that while these first-time shareholders may already be predisposed to achieving a healthy lifestyle—an observation potentially supported by their decision to enroll in a H&W program. While this self-selection is a drawback to our project, it is unavoidable. We have designed this project to mirror actual employer-incentive CSA programs in order to understand how such programs might impact participants who select into this program. CSAs are not a food acquisition structure that fits everyone's lifestyle. What our data show, though, is that vouchers do motivate those who are unfamiliar with or intimidated by the CSA approach to try it. Further, these participants are achieving measurable health benefits and behavior changes. Finally, as discussed above, both shareholder groups had significantly lower interest in health issues (see Table 6) when joining the CSA. Because of this, the potential health benefits are enjoyed by those whose primary motivation to join a CSA is not health related. At the same time, the commitment to a CSA can be a meaningful mechanism to support implicit health goals. These observations echo those of other researchers [9,11,52–54]. Health benefits and eating behaviors shift whether or not this is the primary intention of the subscriber.

## 5. Conclusions

This study measures the behavior changes associated with first-time CSA shareholders participating through an employer-subsidized program. While CSA incentive programs are not the lowest-cost health interventions, employers have used preliminary data contained from this article to form pilot and expanded CSA incentive projects. As such, they are willing to invest over \$200 per employee in wellness efforts oriented toward produce consumption as they see a positive return on their investment. As few employers offer any type of healthy food wellness programs, CSA programs represent a unique approach toward reducing absenteeism, improving workplace satisfaction, and generating a workplace culture of health [14–17,55].

To fully embrace this approach as a health intervention, however, researchers may want to consider whom this type of program may reasonably affect. While a monetary incentive is important to expanding the potential subscribers, not all employees are likely to find the CSA model attractive. It can

restrict consumer choice, requires changes in food preparation and acquisition skills, and, while of good overall value, involves a significant pre-payment. Additionally, CSAs may be of limited benefit to individuals with chronic conditions or other mitigating circumstances. Others may lack the time to consistently prepare fresh produce. Also, different geographic regions of the US have varying ability to produce items that are appealing to local consumers due to climate particularities, land availability, and farmer interest.

The degree of CSA-motivated behavior changes will be influenced by the extent CSA providers develop novel approaches to program awareness and implementation. Researchers should examine what types of financing models, incentive structures, producer trainings, infrastructure investments, and consumer engagement programs would be required to create a viable CSA food economy that could support a CSA incentive program. Additionally, researchers would benefit from identifying the particular benefits that accrue to sponsoring organizations from engaging with a CSA incentive program, including returns on investments resulting from decreased absenteeism and health care expenditures. This would help make a better case for business and organization involvement in supporting the agricultural economy. It would also be valuable to have a better understanding of what types of consumer might be most likely to subscribe to the CSA voucher program. We recognize the need for a model that may predict that type of employee which would be mostly likely to subscribe to and benefit from a CSA voucher program. We attempted this with a logit analysis that compared key determinants of those who accepted and rejected their pilot voucher offer. This approach yielded results of limited utility (e.g., education was a significant factor in acceptance, but not pre-CSA vegetable consumption or income) due to a relatively low sample size.

Finally, it would be valuable to theorize and understand the potential role for complementary education initiatives related to CSA participation and benefit capture. This was limited in our experiment, but we intend to observe the impact of associated programs in following seasons. These initiatives might amplify behavior change results and be highly useful to first time CSA participants in an employee program. We are currently working with a regional non-profit and employers to expand CSA incentive programs and continue monitoring new and long-term CSA shareholders and the associated incentive programs. Through these efforts, we expect to provide more detailed information on the potential benefits of a CSA incentive program from the perspective of the individual, the employer, and the communities in which these organizations are embedded.

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