

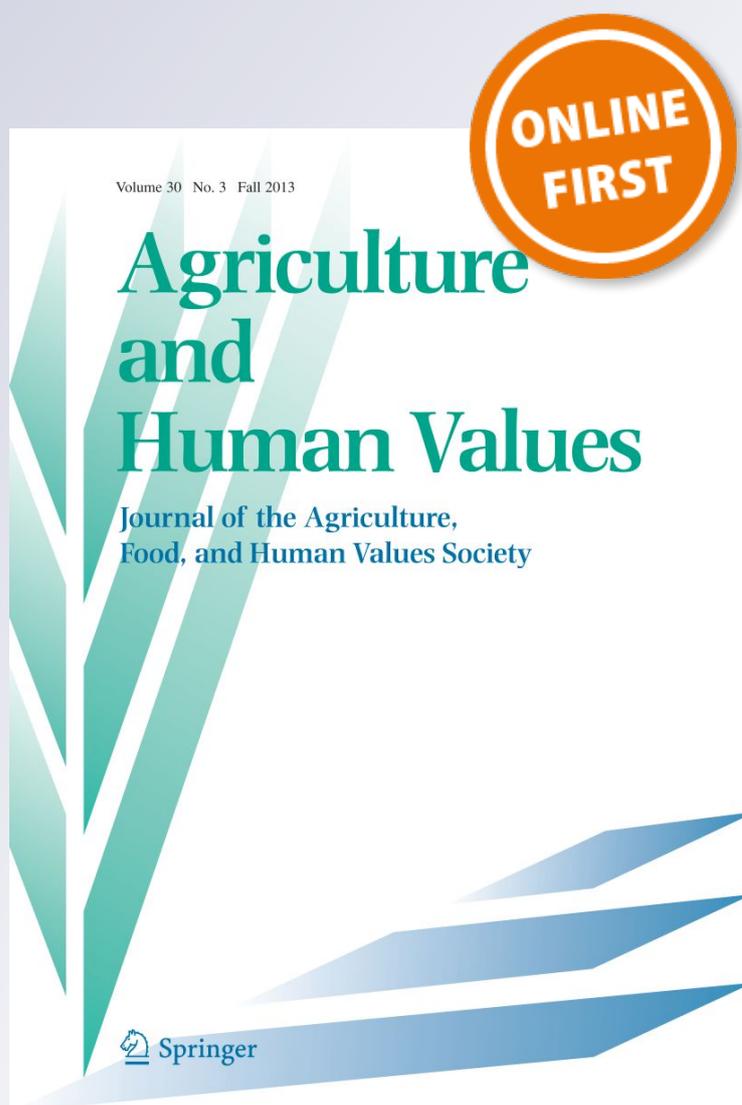
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# CSA shareholder food lifestyle behaviors: a comparison across consumer groups

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**Abstract** Community supported agriculture (CSA) programs are transforming the way people relate to food and agriculture. Many researchers have considered the transformative potential of CSAs on economic, social, and environmental relations. They illustrate how participants are embedded in broader political economic transformations. The same focus, however, has not been given to CSAs' transformative impact on individual shareholders—especially in terms of their relationship to food and health. We draw together literatures from behavioral economics, econometrics, and political ecology to evaluate the potential impacts of CSA participation on food lifestyle behaviors. Using primary data drawn from a survey of four groups with distinct food acquisition environments, we compare respondents' self-assessed food-related behaviors along three different categories: (1) produce versus processed food consumption, (2) food away from home consumption, and (3) food acquisition and interest in

nutrition. By documenting between-group differences, we confirm that shareholders display significant absolute differences to other groups along numerous indicators related to the above-stated categories and in general assessments of health. These differences correspond directionally to behaviors public health officials identify as correlated to beneficial health outcomes. We conclude by theorizing how the food environments delineated by a CSA exchange relationship provide unique reflexive opportunities for participants to develop diverse food-related skills and behaviors.

**Keywords** Community supported agriculture · Food lifestyle behaviors · Political ecologies of health

## Introduction

Community supported agriculture (CSA) programs are transforming the way people relate to food and agriculture. While many novel models are emerging (Nost 2014; Woods and Tropp 2015), CSAs generally require a direct relationship between a farmer and a shareholder-consumer through some sort of seasonal subscription to farm products. Shareholders buy into the farm's operation prior to the growing season in exchange for a regular delivery of fresh produce, meats, and/or value-added products. In this novel economic exchange, producers and shareholders engage in a complex negotiation of social and economic value (Hinrichs 2000; Kloppenburg et al. 1996) that transforms the environments in which agricultural goods are produced, distributed, and consumed.

In examining the transformative potential of CSAs, researchers and policymakers often focus on economic impacts (Galt 2013; Low et al. 2015; Sabih and Baker 2000), community engagement (Hinrichs 2000; Sumner

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et al. 2010), and environmental sustainability (Feenstra 1997; Hayden and Buck 2012; Uribe et al. 2012). These approaches serve two primary purposes. They (1) identify changes to the political economic landscape of food systems that facilitate or are facilitated by direct-to-consumer production/distribution strategies and (2) situate the shareholder-producer relationship within wider social, economic, and ecological contexts.

While researchers emphasize how CSAs and their participants are embedded in these broader political economic transformations, a growing number of researchers are interested in understanding the relationship between CSAs, health outcomes, and food-related behaviors (Allen IV et al. 2017; Cohen et al. 2012; Curtis et al. 2015; Russell and Zepeda 2008; Wilkins et al. 2015). These researchers have documented compelling behavioral changes among shareholders associated with their CSA experience. Shareholders increased vegetable consumption, altered their food acquisition strategies, and developed food preparation skills and knowledge related to a wide variety of food issues. At the same time, these studies have paid less attention to specific differences between CSA participants and non-participants in terms of food related lifestyle and consumer behaviors.

To build on and extend this literature, our research asks whether and to what extent key food-related behaviors are different between CSA participants and three other consumer segments. These three non-shareholding groups represent individuals situated on a continuum of food acquisition environments, contexts, and values that are progressively more similar to the CSA shareholder—(1) the average Kentuckian, (2) members of the University of Kentucky Health and Wellness program (H&W), and (3) owners of local co-operative retail outlet (COOP). The latter two groups can be classified as Lifestyle of Health and Sustainability (LOHAS) consumers. LOHAS groups engage in consumptive behaviors that they feel produces healthy bodies, environments, and society.<sup>1</sup>

Through multiple econometric analyses of a common survey instrument, we identify health-related behaviors that are characteristic of CSA participants when compared to non-participants, even when non-participants share similar food values. Shareholders display significant absolute differences to other groups along numerous indicators related to the following categories: (1) produce intake versus processed food consumption, (2) consumption of food away from home (i.e., restaurant items/fast food), and (3) consideration of health and nutrition in food acquisition behaviors.

Through these comparisons, we tease out lifestyle behaviors that are more strongly associated with CSA shareholders. We acknowledge that behaviors are personally and geographically complex. Choices on how to relate to food are shaped by an individual's family history, idiosyncratic choices, gustatory preferences, differential accesses to resources, and other local contingencies (Hayden and Buck 2012; Hayes-Conroy and Hayes-Conroy 2013; Shepherd 2006). Despite these environmental, personal, and social complexities, we argue that individuals' embeddedness in particular food environments and consumer groups matter.

While the CSA participation itself may be part of the health lifestyle choice set distinct from other consumer segments, many institutions find the potential benefits of CSA participation appealing and are exploring CSA-based preventative health care interventions. As such, the importance of our research is in providing a statistical characterization of how CSA shareholders generally differ from other consumer groups in food and healthy lifestyle behaviors. These differences lead to further questions about the impacts of participation in CSAs on health outcomes. At the end of this manuscript, we theorize what role the CSA exchange relationship may play in shaping these differences by drawing from existing literature and from our analysis of survey data.

We draw this econometric approach into conversation with political ecology - an interdisciplinary field concerned with understanding how land- and resource-use decisions are shaped by individuals' embeddedness in broader social, political economic, and geographic contexts. This analytic synthesis allows us to detail specific group trends in food acquisition and consumption attitudes while situating individual behaviors as socially and geographically contingent.

## Literature review: public health and CSAs

Researchers in diverse fields identify social trends and individual behaviors that are associated with positive and negative health outcomes. The food environments of industrial societies, especially the US, are characterized by the substitution of fresh foods with processed items (Monteiro et al. 2011; Moubarac et al. 2013) and increased away-from-home consumption (Kant and Graubard 2004). These trends, tied to the advance and expansion of global shipping and manufacturing technologies following WWII, are increasingly associated with health issues such as obesity, diabetes, and heart disease (Oh et al. 2005; Stuckler and Nestle 2012).

As researchers and public health officials are concerned about the social and economic costs of what they see as consumption-related maladies, they advocate increased access to and affordability of fresh produce for individuals

<sup>1</sup> See <http://www.lohas.com> for detailed discussion on how different LOHAS consumer groups are categorized.

in institutional and neighborhood settings (Krebs-Smith et al. 2010; U.S. Department of Agriculture & U.S. Department of Health and Human Services 2010). We review literature associated with how CSA participation relates to three main categories of life food lifestyle behaviors that are relevant to public health. Based on these broad categories, we compare CSA shareholders' behaviors to those of other groups through our surveys.

### **Fresh produce versus processed food consumption**

Increased vegetable consumption is generally treated as a positive factor in health outcomes. It is strongly associated with decreased rates of chronic health disease, hypertension, stroke, and cancer (Boeing et al. 2012; Dauchet et al. 2006; Harmon 2014). Nutritionists promote five servings per day as a benchmark for achieving significant health benefits (Bellavia et al. 2013). Given the prevalence of processed food, and comparative decline of vegetables in the diets of individuals in industrial countries (Clary et al. 2015; Produce for Better Health Foundation 2015), CSAs are one social node with the potential to reverse this trend for participants. By providing the subscriber with large amounts of fresh produce weekly, CSAs may create opportunities for behavior changes related to vegetable consumption.

A few researchers have found evidence of this in other studies. Consumers that frequent direct-to-consumer market channels (e.g., farmers markets, community gardens, and CSAs) exhibit long-term increases in vegetable consumption (Freedman et al. 2013; McCormack et al. 2010; Quandt et al. 2013). CSAs in particular seem particularly effective—with the average participant increasing their daily fruit and vegetable consumption by at least two servings (Cohen et al. 2012; Wilkins et al. 2015). As such, we detail the differences in produce and processed food consumption between different surveyed groups.

### **Food away from home consumption**

Our second area of interest relates to food-away-from-home (FAFH) consumption. In terms of health impacts, meal portions at restaurants are usually larger and more calorie-dense than meals served at home (Beydoun et al. 2009; Kant and Graubard 2004; Story et al. 2008). FAFH consumption provides a food environment focused on proteins, processed ingredients, and increased meal size. CSA subscriptions expose shareholders to significant produce quantities on a weekly basis—potentially altering their decisions on where and how to eat. As others have observed shareholder changes related to increased food preparation frequency and technical knowledge (Goland 2002; Russell and Zepeda 2008), CSAs encourage dining at home. Our

surveys compare different groups' FAFH consumption via multiple indicators.

### **Food purchasing behaviors and interest in nutrition**

Our last behavior category relates to how food purchasing behaviors are informed by a reflexive consideration of health impacts. Researchers have tied CSA participation to a variety of purchasing behaviors. Some individuals exhibit an increased preference for organic foods (Durrenberger 2002; Russell and Zepeda 2008). Others were observed to shift from a protein- to vegetable-centric model of meal planning (Perez et al. 2003; Russell and Zepeda 2008). Some CSA members began purchasing new types of produce due to their exposure with novel varieties in their share (Brown and Miller 2008). In general, CSA participation may have a lasting effect on how shareholders shop for or acquire food. We compare related consumer behaviors between groups in our survey and also inquire about how individuals get information about an item's nutritional content.

### **General approach for comparisons**

Our general approach is to identify any between-group differences in the three consumption and food lifestyle categories. Group differences may speak to the embeddedness of individuals in different food environments. As food lifestyle behaviors are ultimately personal decisions, individuals respond to similar situations differently. At the same time, individual decisions are made within a certain set of constraints—environmental, economic, and informational. As such, we attempt to draw out particular trends in group behavior via econometric methods, while recognizing that individual and bodily responses to these environments are not pre-determined or individually predictable (see Guthman 2012; Hayes-Conroy and Hayes-Conroy 2013). We also are concerned with theorizing how participation in a CSA may situate shareholders in a qualitatively different set of social and exchange relations which are conducive to food-related behavioral change. To understand how these food environments are affective social/exchange relationships, we draw from the insights of political ecology.

### **Political ecology, food environments, and individual behavior**

Political ecology is a multidisciplinary field concerned with understanding how broader social arrangements and environments impact the resource use decisions of communities and individuals. While this field is decidedly diverse, its utility resides in conceptualizing connections between

individual choices, embedded economic conditions, and the environment (Blaikie and Brookfield 1987; Peet et al. 2010; Robbins 2011). Political ecology was originally developed to understand how land use decisions in the developing world were impacted by the advance of export-oriented commodity production schemes (see Grossman 1998; Nietschmann 1979). In recent years, political ecologists have begun to more explicitly address agricultural issues within industrial nations and complex socioecological networks. Scholars have widened their purview to theorize how agricultural policies and development strategies are formulated by actors in the global north (Graddy 2014; Robbins 2002) and to understand how alternative food networks intersect with these global flows (Galt 2013; Horlings and Marsden 2011).

While maintaining a strong focus on illuminating how ecologies, health conditions, and community relations are shaped and modified by diverse multiscale economic relations, political ecologists have also begun to engage with biomedical and public health questions by broadly defining what counts as 'the environment'. They reconceptualize the connections between lived environments (the built and natural spaces humans inhabit) and bodily environments (the biological relationships between the body and what it consumes) (Guthman and Mansfield 2013; Guthman 2012; Hayes-Conroy and Hayes-Conroy 2013; King 2010; Stallins 2012). In this set of literatures, the body is embedded in complex political economic worlds and lived environments which, in turn, shape (1) individual resource use decisions and (2) bodily exposure and response to diverse environmental inhabitants.

Recent political ecology scholarship brings attention to relationships between humans and their encounters with varied sociocultural spaces and situations. For instance, Guthman and Mansfield (2013) link the exposure of environmental toxins—a situation conditioned by social inequality—to intergenerational effects on the expression of genes in exposed individuals. Hayes-Conroy and Hayes-Conroy (2013) illustrate how individual behavioral changes associated with farm-to-school program are unpredictable and related to individual emotions and varied life-experiences. These researchers emphasize that human health is the material embodiment of varied environments, ecological factors, and individual experiences. Many of these discussions related to health are centered on environmental justice and provide crucial insights into how many social groups embody social, economic, and racial inequality.

Recognizing the importance of this work, we engage with this framework in a more circumscribed manner. We use political ecology to theorize how different, broadly-defined food environments provide varied resources and opportunities for individuals to re-envision their relationship to food. Political ecologists note that individual

resource use decisions are constrained or enabled by environmental contexts, but are never determined. Additionally, political ecologists and social theorists posit that behaviors, social relations, personal/group identities, and knowledges change as a result of iterative, repetitive embodied actions that occur within differentially constituted environments (Lock 1993; Mol 2002; Schatzki 2001). We tie these insights to qualitative and quantitative survey data from our surveys to offer thoughts about how voluntary participation in a CSA food environment may create a social context for supporting healthy food-related lifestyle behaviors.

Like political ecology, behavioral economics is concerned with understanding individuals' use of different resources, but take a more structured approach to the role of the environment. Drawing from value-expectancy theory, approaches such as the Information-Motivation-Behavioral Skills (IMB) model (Fisher and Fisher 1992) posit that individuals often make choices that, in their estimation, will provide benefits beyond the cost of making that decision (Crosby et al. 2013). Individuals are embedded in different social settings that facilitate or hinder the enactment of certain behaviors. These social settings (relationships and/or environments) create different opportunities for action by presenting diverse forms information and motivation. Using econometric approaches, behavioral economists can delineate broad patterns of action associated with particular determinants of group membership.

We draw together political ecology and behavioral economics to create a mixed-method analysis that measures the differences in self-reported behaviors of CSA shareholders compared to other groups. In other words, we focus on detailing specific statistical differences in group behaviors while recognizing that the social contexts that facilitate these behaviors are complex and contingent. For the purposes of this particular study, we are most interested in detailing behavior patterns of CSA shareholders as the compare to other similar (LOHAS) and different (general consumer) groups. From these statistical analyses and open-ended responses in surveys, we theorize the role the CSA exchange structure may play in shaping these differences.

### Survey design and participant recruitment

We distributed an online survey via SurveyMonkey to compare the food consumption and lifestyle choices of CSA shareholders to three groups whose members had no experience in a CSA. The first group—the general Kentucky consumer—serves as a control since its consumers reside in diverse food environments. The other two groups were chosen based on the centrality of healthy lifestyle behaviors to their membership. These COOP group in particular had scores very similar to the CSA group on survey questions

designed to identify 'food choice factors' or values related to each groups' food acquisition habits (see Table 2). The four groups included in the survey are as follows (with abbreviations):

1. The Average Kentucky Consumer (KYC)—This group included a broad variety of consumers in Kentucky and was chosen to provide a baseline for the other, more specialized target groups. Participants were randomly recruited by Market Tools—a third party company that maintains a group of willing survey takers from diverse communities in the state.
2. Health and Wellness Program Participants (H&W)—Participants from this group were drawn from the University of Kentucky's Health and Wellness program. As H&W participants have taken initial steps to improving their health, they provide a litmus test for comparing CSA shareholders' food consumption and lifestyle behaviors. Health improvement, in this segment, is loosely characterized by a combination of increased exercise, monitoring biometrics, and attention to dietary practices. Participants were recruited through an online invitation and link provided by the director of the University of Kentucky's Health and Wellness program.
3. Food Cooperative Owners (COOP)—Coop owners have voluntarily chosen to buy a stake in a local grocery cooperative focused on organic, local, and health foods. Compared to H&W participants, we expected coop owners to conceive of healthy behavior more explicitly in terms of food consumption choices. Like H&W participants, this group presents a benchmark for comparing behaviors to our CSA shareholder group. We recruited participants through an online invitation and link distributed by a store manager to all owners of the Good Foods cooperative in Lexington, KY.
4. CSA Shareholders (CSA)—Individuals in this population were involved in a local CSA for at least one season. Central Kentucky has a few large CSA programs, but many smaller farms are emerging as providers. We recruited participants from the largest existing farms which collectively contain approximately 850 previous shareholders.

For each population, we offered a \$10 incentive to the first 150 individuals to complete the survey. All KYC participants were recruited through Market Tools and each participant received compensation as per the conditions of this 3rd party service provider. The CSA community was reached by sending surveys to 439 CSA shareholders; 151 usable responses were received. For the H&W group, 126 out of 500 recipients completed the survey. For the COOP group, approximately 8000 cooperative owners received an

email invitation and 379 individuals completed the survey. An undeterminable amount of participants in the H&W and COOP groups were ineligible to participate since they were previous or current CSA shareholders. We had 500 responses from Market Tools. Due to Market Tools proprietary methods recruitment, we have no data on how many individuals were contacted to collect 500 responses.

Each group received a nearly identical set of questions which asked each respondent to assess current engagement in a variety of food-related behaviors. Our questions were designed to fit into three broad categories as detailed above: (1) fruit and vegetable versus processed food consumption, (2) food away from home versus food prepared at home, and (3) food purchasing behavior and interest in nutrition. We developed these questions from previous surveys and focus groups conducted by members of the research team, analysis of peer-reviewed works, and consultation with stakeholders in the wellness and public health communities.

Questions related to the first category asked respondents to quantify their daily vegetable intake as well as monthly intake of salads, processed meals, and snack foods. The second category involved questions about how often participants prepared and consumed foods in different environments. For the third category, we examined behaviors related to purchasing different categories of food. For each of these first three categories, most questions involved the average monthly frequency of behaviors along a 7-point Likert scale with the following options: Almost never, 1–2 times, 3–4 times, 5–6 times, 7–8 times, 9–10 times, and more than 10 times. The exceptions to this strategy were that respondents were asked to quantify average daily vegetable intake, average annual visits to the doctor, weekly restaurant expenditures, and monthly pharmacy expenditures. Finally, we had each respondent categorically assess their current health on a five-point scale.

Finally, we developed a set of questions which asked participants to identify 'what factors influence your food choices?'<sup>2</sup> Each option was measured on a 7-point scale (1 = not a factor to 7 = significant factor). We used these questions to compare group values related to how individuals acquire and consume food.

## Analysis

First, to categorize our different groups, we compared the scores of 'food choice factors' by group using ANOVA and Tukey's tests. We used an ANOVA test to identify

<sup>2</sup> For CSA shareholders this question was phrased 'what factors caused you to join your CSA initially?'

**Table 1** Survey group characteristics

	KYC	H&W	COOP	CSA
N	502	106	292	136
Mean (sd)				
Sex (female)	0.62 (0.49)	0.78 (0.41)	0.82 (0.38)	0.81 (0.39)
HH income (thousands of \$)	47.86 (38.84)	80.15 (44.73)	79.25 (52.19)	108.08 (66.99)
Age (years)	46 (12)	45 (12)	52 (13)	45 (13)
Children per household (n)	1.8 (1.2)	1.6 (1)	1.5 (1)	1.9 (1.1)
Education	Proportion			
No degree	0.05	0.01	0.01	0.00
High school grade	0.55	0.15	0.13	0.03
2 or 4 year degree	0.31	0.44	0.37	0.33
Professional degree	0.01	0.39	0.50	0.64

significant differences between groups based on each group mean's associated variance. If the ANOVA indicated meaningful differences between at least two groups, we applied a Tukey's HSD Posthoc Test to identify which groups were different from each other. The Tukey's test involves a pairwise comparison of each group against all others.

Next we applied Analysis of Variance (ANOVA) and Tukey's Post-Hoc Test to 20 separate dependent variables that measured behaviors in the three categories specified above. We also applied three sets of OLS Linear Regression analyses to each dependent variable to control for demographic differences and for food related values (i.e., 'food choice factors').

The first set of regression models involved the same 20 dependent variables related to food and health behavior. We included the following independent variables: age (continuous, in years), sex (male as reference category), income (continuous, in thousands of USD), self-reported health (categorical, selected from 'poor', 'average', 'good', and 'excellent' with 'poor' as the reference category), and group (categorical dummy variable, with KYC as the reference category) as factors to help explain reported variations in each behavior.

Noticing that income contributed significantly for many variables, and that CSA and two LOHAS groups had a higher average income than the general Kentucky consumer (Table 1), we tested and adjusted for income interaction effects by running a second set of regressions on each behavior variable including an additional independent variable. This variable (income  $\times$  group) was the product of each individual's income and group identity. The coefficient of this new variable was multiplied by the average income of all groups combined (\$67,000 USD). This number was added to each group's coefficient to produce a new group coefficient adjusted for interaction effects. By creating an adjusted

coefficient, we evaluate the impact of the group variable more conservatively in order to mitigate the effects of the overall income disparities between groups. The results presented in Table 4 correspond to this set of regressions.

Finally, to control for the potential relationship between shareholders self-selecting into a CSA and a predisposition toward other healthy behaviors, we ran an additional set of regressions, each of which included an extra dependent variable that was based on the scores of one of five selected 'food choice factor' questions. These extra independent variables corresponded to values that might situate an individual as more likely to seek healthy behaviors prior to joining a CSA or as generally well-versed in alternative food networks and their associated values. We selected the participants' scores for the following responses to the question 'which factors influence your food purchase choices' to add to these separate regressions:

1. getting engaged with like-minded community,
2. wanting to support local farm and farmers,
3. wanting access to better quality food,
4. felt like organic food was safer, and
5. knowledge about how my food is produced.

Scores measured participants' self-evaluation of how important each of these issues were to them when buying food. By adding each of these variables to their own separate regressions, we to some degree control for the impact of pre-CSA values on behavior. These regressions provide some indication that the participation in the CSA structure is important to explaining the absolute differences between groups. The results of these regressions did not change the significance or magnitude of the income-adjusted regressions. As such, they are not presented in Table 4.

**Table 2** Food choice factors by group

Which factors influence your food purchase choices?	KYC	H&W	COOP	CSA
A specific health concern	4.09 <sup>b</sup>	4.43 <sup>ab</sup>	4.65 <sup>a</sup>	2.80 <sup>c</sup>
Wanting to lose weight	4.36 <sup>b</sup>	4.92 <sup>a</sup>	3.89 <sup>c</sup>	3.11 <sup>d</sup>
Getting engaged w/ like-minded community	3.15 <sup>b</sup>	3.20 <sup>b</sup>	4.51 <sup>a</sup>	4.30 <sup>a</sup>
Access to new food varieties	4.49 <sup>b</sup>	4.54 <sup>b</sup>	4.90 <sup>ab</sup>	5.28 <sup>a</sup>
Helping the environment	3.97 <sup>c</sup>	4.47 <sup>b</sup>	5.68 <sup>a</sup>	5.36 <sup>a</sup>
Knowledge about how my food is produced	4.58 <sup>c</sup>	4.83 <sup>c</sup>	6.14 <sup>a</sup>	5.52 <sup>b</sup>
Felt organic food was safer	3.58 <sup>b</sup>	4.00 <sup>b</sup>	5.91 <sup>a</sup>	5.89 <sup>a</sup>
Support local farmers	4.59 <sup>c</sup>	5.18 <sup>b</sup>	6.13 <sup>a</sup>	6.23 <sup>a</sup>
Help my family eat better	5.34 <sup>b</sup>	5.90 <sup>a</sup>	6.22 <sup>a</sup>	6.22 <sup>a</sup>
Access better quality food	5.28 <sup>c</sup>	5.71 <sup>b</sup>	6.50 <sup>a</sup>	6.57 <sup>a</sup>

Scores measure average relative importance of each on a 7 point Likert Scale

Different superscripts represent statistically significant differences between group scores based on Tukey Multiple Means test at 5%

## Results

### Group characteristics

Table 1 illustrates the comparative demographic information for each group surveyed. We required each participant to be the primary food purchaser for their household. There were a few similarities across groups. Primary food purchasers were generally female, aged 45–52 years of age, and responsible for shopping for 1–2 other people. However, income differences are quite noticeable between the average KY consumer and all other groups, especially the CSA participant. Finally, we note education differences with all LOHAS groups (H&W, COOP, and CSA) disproportionately receiving some form of post-high school education. The CSA demographic data aligns with other studies (Goland 2002; Russell and Zepeda 2008) that find shareholders to be relatively wealthier than non-CSA households. We adjust for these differences in our data analysis as described in the “Analysis” section.

Table 2 details the specific factors that each group identifies as important in their food acquisition philosophy (or in the case of shareholders, factors important to originally joining their CSA). CSA shareholders scored lowest on interest in health-related metrics and had very similar scores to the COOP group on factors related to food variety and quality, support for local farms and environments, and community engagement. In other words, CSA shareholders and COOP members view themselves as similarly interested in sustainability—from economic, social, and environment standpoints. The H&W group scored closer to the general population than the other two groups on most metrics while indicating more interest in weight-loss than all other groups. With that in mind, H&W groups still fit the LOHAS designation as within-group comparisons illustrate

more concern with supporting farmers, eating better quality food, and production practices compared to other factors.

### Tukey's tests and regression results

The results of the Tukey's pairwise means tests are presented in Table 3 and OLS regression models (income adjusted results only) are presented in Table 4. These regression models provide information on how each behavior (dependent variable mean) increases or decreases for an individual that has attributes specified by each independent variable. These models also indicate whether each independent variable's contribution is significant to the model. The data were calculated with against a reference condition of the average male Kentucky Consumer who is in poor health.

### Vegetable consumption versus processed food

Multiple mean comparisons revealed a few key differences between groups. Mean daily consumption of fruits and vegetables was the highest for the CSA shareholder group. Averaging around 6.2 servings per day, CSA shareholders' intake was significantly more than H&W and KY group at the 95% level. While CSA shareholders consumed nearly one more serving per day than the COOP group, tests did not indicate statistical significance. Regression analyses supported the Tukey tests. The CSA group provided the only statistically meaningful contribution to the model among the groups at the 90% level. Salad consumption also appears highly correlated to CSA participation. The CSA group averaged 9.3 salads per month—significantly more than all other groups in both Tukey tests and in all regression analyses.

In the two behaviors related to processed foods, shareholders consumed fewer processed snacks and meals than

**Table 3** Tukey's multiple means test results

Monthly behavior measures (times/month)	KYC		H&W		COOP		CSA		P value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
<b>Food away from home</b>									
Breakfast at restaurants	1.46 <sup>a</sup>	2.32	1.45 <sup>ab</sup>	2.53	1.11 <sup>ab</sup>	2.08	0.91 <sup>b</sup>	1.78	0.0204
Dinner at restaurants	3.24 <sup>b</sup>	2.85	4.31 <sup>a</sup>	3.19	3.98 <sup>ab</sup>	3.07	3.24 <sup>b</sup>	2.52	0.0001
Eat in the car	2.28 <sup>b</sup>	3.09	3.28 <sup>a</sup>	3.94	2.00 <sup>b</sup>	3.17	1.20 <sup>c</sup>	2.29	<0.0001
Prepare dinner at home	16.79 <sup>c</sup>	8.66	17.02 <sup>c</sup>	7.95	20.11 <sup>b</sup>	7.77	22.84 <sup>a</sup>	7.06	<0.0001
<b>Vegetables versus processed food</b>									
Processed Snacks	5.45 <sup>a</sup>	3.77	5.85 <sup>a</sup>	4.1	3.72 <sup>b</sup>	3.80	3.39 <sup>b</sup>	3.28	<0.0001
Processed meals	5.22 <sup>a</sup>	3.73	5.78 <sup>a</sup>	3.74	3.72 <sup>b</sup>	3.63	2.16 <sup>c</sup>	2.69	<0.0001
Salad consumption	5.58 <sup>d</sup>	3.83	6.80 <sup>c</sup>	3.54	8.32 <sup>b</sup>	3.50	9.34 <sup>a</sup>	2.83	<0.0001
<b>Shopping and interest in nutrition</b>									
Read nutrition labels	6.24 <sup>c</sup>	4.25	7.99 <sup>b</sup>	3.77	9.80 <sup>a</sup>	2.70	8.73 <sup>b</sup>	3.76	<0.0001
Discuss nutrition with peers	2.89 <sup>c</sup>	3.33	4.84 <sup>b</sup>	3.56	6.38 <sup>a</sup>	3.84	6.65 <sup>a</sup>	3.85	<0.0001
Buy organic food	2.50 <sup>c</sup>	3.32	3.27 <sup>c</sup>	3.70	8.60 <sup>a</sup>	3.44	7.50 <sup>b</sup>	3.98	<0.0001
Buy food marketed as local	3.89 <sup>c</sup>	3.44	4.80 <sup>b</sup>	3.41	7.87 <sup>a</sup>	3.28	7.66 <sup>a</sup>	3.47	<0.0001
<b>Recent behavior changes (1–7 scale: no change–significant change)</b>									
Increased cooking expertise	3.87 <sup>b</sup>	1.93	3.70 <sup>b</sup>	1.99	4.01 <sup>b</sup>	1.99	5.17 <sup>a</sup>	1.58	<0.0001
Less processed foods	3.52 <sup>c</sup>	3.83	3.77 <sup>bc</sup>	3.53	4.18 <sup>b</sup>	3.50	4.78 <sup>a</sup>	2.83	<0.0001
Greater nutritional awareness	4.01 <sup>c</sup>	1.90	4.04 <sup>bc</sup>	1.91	4.54 <sup>ab</sup>	2.03	4.89 <sup>a</sup>	1.86	<0.0001
Greater awareness of food sourcing	3.68 <sup>c</sup>	3.45	3.41 <sup>c</sup>	3.41	4.47 <sup>b</sup>	3.28	5.72 <sup>a</sup>	3.47	<0.0001
Better Digestive Health	3.48 <sup>b</sup>	1.83	3.36 <sup>b</sup>	1.94	3.90 <sup>a</sup>	2.02	4.26 <sup>a</sup>	1.90	<0.0001
<b>Other measures</b>									
Daily fruit/vegetable servings	4.76 <sup>b</sup>	4.29	5.04 <sup>b</sup>	3.87	5.41 <sup>a,b</sup>	3.10	6.21 <sup>a</sup>	2.26	0.0003
Self-reported health rating (1–7)	3.27 <sup>c</sup>	0.85	3.50 <sup>c</sup>	0.87	3.87 <sup>b</sup>	0.92	4.15 <sup>a</sup>	0.78	<0.0001
Annual doctors visits	7.48 <sup>a</sup>	11.4	2.94 <sup>b</sup>	2.25	3.11 <sup>b</sup>	3.04	2.03 <sup>b</sup>	1.76	<0.0001

Different superscripts represent statistically significant differences between group scores based on Tukey Multiple Means test at 5%

KYC and H&W. While snack consumption between the CSA and COOP groups was statistically similar, CSA consumed fewer processed meals than the COOP at a 99.9% level. In all regressions, the CSA group variable was more important to the model than all other groups in significance and magnitude for both processed food indicators.

In this behavior category, income was not significant in any model except for 'salad consumption', though self-assessed health condition was significant in all cases. Individuals who consider themselves to be in good or excellent health generally consumer more vegetables and fewer processed foods.

### Away from home consumption

Group comparisons reveal distinct differences in this broad category. Tukey tests indicate that shareholders generally eat breakfast away from home less than the general consumer and eat in the car less often than all other groups. CSA members ate dinner in restaurants at the same frequency as KYC despite large differences

in income, but less often than H&W participants. They also prepared dinner at home more than all other groups. When contextualized with regression analyses, these data are more complex. When income-group interaction effects are considered, shareholders became less likely than KYC to eat dinner at restaurants. At the same time, CSA weekly expenditures at restaurants overall show no significant group differences.

For each of these variables, self-assessed health and income were both important to the models. Individuals who rated their health as 'good' or 'excellent' health ate at restaurants less. Increased income was positively correlated with consumption outside the home. Yet group differences were apparent. Without considering income interaction effects in regression models, shareholders scored lowest on all 'away from home' consumption variables at a 90% level. When considering income interaction effects, the variables remained the same, but significance was lost. Finally, shareholders were the only group to display a recent acquisition of food preparation skills in both regressions and the Tukey tests.

**Table 4** Regression results by behavior

Dependent variables	Independent variables							Cons	R2	N			
	Dep var mean	Age	Sex.F	Income	Health Avg.	Health Good	Health Ex.				H&W	COOP	CSA
In avg. month, how many times do you...													
Eat breakfast at restaurants	1.33	-0.01**	-0.36**	0.01***	-0.28	-0.65***	-0.60**	-0.10	-0.26	-0.54	2.35	0.036	971
Eat dinner at restaurants	3.57	-0.04#	-0.22	0.02#	-0.45	-0.77***	-0.92**	0.69***	0.68#	-0.53	4.58	0.093	971
Eat in the car	2.17	-0.03#	-0.14	0.01**	-0.21	-0.69**	-0.99**	0.90**	-0.09	-0.95	3.94	0.056	971
Eat processed snack foods	4.8	-0.04#	-0.09	0.00	-1.14***	-1.39#	-2.33#	0.61**	-1.13*	-1.81***	8.22	0.095	971
Eat processed foods for meals	4.50	-0.02**	-0.40	0.01	-1.49#	-2.11#	-2.86#	0.75*	-0.80	-2.62#	7.74	0.141	971
Read nutrition labels	7.71	-0.02*	0.81***	0.02#	-1.41#	-0.35	-0.12	0.98	3.02#	2.05#	6.38	0.195	971
Eat salads	6.91	0.01	0.93#	0.02#	0.17	0.94***	1.97#	0.44***	1.31#	2.41#	2.76	0.220	971
Discuss nutrition with friends & colleagues	4.52	-0.04#	1.04#	0.01***	-0.17	0.75**	1.35***	1.32#	2.8#	2.84#	2.99	0.240	971
Buy organic foods	4.82	-0.02**	0.23	0.01#	-0.09	0.69**	1.50#	0.28*	5.41#	3.79#	2.39	0.421	971
Buy food marketed as locally produced	5.53	-0.01	0.36	0.01	0.01	0.39	1.29***	0.39	3.38#	2.99#	3.52	0.250	971
Prepare dinner at home	18.43	0.07#	1.53***	-0.02**	2.85#	5.06#	5.66#	-0.09	2.06	5.03#	10.51	0.068	971
In avg. year, how many times do you...													
Preserve food by freezing	7.23	0.00	0.06	0.00	-0.44	0.60	0.72	0.30	0.49	1.02	6.64	0.029	970
Preserve food by canning	1.94	0.00	0.40	-0.01	0.43	0.77**	1.14**	-0.88*	-0.55*	-0.01	1.85	0.022	968
Visit a farm	2.23	-0.01	-0.21	0.00	0.46	0.67*	1.15***	-0.10	-0.08	1.15**	2.21	0.035	967
Buy food from farmers or farmers' markets	5.50	0.01	0.88***	0.00	0.06	0.86**	0.85*	1.19	3.27#	2.91#	2.08	0.186	968
Other indicators													
Avg. daily fruit and vegetables servings	5.16	0.02*	1.36#	0.00	0.03	0.38	0.98**	0.04	0.13	1.21*	3.17	0.054	965
Weekly expenditure at restaurants	27.78	-0.02*	-6.54*	0.29#	-3.50	-2.16	-6.28	8.1***	-3.93	-9.55	35.51	0.061	970
Monthly expenditure at the pharmacy	29.56	0.34	-11.39*	0.25**	-56.75#	-62.40#	-68.72#	-7.30	0.52*	-4.45	61.04	0.071	968
Annual visits to doctor or health clinic	5.15	0.00	0.59	-0.04#	-3.79#	-5.12#	-4.98#	-3.63#	-3.08#	-3.71#	12.47	0.135	971
Self reported health	3.56	0.00	-0.04	0.01#				0.06	0.47#	0.67#	3.13	0.186	971

Sex coefficient to be interpreted relative to reference category of 'Sex: Male'

Health coefficients to be interpreted relative to reference category of 'Poor Health'

Group coefficients to be interpreted relative to reference category of 'Kentucky Consumer'

\*p < 0.10; \*\*p < 0.05; \*\*\*p < 0.01; # p < 0.001

## Food purchasing behaviors and interest in nutrition

Compared to KYC and H&W groups, shareholders spoke about nutrition with friends and read nutrition labels in greater frequency. They also indicate that they had recently become more interested in nutritional issues than all other groups, though measured differences were significantly less than COOP in 'reading nutrition labels' and not statistically different for 'discussing nutrition with friends' in the Tukey's test. In all regressions, the COOP group contributed more to the model in magnitude and significance in 'reading nutrition labels' while the CSA group contributed more to the model when 'discussing nutrition with friends'.

CSA shareholders buy significantly more organic and local products (excluding those in their CSA shares) than the KYC and H&W groups, but less overall than the COOP. Group mean differences between CSA and COOP are not statistically significant with the local and organic behaviors, while regressions indicate CSA shareholders buy fewer organic products when income and selected food choice factors are controlled. Additionally, shareholders become much more aware of food sourcing and farming practices than all other groups, even as they had less concern about these issues than the COOP group initially (Table 2). Finally, CSA shareholders assess their own health as better than all groups. They also have fewer health clinic visits per year than the average Kentucky consumer.

## Discussion

Our data suggest that CSA shareholders are engaging in healthy food lifestyle behaviors that are significantly different from the general population as well as groups associated with lifestyles of health and wellness. The most obvious, yet important difference rests in CSA shareholders' comparatively higher consumption of fresh produce. Government, NGO, and nutritionist guidelines (Bellavia et al. 2013; PFBHF 2015; USDA 2010) indicate that five servings per day of fruits and vegetables is the threshold for achieving positive health outcomes and the reduction of many types of chronic diseases.

Surveyed CSA shareholders are exceeding the daily level and compare most favorably to all other groups according to variables related directly to fresh food consumption. Shareholders also consume salad at greater frequencies and eat less processed foods than all other groups. Additionally, while sharing similar evaluations to the COOP group in their purchasing habits and interest in nutrition, they score much higher than the H&W and KYC groups in terms of behavioral metrics and have a stronger interest in food sourcing practices than all other groups. Finally, when considering health outcomes,

shareholders had on average less visits to the doctor, spent less on medication, and were more likely to rate themselves as being in good health.

From these data, we must ask what sets CSA members apart in terms of their stronger association with certain behaviors, especially since the CSA shareholders are the least concerned (compared to all other groups) with health impacts of food when making food consumption and purchasing choices (see Table 2). It is possible that these individuals are a unique set of consumers who have food politics or values that make them more likely to be concerned with self-improvement, health, and sustainability. In other words, CSA participation may simply be the logical extension of consumption patterns generally associated with healthy lifestyles. Yet, it is also possible that the structure of CSA provides more opportunities for individuals to engage in different food related behaviors, regardless of their initial food values prior to joining.

With this question in mind, we return to the analyses that considered how individuals' food consumption and purchasing values impacted behavioral indicators. Both CSA and COOP have similar and generally high mean scores on questions we use as a proxy to measure food values (Table 2). Based on these scores, both groups appear to be comprised of consumers with a distinct engagement toward LOHAS values. Despite these similarities, CSA individuals had statistically higher absolute values along many indicators as discussed above when compared to COOP members. When we added food choice factors to regressions as independent variables, we did not observe any changes in significance or magnitude of the results presented in Table 4. In other words, membership in a CSA, when treated as an independent variable, is consistently significant in explaining observed differences between groups even when food-related values are controlled. Additionally, while COOP individuals scored higher than CSA when comparing organic food purchasing and reading nutrition labels, CSA members consumed significantly less processed foods and significantly more vegetables and salads while reporting a higher general assessment of health. These results may suggest that while COOP individuals have a stronger self-identified interest in cultivating healthy lifestyles through their purchasing and consumption patterns, CSA shareholders are actualizing certain health-oriented consumption behaviors to a larger degree.

As such, this analysis provides evidence for both explanations regarding the differences between CSA shareholders and other groups. Surveyed CSA participants are a distinct consumer group characterized by their decision to participate in a CSA. On the other hand, CSA participation remains significant in regression models for explaining observed behavior differences even when controlling for similarities in food-related values between groups.

Additionally, while not presented in this article, other data from our shareholder survey indicate that many of these absolute measures presented in Tables 3 and 4 are associated directly with shareholders' experience in the CSA. For instance, we measured pre- and post-CSA behaviors of these same shareholders. Their vegetable consumption increased by around 2.5–3 servings per day (from 3.6 to 6.2) after joining a CSA. Additionally, these previous analyses indicate that shareholders exhibit significant changes in all behaviors listed in Tables 3 and 4 after experiencing at least one CSA season (Allen et al. 2017).

To summarize, CSA participants indicate that their experience in a CSA is a critical factor in modifying their food-related behaviors. At the same time, these participants already hold food-related values that may situate them as more likely to initiate behavior changes that they view as healthy compared to individuals in other groups. As such, this research opens up a few areas for further inquiry. First, we draw from public health and political ecology literature to theorize how the CSA exchange structure may provide different opportunities to engage in specific food-related behaviors. Second, we discuss how to determine if the effects of CSA participation are generally applicable or if CSA participation is an extension of other factors such as food-related values or income.

### CSAs as a motivator for behavior change

Researchers have become interested in the potential health effects of CSA participation. One explanation for differences observed between our surveyed shareholders and other groups is that CSAs provide a unique social exchange context (or food consumption environment) which is conducive to reflexive behavior change (McCormack et al. 2010; Perez et al. 2003; Russell and Zepeda 2008). Once enrolled in a CSA, participants are embedded in a food acquisition environment that involves an embodied learning process. Political ecologists and practice theorists emphasize that knowledge production, personal identity, and social relationships change as result of iterative, repetitive actions (Lave 2012; Lock 1993; Mol 2002; Schatzki 2001). For instance, the concept of citizen science, whereby amateurs participate in processes of data collection and analysis, relies on continuous hands-on training in various skills. Citizen scientists voluntarily engage in these repetitive actions to cultivate expertise, and often become more personally concerned about their object of study.<sup>3</sup>

Similarly, some researchers illustrate that CSAs may provide a foundation for the actualization of specific food lifestyle behaviors (Perez et al. 2003; Russell and Zepeda 2008). CSAs are subscription-based and therefore provide repetitive structured conditions. Subscriptions act as social and individually-reflexive contracts that motivate continued and increased levels of product/service usage compared to spot market exchange (Coyte and Ryan 1991; Gabszewicz and Sonnac 1999; Oster and Scott Morton 2005). On a weekly basis, the shareholder must build familiarity with the receipt, planning, and preparation of their produce box. This iterative structure repeatedly creates the opportunity for participants to use CSA produce as a starting point for meal planning, to develop food preparation skills, and to cultivate an understanding of new types of produce and cuisine (see Harmon 2014; Perez et al. 2003; Russell and Zepeda 2008; Ostrom 2007; Durrenberger 2002). The CSA distribution structure and direct exchange relationships expose shareholders to different informational, social, and motivational resources than other groups (Hinrichs 2000; Kloppenburg et al. 1996). As CSA farms often choose what a shareholder receives each week, shareholders' food choices are to some degree structured for them. CSA farms often provide information for shareholders to develop skills related to food preparation, nutrition, and even farming practices. It is possible, then, that the act of participation provides a unique experiential context to develop and modify certain food lifestyle behaviors.

Additionally, the sheer volume of produce received by the shareholder is likely to impact in-season purchasing and FAFH behaviors. Surveyed shareholders noted that CSA boxes often contained a higher volume and different variety of produce than they normally would purchase at a store. Many respondents mentioned sharing excess produce, taking fewer trips to the store during the CSA season, and worrying about wasting items from their share. As such, CSA participation may create the conditions whereby the shareholder will eat more produce (more creatively) because it is available and taking up space in their refrigerator. The shareholder may be substituting these fresh vegetables for processed snacks and restaurant visits. Others have documented that CSA participants tend to buy more food directly from farmers after their shareholding season ends (O'Hara and Stagl 2002) while spending less time shopping (Perez et al. 2003; Ostrom 2007; Durrenberger 2002). In other words, the CSA structure may push shareholders into different food consumption and acquisition environments. These repetitive, skill-gaining opportunities presented by a CSA may not be present in groups lacking different forms of exchange relationships.

<sup>3</sup> This observation draws from the work of practice theorists, but is based on the lead author's experience and collaboration with volunteers in ecological restoration projects.

## Are CSAs generally effective?

Part of the importance of our analysis is that it opens up areas for further study regarding (1) the potential for CSAs to support food related behavior changes in participants and (2) the generalizability of this potential. We outline a few ways forward to address these issues.

First, to isolate the impact of CSAs on shareholders, researchers would ideally survey first-time shareholders on behaviors both before and after the CSA season using the same questions. They might also survey respondents at multiple times throughout the shareholding season. This monitoring would continue for subsequent seasons to determine long-term impacts of shareholding. The researcher might also compare these observations to those of a control group drawn from the same pool of individuals as the first-time shareholders. Additionally, they could survey other groups (e.g., LOHAS individuals) in the same manner for further comparison. This experimental design would help identify changes that stem directly from participation. Researchers could augment these observations with short follow-up interviews.

Second, according to survey results presented in this paper, shareholders generally score high on sustainability-related food choice factors (environment, supporting farmers, prefer organic products, etc.) prior to joining their CSA. In other words, these individuals might have specific food politics that would explain their willingness to participate in a CSA. As such, from our current data, we cannot completely separate out the effect of implicit food values on shareholders' behaviors, even as we control for a portion of these values by adding food choice factor variables into our regressions. We therefore cannot speak to whether similar levels of healthy food related behaviors would emerge from the placement of random individuals from other consumer groups (e.g., H&W, KYC) into a shareholding arrangement for the first time.

In order to evaluate the impacts of CSAs on participants, a researcher would ideally choose a random sample of individuals from the population to participate in, pay for, and follow through with a CSA. This experimental design approach, though, is unrealistic as it still requires individuals to voluntarily participate. A different approach would be to encourage new participants, who hold different or more variable implicit food values, to participate with an incentive. As noted above, the CSA group had a mean household income of \$109K, which was significantly higher than all other groups. This echoes the critique that CSA shareholders are generally more affluent (DeLind 2011). By addressing the expense associated with upfront payments required by CSAs of shareholders, researchers could draw from a larger pool of participants who are embedded in a variety

of food acquisition environments and socioeconomic circumstances.

To do this, one option would be for the researcher to offer free shares to randomly chosen individuals and then measure each of their responses before and after participation. This approach, however, does not mimic the participant buy-in element of an actual CSA exchange structure. Also, it is impossible to guarantee that all participants would follow through. So any procedure to evaluate a CSA's impacts will inevitably involve shareholder choice to participate in a CSA relationship.

Absent the possibility of full experimental design, researchers might instead work to effectively reduce the barriers to participation by experimenting with different CSA incentive, recruitment, and delivery programs. From a cost perspective, researchers offering experimental CSA programs could offer installment payment plans, vouchers, insurance premium discounts, or sliding-scale rates based on income. By lowering cost barriers to participation, researchers could survey a broader population beyond affluent early-adopters with defined food-based politics and measure CSAs' broader impacts. Additionally, by surveying individuals who decline to participate in CSA studies, researchers might draw out general information on who is more likely to participate in a CSA.

In a subsidized experimental CSA program, shareholders would still contribute money toward the share to ensure that most would follow through with picking up their share. Buying into the program participation (figuratively and financially) is crucial to realizing health benefits. As such, there will likely be a large contingent of individuals for whom a CSA is not a good fit. Discussions with CSA farmers confirm this point as they note a high annual turnover in shareholders. Researchers, then, would benefit from developing and identifying specific indicators that may to some degree identify consumer groups, incentive structures, and public education programs that are effective in supporting the acquisition of healthy lifestyle behaviors.

At this moment, our research team has initiated a series of projects that measure similar behavioral indicators (before and after CSA participation) for individuals who have received a workplace incentive for CSA participation. This quasi-experimental approach was an attempt to attract participants with broader income diversity as well as those who are less familiar with alternative food systems. While we will present this behavioral data in a separate publication, we note that these incentivized participants also exhibit behavior changes in their first year of participation that mirror changes (to varying degrees) in long-term shareholders presented here and in our previous publication (Allen et al. 2017).

Additionally, in the regressions presented above, we control for income interaction effects in our regression

analyses. From our data, it is clear that while income differences play a crucial role in food away from home behaviors as well as organic food and salad consumption, income had no significant effect across all groups on vegetable consumption. In other words, as a variable, income did not have an effect on raw fruit and vegetable consumption levels, but CSA group membership did. From this data, we suggest that while our surveyed CSA members on average are more affluent, shareholders at lower incomes also had higher levels of fruit and vegetable consumption compared to other groups. As such, the potential health effects of CSA membership may cross socioeconomic lines if they were comprehensively paired with interventions that make CSAs more accessible.

## Conclusion

This research presents an initial yet promising comparative evaluation of CSA shareholders and their food-related lifestyle behavior. We envision this as a starting point for theorizing the potential impacts CSA models may have on shaping and constituting broadly-defined food consumption environments. Here, and in other work (Allen et al. 2017), we identify CSAs as a promising social/economic arrangement that can provide a unique and beneficial decision-making environment for shareholders even when compared to groups that have an explicit orientation toward health and wellness. To realize these benefits, however, we encourage more evaluation of the potential behavioral and health changes associated with initial and long-term membership in a CSA. Additionally, it would be fascinating to engage in a deep analysis of (1) specific values associated with the decision to join or refuse participation in a CSA and (2) changes in values associated following participation. Finally, our understanding of the links between health and CSAs would benefit from the continued theorization of (1) how broader political economic conditions are related to the development of CSAs in new locations, (2) the different choices made by these farmers as they engage with interested health-related or employer organizations, and (3) how emerging CSA models may specifically address food security and public health issues. By bringing together a focus on local agriculture economies and public health, we view CSAs as a potential mediator of beneficial social, ecological, bodily, and environmental relationships.

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