

A novel dietary improvement strategy: Examining the potential impact of community supported agriculture membership

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DEDICATION

This dissertation is dedicated to my late mother, Sharon Vasquez, and my father, Brian Vasquez, who have always had confidence in me and provided me with endless love, encouragement, and support. It is also dedicated to my loving husband, Jason Tamminen, who has patiently supported me and shared in the many challenges, uncertainties, and sacrifices throughout my academic journey.

ABSTRACT

Objectives: Chronic diseases have grown exponentially in recent years and have become a major burden on our society by increasing rates of premature death and disability, decreasing productivity, and increasing health care costs. Employer-based health promotion programs are increasingly common as a tool to improve employee health and to curb costs related to chronic diseases. This study evaluated the effectiveness of a novel, employer-based health promotion intervention to improve the dietary intake and health status of employees using Community Supported Agriculture (CSA). The key objectives were to evaluate the overall experience of CSA participants, to determine whether participants reported a change in their household food environment and meal patterns, and to investigate the association of CSA participation with dietary intake and health outcomes.

Methods: A convenience sample of employees from three employers was recruited using multiple communication methods with a total of 324 employees completing all study requirements. Data was collected using baseline and follow-up CSA surveys and the HealthPartners annual health assessment taken prior to and following completion of the study. Descriptive statistics were used to examine participant demographic characteristics and variables related to the CSA experience. To evaluate whether prior CSA experience and share utilization were predictive of participants' future CSA plans, logistic regression was used. Changes in the household food environment and meal patterns were assessed

using paired sample t-tests and the Wilcoxon signed-rank test. Linear regression methods were used to investigate associations of CSA participation with dietary intake and health outcomes.

Results: The majority of study participants were female, White, college educated, and lived in households with children and two adults. Common reasons CSA participants reported for joining CSA included fresh food, a dislike of grocery stores, and the educational and family experience of being part of CSA. Participants were generally satisfied with their overall CSA experience, and the majority reported that they planned to renew their CSA membership in the following year or that they were unsure of their plans. Additionally, those participants with prior CSA experience and higher share utilization rates were more likely to report that they planned to renew their membership in the following year. CSA participation was also found to be associated with an increase in the presence of vegetables in the household, the frequency of offering fruits and vegetables at snacks or meals, and the frequency of household meals. Additionally, CSA participation was associated with a decrease in the frequency of eating at all types of restaurants and fast food restaurants specifically. Participants reported that the amount and variety of produce consumed increased as a result of CSA participation, although inferential analyses of the change in daily produce servings and weekly produce variety from baseline to follow-up did not support this finding. CSA share type, weekly utilization, and prior CSA experience were not predictive of daily produce servings. In

addition, there was not a significant association between CSA participation and health status or BMI.

Conclusions: The overall experience of employer-based CSA members was similar to that of CSA members in previous studies, although some discrepancies in employees' motivations for joining and differences in individual satisfaction variables were identified. For example, study participants were more likely to be satisfied with logistics such as the CSA pick-up site and distribution time of day than participants in previous studies. The results of this study also demonstrated that CSA participation is associated with improvements in the household food environment such as an increase in the number of vegetables present, frequency with which produce is served at snacks and meals, frequency of household meals, and frequency of restaurant eating. The findings regarding the association between CSA participation and dietary intake and health were less definitive. Participants indicated that they felt the amount and variety of produce consumed increased as a result of CSA participation in response to the self-report questions on the follow-up CSA survey, but objective measures did not show a change in daily produce servings, weekly produce variety, health status, or BMI from baseline to follow-up when compared to matched controls.

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CHAPTER 1.0: INTRODUCTION

Chronic diseases such as obesity, cardiovascular disease, cancer, stroke, and diabetes are the leading cause of death and disability in the United States^{1,2}. According to the Centers for Disease Control and Prevention, seven out of ten deaths each year are attributable to chronic diseases³, and as of 2012, half of all adults had one or more chronic illness^{1,4}. Obesity has become a particularly concerning health issue given the rapid growth in its prevalence and associated health risks^{1,5,6}. Between 1980 and 2008, obesity rates doubled for adults and tripled for children⁷. Currently, more than one third of adults and seventeen percent of youth in the United States are obese⁸. Obesity is associated with increased morbidity and mortality and also increases the risk of numerous comorbidities including dyslipidemia, hypertension, cardiovascular disease, diabetes, some cancers, stroke, osteoarthritis, obstructive sleep apnea, reproductive problems, gout, and psychological disorders^{6,9}. For example, the relative risk of hypertension among obese adults aged 20-45 years old is five to six times that of non-obese adults, and the risk of diabetes and hypercholesterolemia is 2.9 and 1.5 times higher respectively⁶.

In addition to increasing morbidity and mortality, chronic diseases are placing an unsustainable economic burden on our nation¹⁰⁻¹². Individuals with chronic disease utilize significantly more health care services than healthy individuals¹³ with an estimated 78 percent of annual health expenditures attributed to chronic disease¹⁴. Obesity expenses alone were estimated to be \$147 billion in 2008⁷. In 2011, U.S. health expenditures were

\$2.7 trillion and accounted for 17.9 percent of the Gross Domestic Product (GDP)¹⁵. Left unchecked, these expenditures are projected to reach \$4.6 trillion and comprise 19.9 percent of GDP by 2022¹⁶.

In addition to undermining the fiscal health and competitiveness of the United States¹⁷⁻¹⁹, the growth in health spending has implications for individuals, families, and employers²⁰. A 2010 survey conducted by the Kaiser Health Research and Educational Trust showed that average annual health insurance premiums were \$5,049 for individuals and \$13,770 for families, which represents an increase of 130 and 138 percent respectively from 1999 annual premium costs²¹. Although 57 percent of individuals with chronic conditions are covered by private insurance, many incur substantial out-of-pocket expenses for health services not covered by their plan¹³. The indirect costs of chronic diseases such as short-term disability, absenteeism, and presenteeism (on-the-job-productivity) are even greater than the direct medical costs and place a significant financial burden on employers^{22,23}. This was illustrated by a study of the U.S. workforce at Dow Chemical Company, which found that chronic conditions cost the company more than \$100 million annually in lost productivity²⁴. A 2012 survey of CEOs found that health care costs were one of their top concerns²⁵.

Spiraling health care spending has led policy-makers, insurers, and employers to focus on disease prevention and health promotion programs that reduce the risks and associated costs of chronic disease²⁶. President Obama's American Recovery and Reinvestment Act

of 2009 dedicated \$650 million to support health promotion initiatives that target obesity, tobacco and other chronic disease risk factors²⁷, and the Affordable Care Act of 2010 contains specific provisions to encourage employers to implement health promotion programs²⁸. Worksites provide an opportune setting for health promotion given that most adults spend more time at work than anywhere else²⁹. Additionally, characteristics such as shared purpose and culture, social and organizational support, and robust communications systems can help drive program adoption and engagement^{4,35}. Employer based health promotion programs have been demonstrated to positively influence health behaviors, biometric measures, and financial outcomes³⁰. A meta-analysis illustrated the cost-effectiveness of employer-based health promotion programs and found that medical expenditures decrease approximately \$3.73 for every dollar spent, and absenteeism costs decrease \$2.73 for every dollar spent³¹. It is important to note that this study did not include presenteeism costs, and therefore, it may underestimate the return on investment of health promotion programs. Although there is well documented support of employer based wellness programs, the effects of these programs on behavioral change are often small to modest, and the evidence does not show them to be effective in increasing fruit and vegetable consumption³². As such, further research is needed to develop innovative approaches to improve upon the effectiveness of health promotion programs, specifically as it pertains to dietary behaviors such as fruit and vegetable intake.

The research that follows utilized a study conducted by a Minnesota-based health care system and investigates the effectiveness of a novel employer based health promotion

approach to improve the dietary behaviors of health plan members. Employees of three different employers were offered the opportunity to purchase a community supported agriculture (CSA) share, which was delivered to their respective worksites. The objectives of this research were as follows: (1) To investigate the overall experience of CSA participants, (2) to determine whether CSA participants report a change in their household food environment and meal patterns, and (3) to determine whether there is an association between CSA participation and dietary intake and health status. Chapter Two of this document includes a literature review of following topics: (1) benefits of fruits and vegetables, daily recommendations for fruit and vegetable consumption, and interventions to improve fruit and vegetable intake, (2) history of CSA and the current prevalence of CSA farms, (3) definition of CSA and an overview of its structure, (4) demographic characteristics of CSA members, (5) benefits of CSA, and (6) CSA member satisfaction. This chapter also describes the significance of this research and its contribution to the field. Chapter Three provides the conceptual framework on which this research is based. It also includes the research questions and hypotheses along with a description of the study design, survey measures, statistical methods, and the study sample. Chapter Four provides the results of this study, and Chapter Five includes a discussion of these results as well as the study strengths, limitations, and opportunities for future research. Finally, Chapter Six provides the study conclusions and is followed by tables, references, and appendices.

CHAPTER 2.0: LITERATURE REVIEW AND STUDY CONTRIBUTION

Fruit and Vegetable Intake

It is widely accepted that healthy lifestyle behaviors, such as eating fruits and vegetables, help to prevent chronic disease³³. Fruits and vegetables are high in fiber, vitamins, minerals and antioxidants, and are also low in energy density and fat³⁴. Increased consumption of fruits and vegetables has been suggested to reduce the risk of diseases such as cancer, heart disease, stroke, diabetes, cataracts, diverticulosis, and obesity^{33,35,36}. According to the National Institutes of Health, studies show that people who consume five or more servings of fruits and vegetables per day have approximately one-half the risk of cancer than those who consume fewer than two servings per day³⁷. Another study conducted by Joshipura et al. found consumption of fruits and vegetables – particularly citrus fruit, juice, cruciferous vegetables, and green leafy vegetables – to be protective against ischemic stroke risk³⁸. Evidence has also shown that consumption of fruits and vegetables helps to support weight management by promoting satiety and reducing energy intake^{34,39}.

Despite the well-documented benefits of fruits and vegetables, many Americans consume far less than the recommended amounts. Western diets are typified by high intake of energy-dense foods such as red meat, refined carbohydrates, sugar, and saturated fat^{33,35}. Excessive intake of these foods often replaces nutrient-dense foods and makes it difficult

for individuals to get the recommend nutrients and to control caloric intake⁴⁰. The United States Department of Agriculture recommends that moderately active adults consume two-and-a-half to three cups of vegetables and one-and-a-half to two cups of fruits per day depending on age and gender. Intake recommendations for children range from one to three cups of vegetables and one to two cups of fruit per day depending on age and gender.^{41,42} Eating a variety of fruits and vegetables is also recommended, especially dark-green, red, and orange vegetables⁴⁰. In 2007, only 24 percent of adults⁴³ and 22 percent of high school students⁴⁴ reported eating the recommended servings of fruits and vegetables per day. The low intake status of adolescents is particularly concerning given that this is a period of rapid growth and development⁴⁵. Furthermore, evidence suggests that dietary patterns established during adolescence may continue into adulthood⁴⁶. Socioeconomic disparities also exist with individuals of lower socioeconomic status being at greater risk for low intake of fruits and vegetables^{47,48}. This is evidenced in a study by Grimm et al. that found fruit and vegetable intake for individuals living with the greatest poverty was significantly lower than individuals living with the least poverty⁴⁷.

Numerous studies and interventions have been conducted in recent years to understand the correlates of fruit and vegetable intake and to develop interventions to increase consumption. Factors such as environmental influences⁴⁹⁻⁵¹, psychosocial constructs⁵², demographic characteristics⁵³, and taste preferences⁵⁴ have all been found to be associated with the intake of fruits and vegetables. For example, a study of adolescents conducted by Neumark-Sztainer et al. found that taste preferences and home availability

were associated with fruit and vegetable intake⁵⁵. Another study of preschool children found that household environment characteristics such as parental intake and provision, availability, accessibility, and set mealtimes were associated with intake levels⁴⁹. Litt et al. evaluated the association between an urban adult population's produce consumption and social involvement, neighborhood aesthetics, and community garden participation. Community gardeners reported significantly higher intake of fruits and vegetables than home gardeners and non-gardeners. Furthermore, social involvement and perceived neighborhood aesthetics were positively associated with fruit and vegetable intake.⁵⁶

A number of strategies to target the various correlates of fruit and vegetable intake and to increase consumption have been implemented with modest results. For example, the 5-A-Day for Better Health Program is a national nutrition education campaign that was designed to increase awareness of the need to consume more fruits and vegetables and to increase average consumption in the United States to five or more servings daily. The program was successful in increasing awareness of the 5-A-Day message from seven percent in 1991 to nineteen percent in 1997. However, after adjusting for demographic factors, increases in consumption were only experienced by Hispanics, individuals aged 18 to 34, and non-smokers.⁵⁷ A recent review evaluated behavior-based intervention trials to increase fruit and vegetable consumption and found that of the 34 studies identified, the average increase in fruits and vegetables was 1.13 and .39 servings per day in adults and children respectively. Minority and low-income populations reported slightly lower increases in consumption than the general adult population with an increase of .97

servings per day. Seven of the 34 studies evaluated were worksite based interventions, and the results showed that employees increased consumption an average of 0.8 servings daily.⁵⁸ A number of interventions have focused on increasing access to fruits and vegetables^{36,51,59-61}. For example, the Seattle Senior Farmers' Market Nutrition Pilot Program delivered baskets of fresh, locally grown produce to 480 low-income, homebound seniors. Seniors who received the baskets reported increasing their consumption of fruits and vegetables by 1.04 servings daily, and the number of participants consuming five or more servings per day increased from 22 percent at baseline to 39 percent by the end of the season.³⁶ The Pennsylvania Fresh Food Financing Initiative was created in 2004 and helps to improve access to fruits and vegetables by refurbishing or developing new supermarkets in underserved areas^{61,62}. Since its inception, it has provided funding for 88 fresh-food retail projects and has improved access to healthy food for more than 500,000 people⁶². Interventions to improve the food environment are also common. For example, a worksite study by Jeffery et al. found that increasing the availability of nutritious food choices in the cafeteria and lowering prices resulted in a threefold increase in fruit and salad purchases⁶³.

CSA History and Prevalence

The concept of CSA originated in the 1960s in Japan, Switzerland, and Germany in response to concerns regarding food safety and the urbanization of farmland⁶⁴⁻⁷⁰. These concerns led to the development of the teikei system by a group of Japanese

homemakers^{67,68,70,71}. The literal translation of the word teikei is partnership, but philosophically it means “food with a farmer’s face on it”⁶⁷. Teikei reconnects consumers with producers through a direct food distribution system that operates independently of the commercial market in accordance with ten key principles (Appendix A). Through collaboration, mutual understanding, and commitment, the teikei system ensures a safe, sustainable, and ecologically sound food supply.⁷²

A movement similar to the teikei system started in Europe at around the same time period^{66,68}. Unlike in Japan, the inception of this movement is thought to be related to the teachings of Austrian philosopher, Rudolf Steiner (1861-1925)⁷³. Steiner believed that the proliferation of chemical agriculture was problematic and environmentally damaging. He held what is argued to be the first ever organic agriculture course in 1924, which was attended by individuals from six different European countries.⁷⁴ Steiner’s lectures formed the foundation for an alternative form of agriculture to “heal the earth”, which would eventually come to be known as biodynamic farming^{73,74}. This alternative farming method, and its eventual outgrowth to CSA, was founded on the idea of a mutually beneficial consumer-producer association⁶⁷ and holistic management practices that incorporate the environmental, financial, and social aspects of farming⁷⁵.

It wasn’t until the mid-1980s that the concept of CSA made its way from Europe to two independent farms in New England^{65,67-69,76}. Jan Van Tuin, who had experience with the CSA concept in Switzerland, and Robyn Van En established the Indian Line Farm CSA

in 1985 in South Egremont, Massachusetts^{67,77}. Temple-Wilton Community Farm CSA was established in 1986 in Wilton, New Hampshire with the support of Trauger Groh who had recently moved to the United States from Germany^{67,78}. Since the arrival of CSA to the United States, the movement has gained considerable momentum. In 1992, there were approximately 37 farms that offered CSA; within just a couple of years that number had grown to around 400 farms^{66,79}. Current estimates regarding the number of CSA farms vary by source, but it is clear that the growth of CSA has continued at an exponential pace. The United States Department of Agriculture 2007 census data estimated the number of farms marketing products through CSA to be 12,549 in 2007⁸⁰. Local Harvest, which has one the most comprehensive databases of CSA farms, had over 5,000 farms listed in their database as of August 6th, 2012. CSA farms are now available in every state⁷¹ and are typically located near large metropolitan areas⁸¹ with the highest concentrations found in the Northeast, certain areas of the Midwest, and coastal regions of the West^{66,68,71,82,83}. In addition to the increase in the number of CSA farms, membership rates have grown as well. A survey of 205 CSA farms found that the number of members grew an average of 50 percent between 2007 and 2009.⁸⁴

CSA Definition and Structure

The CSA model is a form of direct marketing in which consumers and farmers engage in a mutually supportive relationship by sharing in the risks and benefits of food production^{65,66,81}. Members typically purchase a share prior to the start of the growing

season, and in return, they receive regular allotments of the farm's harvest throughout the season. CSA members do not know the exact variety or amount of food that they will receive⁸⁵. If the farmer has a bumper crop, the member will benefit by receiving a greater amount of food whereas if the harvest is small due to weather or pests, the member will suffer alongside the farmer^{66,86}.

The specific CSA structure, season length, and product offerings vary, but most farms share a number of commonalities. The core product offerings are typically fresh vegetables and fruits⁷⁹ that are grown utilizing organic or biodynamic farming methods^{66,76,81,87}. Some farmers also offer alternative products such as meat, eggs, dairy products, herbs, flowers, and honey^{67,82,88,89}. The majority of CSA farms provide members with a pre-selected box of produce, although it is increasingly common for members to be offered some degree of choice^{71,82,90}. For example, some farmers allow members to leave items they don't want and exchange them for items other members have left behind. The amount of produce that members receive varies based on the farm and share type. A typical full share is provided on a weekly basis and is enough to meet the produce needs of two to four people^{67,81,89}. Some farms also offer other options such as half shares, extended season shares, winter shares, and fruit only shares⁸¹. Members typically pick up their share from the farm, a member's house, or a local business^{68,91}. The length of the CSA season varies but is usually around five months for a full share⁷⁶.

Another commonality amongst CSA farms is the season-long financial commitment from their members⁸². The traditional model of CSA requires pre-payment for the entire season, but flexible payment plans have become increasingly common in recent years⁸⁴. Membership fees vary according to the farm, share type, and season length with a typical full share costing between \$300 and \$800⁹⁰. Some farms also provide discounted or free shares in exchange for work⁷¹. For example, Troy Community Farm in Madison, Wisconsin charged \$400 for a full share in 2006 and provided ten shares at no cost in exchange for 84 hours of work. Ten partially reduced shares were also provided to low-income members.⁹²

The CSA model emphasizes the community aspect of the consumer and producer relationship, although the extent to which this is prioritized differs by farm. On one end of the spectrum, some farms rely heavily on core groups of volunteers to oversee many operational aspects of the farm such as food distribution, member events, marketing, planning, and budgeting^{64,79}. Data from the 1999 National CSA Farm Survey showed that approximately 28 percent of the farms that were surveyed utilized core groups⁷⁶. Other farms call on members to help with weeding or harvesting during the season^{65,87}. A study of four CSA farms in the Twin Cities region found that all four farms relied on volunteer labor to some extent, and one farm required at least one day of labor for each share that was purchased⁷⁹. In contrast, other farms do not require or even encourage their members to work on the farm^{71,82}. Another way in which farms support community development is through farm events, tours, newsletters, potlucks, and educational programs^{68,69,76,87}.

Approximately 81 percent of respondents to the 1999 National Farm Survey reported that they offered planned events at their farms. Results of this survey also showed that farms who utilized core groups were more likely to organize social and educational events, establish programs for low-income members, and to have higher farm incomes.⁷⁶

CSA Member Demographics

The demographic profile of CSA members tends to be relatively homogenous with respect to their racial and ethnic background with the majority of members being Caucasian^{85,92-94}. For example, a 2010 study by Landis et al. of five CSA farms in North Carolina (n = 210) found that 97.1 percent of the members were Caucasian, 1.4 percent were Asian, and only 0.5 percent were African American⁸⁵. An earlier study that evaluated 12 CSAs on the Central Coast found that 90 percent of the members were of European-American descent⁹⁵. Demographic analysis of CSA members of a Madison, Wisconsin farm revealed that not one of the 110 members was African American⁹². Research conducted by Dr. Schnell might lend some insight into the racial homogeneity of CSA members. Comparison of counties with and without CSA farms illustrated that African Americans represented an average of 5.2 percent of the population in counties with CSA farms and an average of 9.6 percent of the population in counties without CSA.⁸² This suggests that the geographic distribution of CSA farms might be associated with the low participation of minority groups. However, Asian and Hispanic populations were well represented in CSA counties despite the fact that their participation was low.

The author attributed this to the high density of CSAs on the West Coast and the fact that these areas have a large population of Hispanic agricultural workers and Asian Americans but did not provide suggestions for why these minority groups were underrepresented among CSA members.⁸² Although no other studies were identified that looked specifically at the reasons for the racial homogeneity of CSA members, it is likely that a number of confounding variables are associated with member race and ethnicity such as CSA access, socio-economic status, and education. For example, membership might not be within reach of low-income households because paying for their food in one lump sum prior to the start of the growing season might not be economically feasible.

CSA members also tend to be highly educated^{65,71,79,81,85-87,93-95}, although MacMillan et al. suggested that this association is not consistent as evidenced by a study that found education level to be negatively related to interest in local foods^{93,96}. However, the referenced study investigated consumers' willingness to purchase local agricultural products and was not specific to CSA⁹⁶. CSA only represents one part of the local food movement, and it is plausible that the demographic characteristics of CSA members differ from the overall population of individuals involved with this movement. All CSA specific studies that were identified as part of this review, including the one conducted by MacMillan et al., illustrate the fact that CSA members are highly educated. Of the 115 CSA members surveyed in MacMillan's study, 88.5 percent had completed a bachelor's, graduate, or professional degree⁹³. Research conducted in 2000 by Cone et al. of eight CSA farms in the Twin Cities area found that almost all members had college degrees

and close to 60 percent had completed some postgraduate work⁸⁷. Another study evaluated farms in the Mid-Atlantic area and found that 89 percent of survey respondents had at least a college degree, and 56 percent had a graduate or professional degree⁸¹. Research by Landis et al. provides further support for the educational status of CSA members. Almost all members of the five farms he evaluated were college educated. Approximately 98 percent had a bachelor's degree, 37.3 percent had a master's degree, and 23 percent had a doctoral degree.⁸⁵

The large majority of research studies also show that CSA members typically earn more than the average population in the United States^{81,85-87,92,93,95}. For example, the aforementioned study by Landis et al. found that the majority of members had an annual household income of over \$60,000. Over 43 percent of the members reported that they earned over \$100,000.⁸⁵ In comparison, the median national household income during this same time period (2007) was \$52,823⁹⁷. Another study by Perez et al. of 14 farms on the Central Coast found that 66 percent of the members who responded to a survey regarding their 2001 CSA experience had an annual household income of \$60,000 or more⁹⁵. Similarly, a study by MacMillan et al. found that 71.2 percent of the study participants had a household income of \$60,000 or higher⁹³. A study by Goland et al. shows a somewhat less clear income distribution with a slight majority of members having a household income of less than \$50,000 in 1999⁷¹, which is less than the median national household income for that year of \$53,252⁹⁷. However, the number of study

participants was quite small with 24 and 22 respondents for the fall and spring surveys respectively⁷¹.

The existing research provides strong evidence for the fact that the majority of CSA members are female^{71,81,86,87,93,94}, but findings regarding age distribution^{71,81,92,94} and household characteristics are slightly less definitive^{65,71,85-87,92}. Despite some variability in results, CSA members are by in large middle-aged^{71,81,92,94} and tend to have children and more than one adult living in the household^{71,86,87}. A study by Cone and Myhre showed that 74 percent of CSA memberships were initiated by women and also found that women typically take on the primary role of household food procurement and preparation. Of the 592 participants in this study, the large majority (71.9%) indicated that they lived in a household with children, and most of these households also had two parents present (65.7%). Only 22.5 percent indicated that they lived in a single adult or single parent household.⁸⁷ A study by Goland found similar results and showed that participants were primarily female, an average of 50 years old, and lived in households with an average of one child and one additional adult⁷¹. Research conducted by Oberholtzer of four Mid-Atlantic farms also found that the majority of members were female (80%), but in contrast to Goland's research, this study showed that most members (66%) were between 30 to 39 years old⁸¹. Three other studies showed the average age of CSA members to be between 42 and 47 years old^{85,92,93} whereas a study of low-income CSA members found that the average age was 36 years old⁸⁸. Russell and Zepeda also showed that CSA members were less likely to be single, and unlike with some of the

aforementioned studies, less likely to have children living in the household⁹². Another study by Kolodinsky and Pelch showed that having children was inversely associated with a household's likelihood to join a CSA⁶⁵. The variability in household characteristics may be related to confounding factors not assessed in the majority of studies that were identified. On one hand, the quantity of produce in a typical CSA share might be best suited to households with a greater number of individuals. However, households with children might be busier and therefore less able to incorporate CSA into their lifestyle due to the extra time required for food preparation. Employment status, income, amount of leisure time, and external support might all influence whether households with children decide to participate in CSA.

Reasons for Joining a CSA

Several studies have assessed the motivations for involvement in CSA and have identified a plethora of reasons that members cite for joining a CSA farm. The most prevalent of these reasons are concern for the environment; a desire for fresh, organic, quality produce; and a preference for local foods^{64,67,70,71,73,79,81,85-87,95,98-100}. For example, a survey of shareholders from four Mid-Atlantic farms asked participants to rate 13 different reasons for participating in CSA using a 4-point scale ranging from “not important” to “very important”. The following five factors were most frequently rated “very important” by the 276 respondents: desire for fresh food (76%), desire for locally grown produce (75%), desire to support a local farmer or farm (74%), desire for organic

produce (72%), and general concern for the environment (62%). Factors that were lowest in importance included trying new foods (8%), convenience (4%), less expensive food (4%), and an opportunity to work on the farm (3%).⁸¹ Similarly, a study of eight CSA farms in California showed that members' top reasons for participating in CSA were a desire for organic produce, fresh produce, and buying or supporting local foods⁹⁵.

Another study by Cooley and Lass lends further support to these findings and showed that 93 percent of participants indicated produce quality was an important reason for joining a CSA, and 97 percent cited local farming as important⁶⁹. Other less frequently cited reasons for joining a CSA include health/dietary reasons^{71,85,98,100}, food safety^{71,86}, a desire to eat food in season⁸⁷, interest in knowing how/where food is grown^{86,87}, and produce value⁶⁴. It is interesting to note that community and price are not typically indicated as important factors in the decision to join a CSA farm. Surprisingly, research has illustrated that even the members most engaged in farm activities often rank community as low in importance in their decision to become a member.^{79,87} For example, a study of four CSAs in the Twin Cities area showed that while belonging to the farm community was ranked low in importance, 70 percent of members indicated they wanted to participate in farm events, and 57 percent visited the farm during the season⁷⁹. Another study by Russell and Zepeda suggests that the idea of a "conceptual community" might be more important to members than an actualized network of relationships⁹². In other words, members value the idea of belonging to a group of people who have similar ideals and interests more than they value spending time and developing relationships with other members. This premise was further supported by Russell and Zepeda's study, which

found that despite low levels of interaction among members, the majority of participants indicated that they found value in belonging to a group with whom they believed to share common interests and values⁹². The low importance of price as a reason for joining CSA might be related to the fact that many CSA members are more affluent, although no studies were identified that explored this topic in further detail.

Benefits of CSA

Community supported agriculture is postulated to provide a number of benefits to CSA farmers, shareholders, and the community at large. For example, a number of studies have shown that CSA provides numerous economic benefits^{66,67,69-71,81-83,86,87,90,101-105}. Cooley et al. investigated the retail values for an equivalent amount of organic and conventional produce for three CSA farms and found that the CSA shares were substantially less expensive. When compared to retail prices for organic produce, the savings ranged from \$149 to \$683 for the three farms analyzed. Savings were less when comparing to conventional produce prices but still significant at \$45 to \$335.⁶⁹ A 1996 study by Farnsworth et al. also demonstrated that CSA members receive a good value for their share relative to retail produce prices⁶⁴. It is important to note that these studies assume an equivalent amount of produce utilization regardless of whether the produce was obtained via a CSA share or a retailer, which might not be the case due to the pre-selected nature of CSA shares. CSA farmers also reap many economic benefits. Pre-payment of membership fees provides the capital needed for farm operations and

salaries^{66,86,101}. This is particularly advantageous to small scale farmers in that it eases entry into the agricultural market¹⁰⁵ by providing them with guaranteed income and financial credibility^{67,71,87,102}. CSA also provides farmers with the financial security to survive the inherent variability of farming^{70,71,102}. For example, the costs incurred due to a drought are shared amongst all members of a CSA and are thus far less catastrophic to the individual farmer than they would be under the conventional farming model.

Additionally, CSA farmers receive better prices for their produce by eliminating intermediaries in the supply chain and selling directly to consumers^{66,70,82,103}. The CSA model also reduces or eliminates many of the transport, packaging, and marketing related costs that are characteristic of conventional agricultural practices^{66,69,71}. Although no studies were identified that attempted to quantify the economic value to communities, it has also been suggested that CSA supports the local economy¹⁰⁶ by encouraging entrepreneurship⁸⁸ and local employment^{83,107}.

In addition to the potential economic benefits, CSA is thought to build a sense of community between farmers and the people who consume the food they grow^{64,67,82,90,95,108}. CSA members know how, where, and who grows their produce⁸⁷, which helps to instill a sense of trust regarding food safety^{69,71}. Farm events such as festivals, farm tours, volunteer work days, and children's activities also provide an opportunity for members to make social connections with one another^{83,87,90,95,102}. This connection was illustrated by a study that brought together CSA farmers with low-income households by utilizing a grant to pay the membership fees for study participants. The

results of this study showed that new relationships were formed between members, their families, and the farmers.⁸⁸ Another study found that participation in farm activities provided members with a sense of spiritual fulfillment, a connection to the land, and an avenue for exercising their civic responsibilities⁸⁷.

CSA also provides an ecologically sustainable alternative to industrial agricultural systems^{64,67,69,71,73,85,90,95,103,104} and helps to revitalize rural landscapes¹⁰⁸. Unlike with industrial agriculture, which often emphasizes monoculture farming practices¹⁰⁹, CSA farms typically produce a wide diversity of crops to meet the needs of their members^{71,104}. Crop biodiversity has the added benefit of providing natural protection against pests, sustainable yields, and soil fertility¹⁰⁹. The majority of CSA farmers also use organic or biodynamic farming methods, which fosters land stewardship through the avoidance of chemical pesticides and fertilizers^{69,71}. Additionally, local food production minimizes the environmental impact related to the transport and excess packaging of food^{69,103,104,110}. Through participation in CSA, consumers also gain agricultural knowledge and an awareness of the environmental aspects of food production^{69,82,90,95}. For example, a study by Perez et al. showed that 16 percent of study participants were more aware of agricultural and environmental issues, and 11 percent indicated that they were more active regarding agricultural issues⁹⁵.

Local food systems such as CSA are often asserted to provide premium quality produce^{67,69,88,90,101,103}. One reason for this assertion is that local foods are typically

thought to be fresher than produce purchased from conventional sources^{83,88,103}. For example, almost all participants in a 2008 study by Andreatta et al. agreed that CSA produce tasted better because it was freshly picked⁸⁸. It is also thought to taste better because of the fact that it is often chemically free and vine ripened⁶⁷. Additionally, the produce varieties that are grown are more likely to be selected for quality rather than for their ability to withstand long travel distances¹¹¹. The quality benefits of local produce are hypothesized to go beyond just taste; it is also suggested that more nutrients are retained because of shorter travel distances^{83,104,112}. However, this premise has not yet been empirically proven^{83,112}, and studies have shown that produce nutritional value is influenced by factors other than transport distance such as growing methods, storage conditions, the time between harvest and consumption, and food preparation techniques^{112,113}.

A number of research studies also suggest that CSA participation might positively influence dietary behaviors^{67,71,81,83,85,88,89,92,93,95,101} and health outcomes^{83,88,95,114}. Post-hoc survey responses provide some evidence in support of this theory, but none of the studies identified attempted to quantify the amount or significance of CSA's association with diet and health. For example, post-hoc survey results from a study of CSA participants in Arizona showed that 68 percent of respondents reported an increase of fruit and vegetable consumption, and 92 percent indicated that they consumed a greater variety of fruits and vegetables⁹³. Another study showed similar results and found that 74 percent of participants said that they increased the amount of produce they consumed⁸¹.

Similarly, 79 percent of survey respondents in a study by Perez et al. reported that they ate more vegetables or a greater variety of vegetables due to CSA participation⁹⁵. CSA members in some studies reported that participation had benefited the diets of their families as well^{88,92,93}. Survey data from a convenience sample of CSA members in Arizona showed that the majority of members reported that they served their families a greater amount and variety of fruits and vegetables⁹³. Members in another study felt that their children had become more educated about vegetables and when given a choice among different food items, were more likely to opt for healthier options⁹². Minimal data was identified in the literature regarding the health status of CSA members, although a small number of post-hoc survey respondents in one study reported better adherence to physician ordered diets and significant weight loss due to their participation⁸⁸. Another study found that greater geographic access to CSA is associated with lower BMI levels. In addition, this study utilized individual level data from the Behavioral Risk Factor Surveillance System (BRFSS) Selected Metropolitan/Micropolitan Area Risk Trends (SMART) and found that CSA access was associated with individuals who experienced a greater weight reduction in the previous year. The author theorized that as access to local food increases, individuals substitute lower calorie, local food items for food items with higher caloric values.¹¹⁴

Researchers suggest a variety of ways in which CSA might influence dietary behaviors including changes in shopping behavior^{88,92}, meal planning alterations^{71,88,92,95}, a decreased frequency of restaurant eating^{92,95}, and displacement of unhealthy foods^{92,101}.

For example, researchers who investigated CSA models on two college campuses theorized that receiving a weekly CSA share might minimize shopping trips to conventional food markets thus decreasing the opportunity to purchase unhealthy foods¹⁰¹. No studies were identified that quantified the number of pre- and post-participation shopping trips, but post-hoc survey data shows that the produce received in CSA shares comprises a large percentage of members' overall produce needs^{81,85}. As such, it's feasible that CSA participation might reduce the number of shopping visits to conventional food markets, but given the need for non-produce food items, it's unlikely that they will be completely eliminated. It has also been suggested that CSA membership might influence the types of stores members shop at and the food items they purchase. Post-hoc survey data from two studies showed that members reported purchasing more organic foods, and in one of the two studies, they also reported purchasing a greater amount and variety of vegetables.^{88,92} Additionally, some members said they started shopping at different types of stores that had better quality produce such as co-ops and farmers markets⁸⁸. Many CSA members also reported that they changed how they plan meals as a result of participation. One of the most frequently cited changes was that they planned meals around the items received in the CSA rather than purchasing foods according to meals planned in advance or relying on prepared foods^{92,95,111}. Another study by Perez et al. found that 27 percent of post-hoc survey respondents reported that their cooking practices had changed. These changes included trying new recipes, cooking more creatively, and an increased enjoyment of cooking. Eleven percent of participants in this study also reported that they ate out less frequently during CSA participation.⁹⁵ A

reduction in the frequency of eating out was also reported by participants in Russell and Zepeda's study, and one member said that when he does eat out, he thinks more about where he dines. Other studies found that CSA members reported an increase in cooking knowledge⁹², time spent preparing food^{95,111}, and seasonal eating⁹². Feedback from participants in a focus group provided some evidence to suggest that CSA might also have an indirect effect on the consumption of less healthy foods; participants indicated that increased vegetable consumption had resulted in them eating less meat^{92,95}.

Member Satisfaction

Research studies show that the large majority of CSA members were satisfied with their overall experience^{64,69,79,81,87,88}. For example, shareholders in a study by Oberholtzer reported that their expectations had been met (56%) or exceeded (20%)⁸¹. Similarly, a study by Perez et al. investigated member experiences for 14 CSAs and found that 71 percent of members indicated that they were "very satisfied"⁹⁵. The CSA characteristics that members were most frequently satisfied with include the quality of produce^{64,79,81,87}, quantity of produce^{64,79,87,95}, cost^{64,79,95}, and logistics related to share pick-up^{64,79,87,95}. Some members also indicated that they liked being surprised with vegetables that were unfamiliar to them and liked the feeling of exclusivity that came with being a CSA member⁶⁴. Two other studies showed that vegetarian members were somewhat more satisfied than non-vegetarian members^{71,94}, and one of these studies also found that female members tended to be more satisfied than male members, working members more

satisfied than non-workers, and older members more satisfied than younger members⁹⁴. The most common sources of dissatisfaction for CSA members were related to product variety and mix^{69,79,81,87,95}, a lack of choice^{69,71}, and food processing time^{71,87}. Some members also reported that they received too much produce resulting in waste^{69,71,87}.

Despite the fact that CSA members are generally satisfied with their experience, membership turnover rates are relatively high^{81,92,95}. For example, Oberholtzer surveyed 13 CSA farms and found that the average retention rate was 53 percent⁸¹. Russell and Zepeda's study found similar results with a retention rate of 56 percent⁹². Another study by Perez et al. found retention rates to be slightly higher with an average of 65 percent among 14 farms in California. However, this study also illustrated that long-term membership rates were a challenge with only around 20 percent reporting that they had been members for four years or more⁹⁵. When surveyed about their future membership intentions in post-season surveys, more members indicate they plan to renew their membership than actual retention numbers reflect^{81,85,95}. For example, survey results in the study conducted by Oberholtzer showed that 60 percent of members planned to renew their membership the following year, and 18 percent were unsure. In addition, 47 percent of the total survey respondents indicated that they planned to continue their membership for three to five years.⁸¹ Members in the study by Perez et al. showed even more optimistic results regarding their future membership intentions with 78 percent indicating that they planned to rejoin the following year⁹⁵. A number of factors are related to an increased likelihood of membership renewal. Members who were more satisfied with

their share - particularly with factors such as quality, quantity, share pick-up, and variety - were more likely to renew their membership^{81,95}. Not surprisingly, those who have been members for multiple years also tend to be more likely to renew^{81,87,95}. Some studies also reported that renewing members were older and more financially comfortable^{81,95}. Interestingly, Perez et al. found that 82 percent of members who reported that their household had experienced a change in dietary habits indicated they would renew their membership, whereas 65 percent of members whose households who did not experience dietary changes indicated that they would not renew their membership⁹⁵. Given that variety and product mix are typically cited as sources of dissatisfaction in membership surveys, it is not surprising that these factors were also frequently cited as reasons for not renewing membership^{71,87,92,95}. Other reasons for not renewing include quantity^{87,95}, inconvenience related to food processing or pick-up^{71,87}, and a preference for self-selected vegetables⁹².

Study Contribution

Despite the growth of CSA and its postulated benefits on diet and health, no studies were identified that evaluated its use as an employer-based health promotion intervention. Physicians Plus Insurance Corporation, a health insurance organization in Wisconsin, has an Eat Healthy CSA Rebate Program that reimburses individual members \$100 and families \$200 for the purchase of a CSA share¹¹⁵. However, it is unknown whether any analysis has been conducted to evaluate the program's impact. This is the first study, to

my knowledge, that empirically investigates the impact of an employer promoted and delivered CSA on the household food environment, dietary behaviors, and the health of employees. CSA offers a unique and potentially far-reaching approach for worksite health promotion. Unlike some of the more commonly used health promotion programs, which are often resource intensive (e.g., individual health coaching), offering CSA at the worksite is relatively inexpensive and straightforward to implement. Additionally, all employees can benefit from CSA rather than just those who have or are at high risk for a chronic disease. The results of this study provide valuable insight to employers and health insurers regarding CSA's potential to improve the dietary intake and health of their employees and members respectively.

Multiple studies have previously investigated the demographic profile of CSA members, reasons for joining, member satisfaction, and members' future intentions. This study builds upon the existing research by examining these variables in the context of an employer promoted and delivered CSA. As mentioned previously, research shows that member demographic characteristics tend to be relatively homogenous with the majority of members being Caucasian^{85,92-94}, female^{71,81,86,87,93,94}, highly educated^{71,79,81,82,85-87,93-95}, and economically secure^{81,85-87,92,93,95}. Worksite based CSA has the potential to increase awareness and access beyond the typical market and to expand membership to individuals outside of the common demographic profile. In addition to expanding access to healthy foods, this provides CSA farmers with opportunities to grow their membership base. This study also illustrates whether employees differ in their motivations for joining

a CSA and satisfaction levels when compared to typical CSA members. Understanding these factors will help employers and farmers adapt workplace CSA programs to maximize participation and also provides useful information for future research. For example, identification of employees' motivations for joining CSA might help employers design and implement incentives to encourage participation.

It is widely accepted that environmental surroundings and cues play a role in influencing dietary and health related behaviors^{50,51,116-122}. As such, CSA has the potential to influence the dietary intake and health status of participants through changes in the household food environment, meal patterns, and restaurant frequency. A few studies were identified with post-hoc reports of changes in meal patterns^{92,93,95,111} and restaurant frequency^{92,95}, but this is the first study that empirically evaluates the association between these factors and CSA participation. The household food environment was assessed by evaluating the change in the presence of vegetables and presence and visibility of fruits from baseline to follow-up. In addition, the change in the frequency of offering produce at snacks or meals in the household was assessed. CSA's association with meal patterns was evaluated by investigating the change in the frequency with which household members planned or ate meals together. Changes in the household environment and meal patterns have the potential to influence the dietary behaviors of employees' spouses and children. For example, Cullen and colleagues found that the availability and accessibility of fruit, fruit juice, and vegetables in the household was significantly associated with consumption among 225 fourth and sixth grade children¹¹⁹. Another study demonstrated

the ripple effect that health interventions can have on spouses and found that a behavioral weight loss treatment delivered to one spouse had a significant impact on the weight and dietary behaviors of the untreated spouse¹¹⁸. Given that the majority of employers offer health insurance coverage for family members, household environmental changes related to CSA participation have the potential to reduce employers' medical expenditures for employees' family members without adding any incremental program costs. Furthermore, improvements in the eating behaviors of household members could provide employees with social support to reinforce healthy eating.

An employer based CSA intervention might also provide a unique approach to reduce the frequency of restaurant eating, which has increased dramatically in recent years¹²³. Foods offered at restaurants tend to be of lower quality and larger in proportion size than those consumed at home¹²⁴. A study by McCrory et al. found that the frequency of consuming restaurant food was positively associated with body fatness in a group of 73 adults aged 19 to 80¹²⁴, and other studies have found similar results^{125,126}. A desire to avoid wasting food, increased knowledge of cooking practices, and increased enjoyment of cooking might lead CSA participants to eat at home more often. This study provides a valuable contribution to the existing literature by being the first to quantify the change in CSA participants' frequency of eating at a variety of different restaurant types ranging from fast food to fine dining.

The existing research regarding CSA's association with dietary behaviors^{67,71,81,83,85,88,89,92,93,95,101} and changes in health outcomes^{88,114} is limited to post-hoc survey results and anecdotal reports. This study fills an important gap in the previous research by empirically quantifying the change in dietary intake associated with CSA participation. Offering CSA at the worksite has the potential to improve employees' access to a variety of fruits and vegetables. Unlike with farmer's markets, grocery stores and other food venues, where customers can select only those foods with which they are familiar, CSA exposes participants to a variety of foods items and typically provides preparation suggestions. Baseline and follow-up measurement of daily produce servings and weekly produce variety consumed by participants was compared to matched controls to evaluate whether CSA is associated with changes in dietary intake. Changes in diet and health behaviors related to CSA participation might ultimately lead to improvements in health outcomes. The following study also analyzed whether CSA participants experienced a change in body mass index and health status. This knowledge provides a foundation for further research to investigate the effects of CSA participation on chronic disease incidence and medical expenditures.

CHAPTER 3.0: STUDY DESIGN AND METHODS

Research Questions and Hypotheses

Question One: Demographics and CSA Experience

Research Question 1.1: What are the demographic and household characteristics of CSA participants?

- *Hypothesis 1.1a:* The majority of CSA study participants will be White, female, college educated, and middle-aged.
- *Hypotheses 1.1b:* The majority of CSA participants will live in households with two adults and one or more children.

Research Question 1.2: What are the key factors study participants indicated as reasons for joining a CSA?

- *Hypothesis 1.2:* Study participants' top reasons for joining a CSA will include a desire for fresh, organic food; concern for the environment; and a desire to support local farmers.

Research Question 1.3: Were CSA participants satisfied with their employer-based CSA experience? What were common reasons among participants for their satisfaction or dissatisfaction?

- *Hypothesis 1.3a:* The majority of study participants will report that their expectations were met during their CSA experience.
- *Hypothesis 1.3b:* The most frequent reasons for participant satisfaction will be related to produce quality, quantity, and pick-up site location.
- *Hypothesis 1.3c:* The most frequently cited reason for participant dissatisfaction will be produce variety.

Research Question 1.4: What are participants' future intentions regarding CSA participation and what are the common reasons for their decisions?

- *Hypothesis 1.4a:* The majority of participants will report that they plan to purchase a CSA share next year or that they are unsure of their future plans.
- *Hypothesis 1.4b:* The most common reason for participants indicating that they do not plan to purchase a CSA share next year will be a lack of produce variety.

Research Question 1.5: Are prior CSA experience and weekly share utilization predictive of whether employer-based CSA participants plan on purchasing a CSA share again in the following year?

- *Hypothesis 1.5a:* Previous CSA membership will be positively associated with participants' plans to purchase a CSA share in the following year.
- *Hypothesis 1.5b:* Share utilization will be positively associated with participants' plans to purchase a CSA share in the following year.

Question Two: Household Food Environment and Meal Patterns

Research Question 2.1: Do CSA participants report a change in the presence and visibility of fruits and vegetables currently stored in the household from baseline to follow-up?

- *Hypothesis 2.1a:* CSA participants will report a significant increase in the presence of vegetables stored in the household.
- *Hypothesis 2.1b:* CSA participants will report a significant increase in the presence and the presence and visibility of fruits stored in the household.

Research Question 2.2: Do CSA participants report a change in the frequency that fruits and vegetables are offered for snacks and meals in the household from baseline to follow-up?

- *Hypothesis 2.2:* CSA participants will report a significant increase in the frequency with which fruits and vegetables are offered for snacks and meals in the household.

Research Question 2.3: Do CSA participants report a change in the frequency with which household members plan and eat meals together within the past seven days from baseline to follow-up?

- *Hypothesis 2.3a:* CSA members will report an increase in the frequency with which household members plan meals together within the past seven days from baseline to follow-up.

- *Hypothesis 2.3b*: CSA members will report an increase in the frequency with which household members eat meals together within the past seven days from baseline to follow-up.

Research Question 2.4: Do CSA participants report a change in the frequency with which they eat at various types of restaurants within the past seven days from baseline to follow-up?

- *Hypothesis 2.4a*: CSA members will report a decrease in the frequency of eating at all types of restaurants within the past seven days from baseline to follow-up.
- *Hypothesis 2.4b*: CSA members will report a decrease in the frequency of eating at fast food restaurants within the past seven days from baseline to follow-up.

Question Three: Dietary Intake and Health Outcomes

Research Question 3.1: Do CSA participants report that the amount and variety of fruits and vegetables they consume changed as a result of CSA participation?

- *Hypothesis 3.1a*: CSA participants' will report that they consume a greater amount of fruits and vegetables due to CSA participation.
- *Hypothesis 3.1b*: CSA participants will report that they consume a greater variety of fruits and vegetables due to CSA participation.

Research Question 3.2: Is CSA participation associated with a change in the number of servings of fruits and vegetables participants consumed in a typical day (daily produce servings) when compared to matched controls?

- *Hypothesis 3.2:* CSA participants will report a greater increase in the number of daily produce servings when compared to matched controls.

Research Question 3.3: Is CSA participation associated with a change in the number of different fruits and vegetables participants consumed within the past seven (weekly produce variety) days when compared with matched controls?

- *Hypothesis 3.3:* CSA participants will report a greater increase in weekly produce variety when compared to matched controls.

Research Question 3.4: Are CSA share type, CSA utilization, and prior CSA participation predictive of the change in the number of servings of fruits and vegetables CSA participants consume in a typical day (daily produce servings) from baseline to follow-up?

- *Hypothesis 3.4a:* Participants who purchased a full CSA share will report a greater increase in daily produce servings consumed than participants who purchased a half share or less.
- *Hypothesis 3.4b:* Participants who utilized a greater percentage of their share each week will report a greater increase in daily produce servings than participants who had lower utilization rates.

- *Hypothesis 3.4c:* First time CSA participants will report a greater increase in daily produce servings than participants with previous CSA experience.

Research Question 3.5: Is CSA participation associated with a change in participants' BMI when compared to matched controls?

- *Hypothesis 3.5:* CSA participants' will experience a decrease in BMI when compared to matched controls.

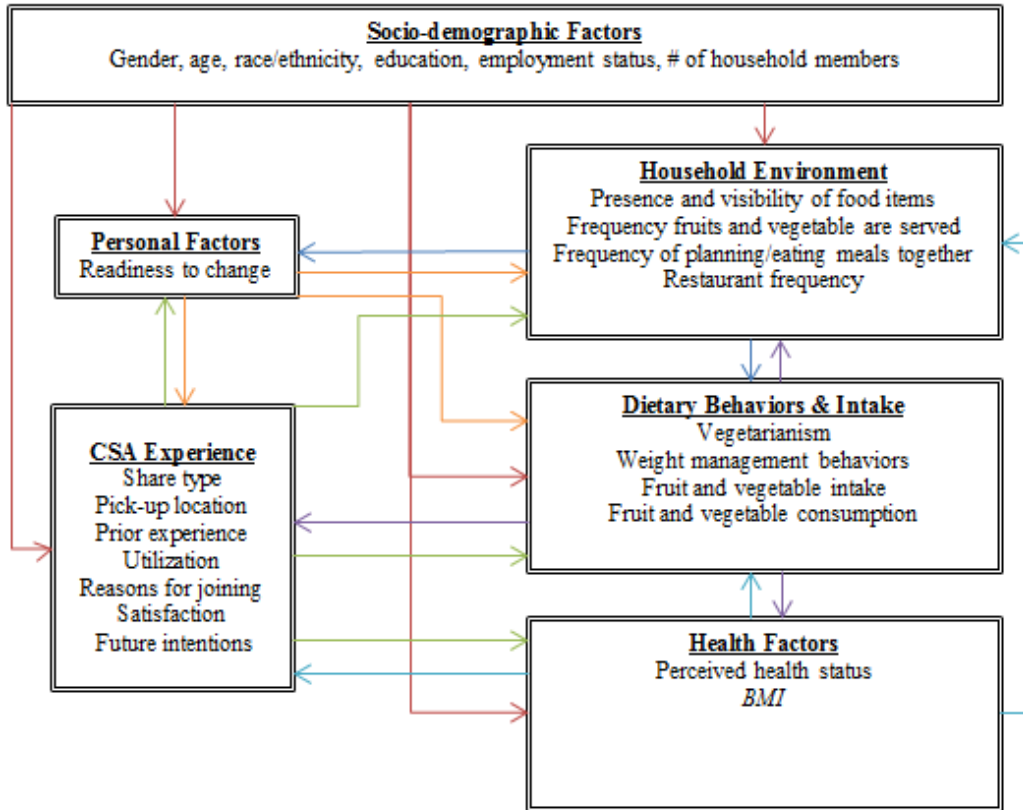
Research Question 3.6: Is CSA participation associated with a change in participants' overall health status when compared to matched controls?

- *Hypothesis 3.6:* CSA participants will report a positive change in overall health status when compared to matched controls.

Conceptual Model

Figure 1

Socio-demographic = Red, Personal Factors = Orange, CSA Exp. = Green, Household Env. = Blue, Dietary Behaviors = Purple, Health Factors = Teal



Overview of Local Food/Health Renewed Study

HealthPartners is a Minnesota-based, integrated health care system that provides comprehensive health care services, health plan financing, and administration.

HealthPartners Institute for Education and Research is encompassed within the larger HealthPartners organization and is dedicated to improving health through discovery, the translation of research, and health professional education¹²⁷. The Local Food/Health Renewed study was a quasi-experimental study conducted by the HealthPartners Institute for Education and Research in collaboration with two additional employers who utilize HealthPartners' health plan, the State of Minnesota and Hennepin County. The impetus for this study was a desire to fulfill a programmatic gap in existing health improvement offerings and to help health plan members improve their dietary habits. HealthPartners currently offers programs such as 10,000 Steps® and Frequent Fitness to support members in meeting their physical activity goals. The 10,000 Steps® program provides members with pedometers allowing them to monitor the number of steps they take, and the Frequent Fitness program promotes physical activity by providing partial reimbursement to members who visit their health club 12 times or more per month. Although there are programs to help members and patients with chronic diseases to eat healthier diets, HealthPartners does not have an experiential dietary improvement program that is inclusive of all members. The Local Food/Health Renewed study sought to: (1) explore the effectiveness of CSA participation in improving the dietary behaviors and health status of participants and their families; (2) develop a program to support

healthy eating for all members/patients, not just those with chronic disease; (3) support the local agricultural community; and (4) fulfill a gap in scientific literature and disseminate results locally and nationally.

Description of Sample and Study Design

A convenience sample of employees from the three participating organizations – HealthPartners, State of MN, and Hennepin County – was recruited using various methods such as lunch and learn sessions, e-mails, Intranet postings and newsletters. Recruitment started in February of 2009 and was completed in early June of 2009. Eligibility requirements included purchase of a CSA share for the summer of 2009, completion of the HealthPartners Health Assessment (HA) within the past six months and a willingness to complete a supplemental survey via Survey Monkey. Study inclusion also required participants to complete a follow-up survey in the fall of 2009 after completion of their CSA membership and to take the next annual HA as indicated by their employer’s annual HA timeframe. All employees were eligible to participate in the study regardless of whether CSA delivery was available at their worksite. Participants whose worksite did not offer CSA delivery were allowed to choose a CSA and pick-up site of their convenience. Those participants whose worksite did offer CSA delivery also had the flexibility to select a CSA and/or pick-up location other than the one offered. A copy of the cookbook, “From Asparagus to Zucchini: A Guide to Cooking Farm-Fresh Seasonal Produce” was given to participants after the completion of the baseline survey,

and a canvas grocery bag was also provided at follow-up as an additional incentive for study completion. The study was reviewed and approved by the HealthPartners Institutional Review Board, and participants were required to sign a consent form that described the study, risks of participation, benefits, and other study related details (Appendix B).

630 employees inquired about the study, and of those employees, 371 completed the necessary requirements for study participation. 399 took the baseline survey, but 28 of the survey participants failed to complete the baseline HA and were therefore excluded from the study. Of the original 371 participants who started the study, 47 were lost to follow-up resulting in a total of 324 employees who completed all requirements necessary for study inclusion. HealthPartners (n = 134; 41.4%) and the State of Minnesota employee participants (n = 132; 40.7%) comprised the majority of the sample, and 58 (17.9%) employee participants worked for Hennepin County. Study participants were matched by age, gender, employer, and occupation level to a non-randomized control group of individuals who did not purchase a CSA share but completed HAs during the same time frame as the study participants. Each participant (n = 188) was matched to three controls with the exception of State of MN employees due to contract specifications that prohibit the sharing of their employees' HA data. The rationale for matching participants to three controls was to ensure that each participant had at least one control that completed the HA at baseline and follow-up. A total of 61 of the matched controls did not complete one or both of the HAs leaving 503 controls that were included

in the study. Four of the 192 Hennepin County and HealthPartners participants were missing control data and were therefore excluded in all analyses using control data. Pearson's chi-square and t-tests were run to identify potential differences in demographic characteristics between the 188 participants who had controls and the 136 who did not. The results of these analyses found that there were no significant differences in demographic characteristics between the two groups of participants.

Featherstone Farm (<http://featherstonefarm.com/>) was the primary farm selected for the intervention, but study participants were allowed to purchase a CSA from a farm of their choosing. Featherstone and Burning River (<http://burningriverfarm.com/>) were the most frequently utilized farms for the study. Table 1.1 provides a detailed list of the CSA farms and the number of participants who purchased a CSA share from each of them. Participants were given the option to purchase a half or a full share and could also opt to split their share with one or more people. The number of participants who selected each of the different share types is also illustrated in Table 1.2. CSA shares were delivered weekly to predetermined locations.

Surveys

Study participants and controls completed an online annual health assessment (HA) per their employer's schedule prior to and following the CSA season. The HA is a simple and confidential online questionnaire that is offered annually as part of HealthPartners' well-

being solution. It consists of 125 questions and takes approximately 15-20 minutes to complete. Questions assess members' health status and productivity, and participants who complete the HA receive a HealthPotentialSM score, a personalized health analysis report, and recommendations to participate in specific health improvement programs.¹²⁸ Health assessments (also referred to as health risk assessments) are one of the most frequently utilized components of worksite health promotion programs^{26,32} and provide a cost-effective means of identifying individual and population level health risks³². A substantial body of evidence documents the validity of HealthPartner's HA^{12,129-131} including a recent study by Pronk et al. which illustrated that health scores related to modifiable health and quality of life factors are associated with prospective health care costs after controlling for non-modifiable risk factors, age, gender, race, and education¹².

As a complement to the HA data, study participants were administered a 45-item baseline survey and a 59-item follow-up survey online via Survey Monkey. These surveys were designed to assess participants' demographic characteristics, CSA experience, household food environment, meal patterns, and dietary behaviors. The primary difference between the baseline and follow-up surveys is that the baseline survey included questions about participants' previous CSA experience, and the follow-up survey included questions about their CSA experience during the study. Survey questions regarding the household food environment were developed using a modified version of the Household Food Inventory checklist that was used in a study by Phelen et al. to evaluate the role of psychosocial, environmental, and behavioral variables in distinguishing weight-loss

maintainers from treatment-seeking obese¹³². This Household Food Inventory checklist is based on the Block Food Frequency Questionnaire, which is one of the most commonly used food frequency questionnaires¹³³ and has been validated in a number of studies¹³⁴⁻
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Specific Measures

Demographic and Household Characteristics

Gender: The HA and surveys both asked participants to identify their gender by selecting male or female. Gender was dummy coded for regression models, and males were the reference category.

Age: The HA and surveys both asked participants their date of birth. The HA birthdate question used a fill in the blank format whereas the surveys specified a MM/DD/YYYY format. The HA data was used since it was available for participants and controls.

Race and ethnicity: The HA asked participants and controls to identify their race and ethnicity. The response categories available for race were (1) American Indian or Alaska Native, (2) Asian or Pacific Islander, (3) Black or African Indian, (4) White, (5) some other race, (6) unknown, or (7) choose not to answer. This variable was only used for descriptive analysis due to a lack of variability in the responses. The response categories

for ethnicity were (1) Hispanic or Latino, (2) not Hispanic or Latino, or (3) choose not to answer. As with race, ethnicity was only used descriptively due to a lack of variability in responses.

Education: The HA and surveys asked participants and controls about their education status. The response categories for the HA were (1) 8th grade or less, (2) some high school, (3) high school diploma or GED, (4) technical training or associates degree, (5) some college, (6) college degree, or (7) graduate studies. The response categories for the surveys were slightly different from those on the HA and included (1) grades 1 through 11, (2) grades 12 or GED, (3) college 1 year to 3 years, (4) college 4 years or more, or (5) graduate degree. The HA data was utilized for this study to allow for comparison of participants to controls. For inferential analyses, the original seven response categories were recoded into three categories due to the fact that four of the categories were selected by fewer than 10 percent of the total number of respondents. The three categories were defined as (1) graduate studies, (2) college degree, and (3) some college or less. Dummy coding was used for regression models with some college or less specified as the reference category.

Employment status: The HA asked participants about employment status (Y/N) and job type. The response categories for job type were (1) administrative support, (2) labor or production, (3) professional/management, (4) retired, (5) sales, (6) service, (7) skilled craft, (8) student, (9) technician, or (10) other. The employment status and job type

variables were only used descriptively due to a lack of variability in the responses and the fact that fewer than 10 percent of the total number of participants selected some of the response categories. The surveys also asked participants which of the participating employers they were affiliated with: (1) HealthPartners, (2) Hennepin County, or the (3) State of Minnesota.

Household members: The baseline and follow-up surveys asked participants about the number of adults and children currently living in their household using a fill in the blank question format. For purposes of inferential analyses, a summary variable entitled total household members was created by adding the number of household adults and children together.

Personal Factors

Readiness to change: The HA asked participants a number of questions related to their readiness to make behavioral changes. For purposes of this study, one of these questions will be utilized. This question assessed how ready participants were to make changes in their food choices. The response categories for this question were (1) I do not think changes are necessary, (2) I have been thinking about making some changes, but I am not ready right now, (3) I am seriously thinking about making some changes, (4) I am currently making changes or have made changes within the past six months, (5) I have made and maintained changes for more than six months.

CSA Experience

Share type: The baseline and follow-up surveys asked participants to select which of the following share types they purchased: (1) whole share, (2) full share but $\frac{1}{2}$ portion, (3) full share but $\frac{1}{3}$ rd portion, (4) full share but $\frac{1}{4}$ th portion, (5) half share, (6) half share of but $\frac{1}{2}$ portion, or (7) other. The “other” response category included an open-ended text box in which participants could specify details about the CSA share they purchased.

Share type was recoded for purposes of inferential analyses because there were fewer than 10 percent of the respondents in each response category. The categories were recoded as follows: (1) whole share, (2) half share, and (3) less than a half share. The recoded “half share” category was created by summarizing the responses for the “full share but $\frac{1}{2}$ portion” and “half share” categories, and the recoded “less than a half share” category was created by summarizing the responses for the “full share but $\frac{1}{3}$ rd portion”, “full share but $\frac{1}{4}$ th portion”, “half share but $\frac{1}{2}$ portion”, and “other” categories. Dummy coding was used for regression analyses with “less than a half share” specified the reference category.

Pick-up location: The baseline survey asked participants where they had made arrangements to pick up their CSA share. The response categories for this question were (1) work, (2) location near my home, or (3) other. The follow-up survey asked a slightly revised version of this question by asking participants to indicate which of the following

locations they picked up their share from during the 2009 season: (1) at my worksite, (2) retail establishment, (3) community site, (4) private home, or (5) other.

CSA history: The baseline survey assessed whether participants had ever purchased a CSA before (yes/no).

CSA utilization: The follow-up survey asked participants to select one of six response categories to indicate the percentage of the share they used each week: (1) 100%, (2) 75-99%, (3) 50-74%, (4) 25-49%, (5) 10-24%, and (6) less than 10%. The original variable was log-transformed for purposes of inferential analyses due to a right skewed distribution.

Farm participation: The follow-up survey asked participants whether they visited the farm during the 2009 season, and if so, what activities they participated in. The response categories for the first question were (1) no, (2) yes, one time, (3) yes, two times, (4) yes, three or more times. An open-ended text box was used for the second question. Due to a lack of variability in responses, this variable was not used for inferential analyses.

Joined reason: The baseline survey asked participants to indicate why they chose to join a CSA farm by selecting one or more of the following responses: (1) fresh food, (2) family experience, (3) improve health, (4) improve eating habits, (5) good recipes, (6) support small farmers, (7) desire to eat produce in season, (8) support local farmers, (9)

organic food, (10) educational experience, (11) general concern for the environment, (12) dislike grocery stores, (13) support sustainable agriculture, or (14) other. The “other” response option included an open-ended text box for participants to specify other reasons they joined a CSA farm. Cronbach’s alpha and factor analysis were conducted to categorize the joined reason variables into two factors: (1) Environment/Agriculture = general concern for the environment, organic food, support small farmers, support sustainable agriculture, and support local farmers ($\alpha = .72$), (2) Experience/Health = educational experience, family experience, improve health, improve eating habits, and food recipes ($\alpha = .60$). The fresh food variable was excluded from the analysis because all 324 participants selected this as a reason for joining CSA. Dislike grocery stores and the like to eat in season variables were excluded from the factors due to low eigenvalues.

Satisfaction: The follow-up survey asked three questions to determine participants’ satisfaction level with their CSA experience. One question asked participants to rank a variety of aspects related to their CSA experience using a scale of 1- 4 with one being equal to “very unsatisfied” and four being equal to “very satisfied”; participants were also given the option to select “not applicable” for each satisfaction variable, and an open-ended text box was included for any additional comments. Satisfaction levels were assessed for the following variables: quantity, quality, freshness, variety, convenience of the pick-up site, convenience of the distribution time/day, window of time for pick-up, quality of the newsletter, farm community, farm communication, quality of the farm website, packaging of the produce, employer communication, and satisfaction with the

cookbook. For purposes of inferential analyses, factor analysis was conducted to categorize the aforementioned satisfaction variables into three clusters: (1) Food = quality, quantity, freshness, variety, and cookbook ($\alpha = .73$), (2) Logistics = pick-up site convenience, distribution time/day, and window of time for pick-up ($\alpha = .78$), and (3) Community/Farm = newsletter, farm community, farm communication, farm website, packaging, and employer communication ($\alpha = .81$). Participants were also asked, what, if any activities or aspects of the CSA they would like to see more of using an open-ended text box. Similarly, they were asked what, if any activities or aspects of the CSA they disliked using the same question format.

Liked reason: The follow-up survey asked participants to select the items they liked about their CSA membership from the following list: educational experience, being connected to a farm, camaraderie with co-workers, healthy eating, family experience, newsletter, supporting sustainable agriculture, fresh food, farm activities, good recipes, organic food, convenience, exposure to new foods, and other. The following two factors were used in inferential analyses: (1) Food/Health = fresh food, healthy eating, exposure to new foods, organic food, and supporting sustainable agriculture ($\alpha = .72$) and (2) Experience = convenience, camaraderie with co-workers, educational experience, farm activities, being connected to a farm, newsletter, and recipes ($\alpha = .62$).

Overall expectations: A question about whether the participants' overall expectations were met was asked on the follow-up survey using the following response categories: (1)

exceeded, (2) met, (3) fell short, and (4) had no expectations. The “had no expectations” category was combined with the “fell short” category because only 3 percent of participants selected “had no expectations”.

CSA price: Perception of CSA price was assessed by asking participants whether they felt the price of their share was (1) too high, (2) about right, or (3) too low. Price was recoded into two categories due to fewer than 10 percent of the respondents selecting the “too low” category: (1) too high and (2) about right or too low.

Future farm intentions: The follow-up study asked participants whether they had signed up for a winter share using the following response categories: (1) yes, I have signed up for a winter share, (2) no, I was offered a winter share and declined, and (3) no, I was not offered a winter share option. In addition, participants were asked two separate questions to determine whether they planned to purchase a share next year from either the same CSA or an alternative CSA using the following response categories: (1) yes, (2) no, or (3) unsure. Responses to the two questions regarding participants’ plans to purchase a CSA share from the same or a different CSA farm were recoded and combined into a single summary variable for future CSA plans to be utilized for inferential analyses. If a participant responded “yes” to either or both of the two questions, they were assigned to the “yes” category, if they responded “unsure” to both questions or “unsure” to one question and “no” to the other question, they were assigned to the “unsure” category, and if they responded “no” to both questions, they were assigned to the “no” category.

Participants who indicated they did not plan to purchase a CSA next year were asked to indicate the reasons for their decision by checking one or more of the following options: (1) too much produce during the season, (2) too little produce during the season, (3) too little variety during the season, (4) dissatisfied with the quality of the produce, (5) household issues, (6) prefer choosing my own produce at the farmer's market, (7) prefer choosing my own produce at the grocery store, (8) inconvenient pick-up time and/or pick-up location, (9) share not worth the cost, (10) personal financial situation, and (11) planning on growing own produce.

Household Food Environment and Meal Patterns

Presence and visibility of fruits and vegetables: The presence and visibility of fresh, frozen, canned, or dried fruits was evaluated on the baseline and follow-up surveys by asking participants to select (1) not present in household, (2) present in household, or (3) present and visible in household for a list of 12 fruits¹³². The same question format was used to ask participants to indicate whether any other fruits not specified in the list were present, present and visible, or not present in the household. In addition to the categorical question about “other fruits”, a text box was provided for participants to document the other fruits that were present or present and visible. The same question format was used to evaluate the presence of 20 different vegetables. The response categories were modified slightly by removing the “present and visible in household” category due to the fact that many vegetables require refrigeration. As with the questions about the presence

and visibility of fruits, a text box was provided for survey respondents to document what, if any, other vegetables were present in the household. Separate summary scores for fruits and vegetables were created by adding the responses for each of the 12 fruits and 20 vegetables. Responses to the categorical questions about other fruits and vegetables were also included in the summary scores for a total possible summary score of 13 fruits and 21 vegetables.

Meal patterns: A series of questions assessed family meal patterns on the baseline and follow-up surveys. Three questions asked participants to indicate the number of times all or most of their household members ate breakfast, lunch, and dinner together during the past seven days. Response categories for these questions were (1) zero, (2) one to two times, (3) three to four times, (4) five to six times, (5) seven times, or (6) not applicable. Response categories “one to two”, “three to four” and “five to six” were recoded by averaging the two numbers to equal 1.5, 3.5, and 5.5 respectively. A summary “household meal frequency” variable was created for purposes of inferential analyses by combining all of the recoded response categories for each question (i.e., breakfast, lunch, and dinner) with the exception of “not applicable”. The same response categories were used for another question that asked how many times all or most of the household members plan meals together. The response categories were recoded in the same manner as described above. Four different questions also evaluated the number of times fruits and vegetables were offered as a snack or at meals with the response categories for each question being (1) never, (2) rarely, (3) sometimes, (4) usually, and (5) always. The

response categories were recoded numerically and summarized into two scores, one for fruits and one for vegetables. The scores were created by adding the responses for the two independent questions, one for snacks and one for meals, with total possible scores ranging from zero to eight.

Restaurant frequency: The baseline and follow-up surveys assessed participants' restaurant eating frequency by asking them the number of times they ate something from different types of restaurants during the past seven days. Four independent questions were used to evaluate the frequency of eating at fast food; fast casual; casual, full service; and fine dining restaurants. Response categories for these questions were (1) zero, (2) one to two times, (3) three to four times, (4) five to six times, (5) seven times, and (6) more than seven times. The four questions were recoded and summarized into an overall total frequency score of eating at any type of restaurant using the following methodology: zero = 0, one to two times = 1.5, three to four times = 3.5, five to six times = 5.5, seven times = 7, more than seven times = 8. The total restaurant frequency score was log-transformed because the distribution of the original data was skewed to the right. The fast food restaurant frequency variable was recoded into two categories due to an insufficient (<10%) number of responses in each of the original categories: (1) zero times and (2) one or more times.

Dietary Behaviors and Intake

Vegetarianism: The baseline and follow-up surveys included a question that asked whether participants currently practice a vegetarian diet using a yes/no question format.

Weight management behaviors: Participants were asked whether they were currently trying to lose weight, maintain weight, or gain weight. “Other” was also a response option for this question.

Participants self-reported dietary change: The follow-up survey asked participants two questions to assess whether they thought participation in the CSA study had impacted their produce consumption. The first question asked participants whether the amount of produce they consumed decreased, stayed the same, or increased as a result their participation in the CSA, and the second question asked participants whether the variety of produce they consumed changed using the same response categories. Only a single respondent indicated that produce amount and variety decreased as a result of CSA participation, so the variable was recoded to two categories: (1) decreased or stayed the same and (2) increased.

Dietary intake: The HA asked a series of questions to assess dietary intake. In a single item question, participants were asked how many fruits and vegetables they consume in a typical day with twelve response categories ranging from zero to eleven or more. The

response options of 0-11 or more were summarized to calculate a total score, and “11 or more” was counted as 11. This variable will henceforth be referred to as “daily produce servings”. The distribution of daily produce servings was left skewed, so the data was log transformed for purposes of inferential analyses. The question, “Which of the following foods have you eaten at least once in the past seven days?” was also asked using a yes/no response format for a variety of food items. The items in this question were selected based on the Kant score for determining dietary variety¹³⁷. The following subset of Kant food items were selected for purposes of this analysis due to their relevance to CSA participation: apple or pear; orange; cantaloupe; grapefruit; tomato; broccoli; spinach; mustard, turnip, or collard greens; carrots or mixed vegetables; green salad; sweet potato or yam; and other potato. A summary “weekly produce variety” variable was created by adding the responses for each of these individual food items.

Sugar: A question on the HA asked participants and controls how often they eat foods or beverages that have a lot of added sugar. The response categories were (1) generally avoid sugary foods and drinks, (2) 1 to 3 sugary foods and drinks daily, and (3) 4 or more sugary foods and drinks daily. Fewer than 10 percent of respondents selected 4 or more sugary foods and drinks daily, so the original variable was recoded into two categories: (1) generally avoid sugary foods and drinks and (2) 1 or more sugary foods and drinks daily.

Health Status

Self-reported health status: The HA asked participants and controls to rank their health using five different response categories ranging from poor to excellent. This variable was originally coded as excellent = 1 and poor = 5. The order of the responses was reversed for easier interpretation.

BMI: The HA data calculates the BMI of the participants and controls based on their self-reported weight and height. The distribution of BMI was left skewed, so the data was log transformed for purposes of inferential analyses.

Data Analysis

Overall Sample Analysis

Two data files were created to account for the fact that not all participants had matched controls. The first data file included health assessment and CSA survey data for all 324 participants, whereas the second data file included health assessment data for the subset of participants ($n = 188$) who had matched controls ($n = 503$). Descriptive statistics were conducted for each variable to evaluate the distribution, measures of central tendency, and dispersion. Frequency tables were examined for categorical variables, and categories with fewer than 10 percent of the total respondents were collapsed where conceptually

appropriate. For example, the seven original categories for share type (whole share, full share but $\frac{1}{2}$ portion, full share but $\frac{1}{3}$ portion, full share but $\frac{1}{4}$ portion, half share, half share but $\frac{1}{2}$ portion, and other) were collapsed into three categories (whole share, half share, and less than a half share) due to the fact that three of the seven original categories had fewer than 10 percent of the total responses. SAS Proc Univariate results were used to identify any variables that needed transformations and to identify any extreme outliers. Variables that had extreme outliers that were conceptually unrealistic were run with and without the outliers to examine the effect on the results. Bivariate associations were run between each of the variables in both data files using crosstabs with the Pearson's chi-square test to compare categorical variables, Pearson's product moment correlations to compare continuous variables, independent sample t-tests to compare continuous variables to categorical variables with two categories, or ANOVA to compare continuous variables to categorical variables with more than two categories. The results of the bivariate analysis along with conceptual relevance to the research questions were used to select covariates for regression analyses. All multiple linear regression models used collinearity diagnostics including variation inflation factors, tolerance, Eigenvalues, and the condition index to test for the existence of multicollinearity between predictor variables. A 95% confidence level was used to interpret the statistical significance of probability tests. All analyses utilized the Statistical Analysis System (SAS, version 9.3, SAS Institute, Cary, NC, 2012).

Research Question One: Demographics and CSA Experience

Frequency tables and means were used to summarize the demographic variables and household characteristics for the 324 study participants. In addition, Pearson's chi-square statistics and independent sample t-tests were utilized to compare demographic characteristics of the 188 participants to those of the 503 matched controls for categorical and continuous variables respectively. Frequency tables were also utilized to summarize CSA participants' reasons for joining, satisfaction, and future intentions regarding CSA participation. Responses to open-ended questions regarding reasons for joining and satisfaction were evaluated to identify any relevant trends and to provide additional context to the results of these questions.

To evaluate whether prior CSA experience and share utilization were predictive of whether CSA participants planned to purchase a CSA share in the future, a multinomial logistic regression model was conducted. Future farm intentions was the dependent variable, and CSA history and weekly CSA utilization were the independent variables. The log transformed version of weekly CSA utilization was used due to the skewed distribution of the data (note that higher values equal a lower percent utilization). The model controlled for overall CSA expectations, price, share type, employer, change in the amount of produce consumed, change in the variety of produce consumed, education, joined reason, liked reason, and satisfaction. The factors as defined in the Specific

Measures section were used for joined reason, liked reason, and satisfaction covariates rather than each of individual response options for those variables.

Research Question Two: Household Food Environment and Meal Patterns

Paired sample t-tests were used to assess the change in the household food environment, meal patterns, and restaurant frequency that CSA participants reported from baseline to follow-up. All distributions were evaluated for normality and the Wilcoxon signed-rank test was used for any non-normal distributions. To assess the change in the household presence and visibility of fruits, the summary scores for all 12 fruits and the “other” category as described in the Specific Measures section were used to conduct two paired sample t-tests, one to test whether the total number of fruits present in the household changed from baseline to follow-up and the other to test whether the total number of fruits present and visible changed. The household availability of vegetables was assessed in a similar manner using the summary score for the 20 individual vegetables and the “other” category. However, unlike with fruits there were only two response categories (i.e., present and not present) due to the fact that vegetables are often stored in the refrigerator. As such, a single paired sample t-test was conducted to determine whether the total number of vegetables present in the household changed from baseline to follow-up.

Two paired sample t-tests were also used to assess the frequency of offering fruits or vegetables for snacks or meals. The summary scores described for “meal patterns” in the Specific Measures section were used. The fruit summary score was used to determine whether there was a change in the frequency of offering fruits at snacks or meals from baseline to follow-up, and the vegetable summary score was used to determine whether there was a change in the frequency of offering vegetables at snacks or meals. Similarly, the summary variables for the frequency of household members planning and eating meals together were used to determine whether there was a change from baseline to follow-up in meal patterns. Due to the skewed distribution of the data for household members planning meals together, the Wilcoxon signed-rank test was conducted rather than a paired sample t-test.

The Wilcoxon signed-rank test was also utilized to determine whether there was a change in the frequency of eating at all restaurant types from baseline to follow-up due to the skewed nature of the data. There was one low and one high outlier for the change in restaurant frequency variable, so the Wilcoxon signed-rank test was run with and without outliers to determine the effect on the results. A Wilcoxon signed-rank test was also used to assess the frequency of eating at fast-food restaurants due to the fact that fast food restaurants tend to offer more unhealthy food options and the frequency of eating at fast food restaurants is associated with obesity incidence. There was one high outlier identified, so the test was run with and without the outlier.

Research Question Three: Dietary Intake and Health Outcomes

A single frequency table was utilized to summarize participants' responses to two independent questions on the follow-up survey that assessed whether they thought CSA participation resulted in a change in the amount and variety of produce they consumed. Multiple linear regression was used to determine whether CSA participation was associated with a greater change in the number of daily produce servings when compared with matched controls. The log-transformed daily produce servings' summary score was used due to the skew of the distribution, and the following baseline covariates were included in the model: sugary food and drink consumption, age, health status, BMI, weekly produce variety, gender, and educational status. The distribution of BMI was skewed, so the log-transformed version of the variable was used. Additionally, there were two low and two high BMI outliers, so the model was run with and without these observations to determine the effect on the results. Multiple linear regression was also utilized to determine whether CSA participation is associated with a change in weekly produce variety consumed from baseline to follow-up when compared to matched controls. The change in the weekly produce variety summary score was used as the dependent variable, and the covariates were the same as those described in the previous model except for that weekly produce variety was replaced with daily produce servings. There was one outlier that was identified for the weekly produce variety variable, so the model was run with and without this observation to determine its effect on the results. As with the previous analysis, the model was run with and without the four BMI outliers.

Three separate multiple linear regression models were utilized to determine whether CSA share type, CSA utilization, and CSA history were predictive of participants' change in daily produce servings from baseline to follow-up. The covariates in each of the three models included the following baseline variables: BMI, weekly produce variety, readiness to change, household presence of vegetables, frequency of serving fruits, household meal frequency, restaurant frequency, and sugary food and beverage consumption.

The two questions that assessed health outcomes used multiple linear regression models. The first model evaluated the association between CSA participation and the change in participants' BMI when compared to matched controls, and the second model evaluated the association between CSA participation and the change in participants' health status when compared to matched controls. Both analyses controlled for the following baseline covariates: sugary food and drink consumption, weekly produce variety, age, daily produce servings, gender, and educational status. The model that evaluated BMI also included health status as a covariate, and the model that looked at health status included BMI as a covariate. Two low and two high outliers were identified for the BMI variable, so the model was conducted with and without the outliers to determine the effect of the outliers on the results.

CHAPTER 4.0: RESULTS

Research Question 1.1: What are the demographic and household characteristics of CSA participants?

Baseline demographic characteristics are illustrated in Table 2. The results showed that the majority of participants were female (86.1%) and White (92.3%). Asian and Pacific Islanders represented 2.5 percent of the participants, 0.9 percent were American Indian or Alaska Natives, 0.6 percent were Black or African American, 0.9 percent indicated they were of some other race, and the remaining 2.8 percent either did not know or opted not to identify their race. When asked about their ethnicity, most participants indicated that they were not Hispanic or Latino (91.7%). The mean age of participants was 44 years old. Participants were also highly educated with 43.2 percent and 38.6 percent having completed graduate studies or a bachelor's degree respectively. Professional or managerial jobs were the most commonly cited occupation (75.3%), with administrative support being the second most common (11.4%). The majority of participants also indicated that they lived in households with two adults (71%), and single-adult households were the second most common household type (19.4%). Over half of participants reported living in households with children (29.1% with 1 child, 25.8% with 2 children, and 9.5% with 3 or more children) whereas just over one-third of participants (35.7%) reported living in households with no children. A slight majority of participants were overweight (31.2%) or obese (22.8%) whereas 45.4 percent of participants were of

normal weight and only 0.6 percent were underweight. (Table 2)

Cross-tabulation with Pearson's chi-square and independent sample t-tests were conducted to examine whether there was a significant association between group (i.e., participants and controls) and demographic variables. Participants and controls were matched by age, gender, employer and occupation, and the results of the chi-square tests validated that there was no significant difference between the groups for these variables. In addition, there was no significant difference in race or ethnicity between groups. However, there was a significant association between group and education, $X^2(5) = 17.58$, $P < .01$. A greater proportion of controls (10.5%) completed technical training or an associate's degree than participants (5.3%). Similarly, more controls (15.9%) completed some college than participants (9.6%). The proportion of study respondents who had a bachelor's degree was similar among participants (38.8%) and controls (38.2%), whereas a greater proportion of participants (44.7%) completed graduate studies than controls (31.8%). Although the mean BMI at baseline was slightly higher for controls ($M = 27.3$, $SD = 6.52$) than it was for participants ($M = 26.4$, $SD = 5.60$), the difference was not statistically significant. (Table 3.1 & 3.2)

Research Question 1.2: What are the key factors study participants indicated as reasons for joining a CSA?

The baseline survey asked participants to select all of the reasons they joined the CSA from a list of fourteen items. The most commonly cited reasons for joining a CSA were for fresh food (n = 319, 100%), a dislike of grocery stores (n = 304, 93.8%), educational experience (n = 261, 80.6%), and family experience (n = 226, 69.8%). An open-ended question also allowed participants to indicate other reasons for joining, and common themes were convenience, exposure to new foods, produce variety, and a perceived financial value of CSA participation. The least common reasons that CSA participants indicated they joined a CSA were to support local farmers (n = 50, 15.4%), support small farmers (n = 81, 25.0%), to improve eating habits (n = 85, 26.2%), and to eat produce in season (n = 91, 28.1%). (Table 4)

Research Question 1.3: Were CSA participants satisfied with their employer-based CSA experience? What were common reasons among participants for their satisfaction or dissatisfaction?

A series of questions asked CSA participants whether they were satisfied with various aspects of CSA participation and what they liked about their experience. Overall, the CSA experience met (n = 142, 44.7%) or exceeded participants' expectations (n = 100, 31.5%). The aspects of CSA participation that were most satisfactory to participants were related to produce freshness, quality, and logistics. Almost all of the 319 participants who responded to this question were satisfied (n = 81, 25.4%) or very satisfied (n = 223, 69.9%) with the freshness of produce they received. Similarly, most participants reported

that they were satisfied (n = 103, 32.3%) or very satisfied (n = 195, 61.1%) with the quality of produce received. Questions about logistics included satisfaction with the CSA share pick-up site, distribution time of day, and the window of time for pick-up. All but eight participants indicated that they were satisfied (n = 44, 13.8%) or very satisfied (n = 267, 83.7%) with their pick-up site. When asked about their satisfaction with the time of day the CSA share was distributed, 220 (69.0%) participants reported that they were very satisfied and 81 (25.4%) reported that they were satisfied. Similarly, 225 (70.5%) participants reported they were very satisfied with the window of time for share pick-up and 75 (23.5%) reported that they were satisfied. Although the majority of participants were satisfied with all factors of the CSA experience that were evaluated, produce quantity and variety had slightly lower levels of satisfaction than some of the other factors. Only 104 (32.6%) and 146 (45.8%) of the participants indicated that they were very satisfied or satisfied with variety respectively, and 153 (48.0%) and 103 (32.3%) participants indicated that they were very satisfied or satisfied with quantity. (Table 5.1)

Two open-ended questions provided an opportunity for participants to document other reasons for satisfaction and dissatisfaction with their CSA share. Common themes from these responses were that participants liked the exposure to new foods but some were dissatisfied with the product mix and lack of information about the produce received. Additionally, some respondents felt that the CSA share was too expensive for the quantity and quality of produce received.

Responses to the questions about what participants liked most about their CSA membership showed that fresh food (n = 289, 89.2%), healthy eating (n = 284, 87.7%), supporting sustainable agriculture (n = 262, 87.7%), and exposure to new foods (n = 242, 74.7%) were some of the aspects that were most liked. Family experience (n = 113, 34.9%), camaraderie with co-workers (n = 115, 35.5%), and the newsletter (n = 146, 45.1%) were less frequently cited by participants as aspects of CSA membership that they liked. (Table 5.2)

Research Question 1.4: What are participants' future intentions regarding CSA participation and what are the common reasons for their decision?

When asked about their plans to purchase a CSA share again next season from the same farm, 104 participants indicated they intended to do so (32.7%), 105 were unsure (33.0%), and 109 indicated they did not plan to purchase a share from the same farm (34.3%). Only 18 participants planned on purchasing a CSA share from a different farm (5.7%), whereas 103 were unsure (32.4%) and 197 did not plan on purchasing a CSA share from a different farm (62.0%). Of those participants who were offered a winter share by their CSA farm, 29 (9.1%) planned on participating, and 191 (60.1%) did not have intentions to purchase a winter share. (Table 6.1)

Participants who did not plan on purchasing a CSA share in the following year were asked to select all of the reasons for their decision from a list of eleven items. The most

commonly cited reason for not purchasing a CSA in the future was a preference for shopping at the farmer's market (n = 120, 37.0%). A preference for shopping at the grocery store was also cited by 61 participants (18.8%). Additionally, 68 participants indicated they would not purchase a CSA share in the future because they felt it wasn't worth the cost (21%). An open-ended question also gave participants the opportunity to describe other reasons they did not plan on purchasing a CSA share in the future.

Common responses included a lack of time to prepare produce, an inability to utilize all of the produce, and dissatisfaction with the product mix of their CSA share. (Table 6.2)

Research Question 1.5: Are prior CSA experience and weekly share utilization predictive of whether employer-based CSA participants plan on purchasing a CSA share again in the following year?

A multinomial logistic regression was conducted to predict future CSA intentions from prior CSA experience and weekly CSA utilization while controlling for other covariates (see page 37 for list of covariates). Results indicated that the overall model was significant ($X^2(40) = 236.04, P < .01, R^2 = .526$). Evaluation of the odds ratios revealed that participants who reported a higher percentage of weekly CSA utilization were significantly more likely to report that they planned to purchase a CSA share in the future ($\beta = -2.34, OR = .10, Wald = 10.80, P < .01$) (note that higher scores equal lower utilization rates). In addition, participants who had previous CSA experience were 7.70 times more likely to report that they planned to purchase a CSA share in the future ($\beta =$

2.04, Wald = 10.28, $P < .01$). A number of individual predictors were also significant with participants whose CSA experience exceeded their expectations being 13.93 times more likely to indicate that they planned to purchase a CSA share in the future ($\beta = 2.63$, Wald = 9.58, $P < .01$). Participants who reported that they thought the CSA share price was about right or too low had a significantly greater odds of indicating that they planned to purchase a CSA share in the future ($\beta = 1.44$, OR = 4.23, Wald = 5.15, $P = .02$).

Working for the State of Minnesota was associated with higher odds of participants being unsure of their future plans ($\beta = 1.36$, OR = 3.90, Wald = 11.19, $P < .01$) or reporting that they planned to purchase a CSA share in the following year ($\beta = 1.96$, OR = 7.10, Wald = 14.02, $P < .01$) when compared to HealthPartners employee participants. An increase in the variety of produce consumed was also associated with significantly greater odds of plans to purchase a CSA again ($\beta = 1.75$, OR = 5.77, Wald = 4.64, $P = .03$). Not surprisingly, participants who liked factors related to the overall CSA experience such as convenience and farm activities were more likely to indicate that they planned to purchase a CSA share in the future ($\beta = .33$, OR = 1.39, Wald = 4.90, $P = .03$).

Participants who were more satisfied with factors related to food such as quality, quantity and freshness were more likely to indicate they were unsure ($\beta = .26$, OR = 1.30, Wald = 7.88, $P < .01$) about their future intentions or that they planned to purchase a CSA share in the future ($\beta = .37$, OR = 1.45, Wald = 8.48, $P < .01$). (Table 7.1)

Research Question 2.1: Do CSA participants report a change in the presence and visibility of fruits and vegetables currently stored in the household from baseline to follow-up?

Participants were asked to indicate whether a list of 12 fruits were present, present and visible, or not present in their household at baseline and follow-up. The same question format was used to ask participants to indicate whether fruits other than those specified were present, present and visible, or not present in the household. Additionally, an open-ended question asked participants to list all other fruits present or present and visible in the household. Paired sample t-tests were conducted using the summary fruit variables for present and present and visible as described on page 52 of the Specific Measures section. Results revealed that there was a significant change in the number of fruits present from baseline to follow-up, $t(317) = 3.69, P < .01$, with participants reporting fewer fruits present at follow-up ($M = 3.08, SD = 2.23$) than at baseline ($M = 3.58, SD = 2.12$). In contrast, there was not a significant change in the number of fruits present and visible from baseline to follow-up, $t(317) = .11, P = .91$. An additional paired samples t-test was run using a summary variable that combined the “present” and “present and visible” categories. Interestingly, the results showed that there was a significant difference from baseline to follow-up, $t(317) = 2.36, P = .02$, when the combined variable was used with the results showing that there was a greater number of fruits present or present and visible at follow-up ($M = 8.79, SD = 3.69$) than baseline ($M = 8.34, SD = 3.26$). Some of the most common fruits listed in response to the open-ended question

about other fruits present or present and visible at baseline were avocado (n = 34), pineapple (n = 20), raisins (n = 16), kiwi (n = 12), and mango (n = 12). Avocados were also the most common fruit listed at follow-up (n = 30) followed by cranberries (n = 20), pineapple (n = 19), mango (n = 16), raisins (n = 14), and kiwi (n = 13). (Table 8)

The change in participants' household presence of vegetables was evaluated in a similar manner. Participants were asked to indicate whether a list of 20 unique vegetables were present or not present in their household and were also asked to specify whether other vegetables were present using the same question format. Additionally, an open-ended question asked participants to list all other vegetables present in the household. A paired samples t-test was conducted using a summary vegetable score that was created by adding the responses for each of the 20 vegetables and the categorical question about other vegetables. Results revealed that there was a significant change in the presence of vegetables in the household ($t(317) = 6.29, P < .01$) with participants reporting a greater number of vegetables at follow-up ($M = 12.52, SD = 3.41$) than at baseline ($M = 11.52, SD = 3.30$). (Table 8)

Research Question 2.2: Do CSA participants report a change in the frequency that fruits and vegetables are offered for snacks and meals in the household from baseline to follow-up?

Two paired sample t-tests, one for fruits and one for vegetables, were used to determine whether there was a change in the frequency of serving fruits and vegetables at snacks or meals between baseline and follow-up. Results revealed that there was a significant difference in the mean number of times fruits were served at snacks or meals between baseline and follow-up, $t(317) = 3.67, P < .01$. Participants served fruits for snacks or meals more often at follow-up ($M = 5.20, SD = 1.40$) than at baseline ($M = 4.91, SD = 1.38$). There was also a significant difference in the mean number of times vegetables were served at snacks or meals between baseline and follow-up, $t(317) = 7.04, P < .01$. As was the case with fruits, participants served vegetables for snacks and meals more often at follow-up ($M = 5.75, SD = 1.25$) than at baseline ($M = 5.26, SD = 1.20$). (Table 8)

Research Question 2.3: Do CSA participants report a change in the frequency that household members plan and eat meals together within the past seven days from baseline to follow-up?

Participants were asked three questions at baseline and follow-up regarding the frequency of eating breakfast, lunch, and dinner with most or all of their household members within the past seven days. The household meal frequency summary variable was used to conduct a paired samples t-test, and there was a significant difference between baseline and follow-up household meal frequency, $t(317) = 2.07, P = .04$. Participants ate meals with household members more often at follow-up ($M = 8.98, SD = 4.25$) than at baseline

($M = 8.54$, $SD = 3.87$). A Wilcoxon signed-rank test was used to compare the mean number of times participants planned meals with most or all household members between baseline and follow-up. Results revealed that there was not a significant difference in the frequency with which household members planned meals together, $S = 414.5$, $P = .37$. (Table 8)

Research Question 2.4: Do CSA participants report a change in the frequency with which they eat at various types of restaurants within the past seven days from baseline to follow-up?

A series of questions asked participants about their frequency of eating at four different types of restaurants within the past seven days. The responses to these variables were summarized into an overall frequency score for eating at all restaurant types, and the summary variable was used to conduct a Wilcoxon signed-rank test to determine whether there was a change in the frequency of restaurant eating between baseline and follow-up. Results revealed that there was a significant difference ($S = -3,248.0$, $P < .01$), with participants eating at restaurants more often at baseline ($M = 2.65$, $SD = 1.83$, $Mdn = 3$) than at follow-up ($M = 2.21$, $SD = 1.82$, $Mdn = 1.5$). The frequency of eating at fast food restaurants was assessed individually using a Wilcoxon signed-rank test, and as with the overall restaurant frequency, the results showed that there was a significant difference between baseline and follow-up, $S = -1,503.5$, $P < .01$. Participants ate at fast food

restaurants more often at baseline ($M = .89$, $SD = 1.25$, $Mdn = 0$) than at follow-up ($M = .58$, $SD = 1.01$, $Mdn = 0$). (Table 8)

Research Question 3.1: Do CSA participants report that the amount and variety of produce they consume changed as a result of CSA participation?

Participants were asked two questions regarding whether they felt the amount and the variety of the produce they consumed decreased, stayed the same, or increased as a result of CSA participation. Frequency tables were used to summarize participants' responses with the results showing that the majority of CSA participants thought the amount ($n = 228$, 71.5%) and variety ($n = 279$, 87.5%) of produce they consumed increased as a result of CSA participation (Table 9).

Research Question 3.2: Is CSA participation associated with a change in the number of servings of fruits and vegetables participants consumed in a typical day (daily produce servings) when compared to matched controls?

A multiple linear regression was conducted to determine whether CSA participation was predictive of the change in the number of daily produce servings. The overall regression model was not found to be significant, $F(9, 681) = .77$, $P = .643$, $R^2 = -.003$.

Furthermore, CSA participation was not a significant individual predictor of the change in daily produce servings, $\beta = -.04$, $t = .37$, $P = .71$. Additionally, none of the other

covariates in the model were found to be significant. (Table 10)

Research Question 3.3: Is CSA participation associated with a change in the number of different fruits and vegetables participants consumed within the past seven days (weekly produce variety) when compared with matched controls?

A multiple linear regression was conducted to determine whether CSA participation was predictive of the change in weekly produce variety from baseline to follow-up. The overall regression was not significant, $F(9,674) = 1.63$, $P = .10$, $R^2 = .008$. Furthermore, CSA participation was not a significant individual predictor of the change in weekly produce variety, $\beta = -.002$, $t = .01$, $P = .99$. The only significant predictor was daily produce servings at baseline, $\beta = -.369$, $t = 2.49$, $P = .01$. (Table 11)

Research Question 3.4: Are CSA share type, weekly CSA utilization, and prior CSA participation predictive of the change in servings of fruits and vegetables CSA participants consume in a typical day (daily produce servings) from baseline to follow-up?

Multiple linear regression models were conducted to determine whether CSA share type, CSA utilization, or a history of CSA use are predictive of the change in daily produce servings from baseline to follow-up. The overall regression model that tested whether CSA share type was predictive of the change in daily produce servings was not

significant, $F(10, 208) = .83, P = .60, R^2 = .038$. In addition, CSA share type was not a significant individual predictor. Purchasing a whole share ($\beta = -.090, t = -.33, P = .74$) or half share ($\beta = -.124, t = -.64, P = .52$) compared to less than a half share was not predictive of the change in daily produce servings. None of the individual predictors were significant either. The overall model that looked at whether weekly CSA utilization was predictive of the change in daily produce servings was not significant, $F(9,205) = .85, P = .57, R^2 = .040$, and none of the of the individual predictors were significant. In addition, the overall model that evaluated whether prior CSA experience was predictive of the change in daily produce servings was not significant, $F(9,209) = .88, P = .54, R^2 = .037$, and as with CSA utilization and prior CSA experience, none of the individual predictors were significant. (Table 12.1 – 12.3)

Research Question 3.5: Is CSA participation associated with a change in participants' BMI when compared to matched controls?

A multiple linear regression was conducted to determine whether CSA participation was predictive of the change in BMI from baseline to follow-up. The overall model predicting the change in BMI from group (i.e., participants vs. controls) was not significant, $F(9, 674) = .64, P = .76, R^2 = -.005$. Furthermore, group was not a significant individual predictor of the change in BMI, $\beta = .04, t = .23, P = .82$. None of the covariates that were included in the model were significant. The model was also run with the four BMI outliers removed. The results were the same except for that daily produce servings at

baseline was a significant individual predictor of the change in BMI, $\beta = -.49$, $t = 3.18$, $P < .01$.

Research Question 3.6: Is CSA participation associated with a change in participants' overall health status when compared to matched controls?

A multiple linear regression was conducted to determine whether CSA participation was predictive of the change in participants' overall, self-reported health status from baseline to follow-up. The overall model predicting health status from group (i.e., participants vs. controls) was not significant, $F(9, 674) = 1.75$, $P = .08$, $R^2 = .010$. Furthermore, group was not a significant individual predictor of health status, $\beta = -.05$, $t = .87$, $P = .38$. The only covariate that was a significant individual predictor was the change in BMI from baseline to follow-up, $\beta = -.03$, $t = 2.64$, $P < .01$.

CHAPTER 5.0: DISCUSSION

Introduction

This study built upon the previous literature by examining the demographic characteristics and the overall experience of CSA members in the context of an employer-sponsored health intervention. It was also the first study to empirically investigate the association of CSA with the change in the household food environment, meal patterns, dietary intake, and health outcomes of CSA members. As hypothesized, the majority of participants were female, middle-aged, White, college educated, and lived in households with two adults and children. The CSA experience of study participants was similar to that of CSA members in previous studies, although some discrepancies were identified such as a lower percentage of study participants who selected support for local farmers as a reason for joining CSA, higher satisfaction rates with CSA logistics, and lower membership retention rates. The results of this study also showed that CSA participation was associated with improvements in the household food environment and meal patterns. These improvements included increases in number of vegetables present in the household, the frequency of serving fruits and vegetables for snacks or meals, and the frequency of household members eating together. Additionally, the frequency of eating at all restaurants and fast food restaurants specifically decreased from baseline to follow-up. Study participants felt that they had increased the amount and variety of produce they consumed as a result of CSA participation, but inferential analyses of the change in daily

produce servings and weekly produce variety did not support this finding. Additionally, the results did not show an association between CSA participation and BMI or health status when compared to matched controls.

Demographics and CSA Experience

Gender

As expected, the majority of study participants were female, which is consistent with the findings in previous research studies. Cone and Myhre's finding that women typically take on the primary role of food procurement and preparation⁸⁷ provides some explanation for the large proportion of female study participants. Although the division of domestic responsibilities has shifted somewhat as the number of women in the workforce has increased, women continue to take on a much larger share of household meal planning, shopping, and food preparation responsibilities¹³⁸. Another possible explanation for the large proportion of female participants is potential differences in dietary behavior and preferences between males and females. For example, a study by Warkle et al. investigated gender differences in food choice and found that females were more likely to eat healthier than males¹³⁹. Another study found that females were more knowledgeable about nutrition, more likely to follow dietary guidelines, and more likely to prefer the taste of foods included in dietary guideline recommendations¹⁴⁰. It is possible that CSA participation is more appealing to females due to the fact that CSA

shares are primarily comprised of healthy produce items. Additionally, females might be more knowledgeable and comfortable preparing foods typically received in a CSA share.

Age

The finding that the majority of participants were middle-aged is also consistent with previous research^{71,92-94}. Although this study didn't investigate the specific characteristics among different age groups that might be associated with CSA participation, it is possible that multiple lifestyle and socio-demographic factors play role. For example, middle-aged adults might be less likely to eat out than younger adults and thus more likely to join a CSA. A study by Kant and Graubard supports this idea and found that Americans aged 45 or younger ate out more often than those older than age 45¹⁴¹. It is also possible that middle-aged adults have more disposable income than younger adults and are therefore better able to afford the upfront costs of CSA. Additionally, there might be generational differences in dietary intake and food preferences. Although the majority of literature was consistent with the results of this study, there were two studies that found the average age of participants to be slightly younger^{81,88}. One of these studies was of low-income CSA members who received a share at no cost, so in this case, socioeconomic factors might be associated with the discrepancy in results⁸⁸. It is also important to note that although demographic information for all employees of the three employers who participated in this study was not available, it is likely some age groups were underrepresented such as the elderly and young adult populations.

Race and Ethnicity

This study postulated that an employer based intervention might expand the reach of CSA beyond the typical demographic profile, but in the case of race and ethnicity, the results do not support this. The findings illustrated that CSA participants were racially and ethnically homogenous with the large majority of participants reporting that they were White, which is consistent previous research. The study by Landis et al. had a slightly higher percentage of White participants (97.1%)⁸⁵ compared to this study (92.3%) whereas another study had a slightly lower percentage of White participants (90.0%)⁹⁵. The finding that Asian and Pacific Islanders were the second most common race (2.5%) is also consistent with the research conducted by Landis et al.⁸⁵. One factor explaining the racial homogeneity of the current sample is that minority groups may be underrepresented in the participating employers' overall employee populations. Using CSA as an employer based intervention for organizations in different industries and in different geographic regions might show different results. Research has also found that minorities typically have poorer quality diets than Whites and has cited a number of factors that are correlated to the racial discrepancies in dietary intake¹⁴²⁻¹⁴⁴. This study addresses one of these factors – access to healthy foods – but other factors such as cultural differences, individual preferences, or education level might also be related to dietary intake and whether someone participates in CSA.

Education

As with the previous research, CSA participants in this study were highly educated with 81.8 percent having completed a bachelor's or graduate degree. However, the majority of the previous studies reported even higher education levels than those reported in this study. For example, the study by MacMillian et al. found that 88.5 percent of participants completed a bachelor's or graduate degree⁹³, and other studies reported that almost all participants had at least a bachelor's degree^{81,85}. These results lend some support to the idea that an employer based intervention might expand the reach of CSA in that the participants were slightly less educated than typical CSA members who purchase a CSA share independently. It is also interesting to note that study participants were more educated than controls, suggesting that high education levels might predispose someone to participate in CSA. However, participants were not randomly selected so there could be confounding factors that affect the relationship between education level and CSA participation.

Occupation

Participants were also asked about their occupation. Not surprisingly, the large majority reported that they held professional or managerial positions (75.3%), which are likely higher skilled, higher paid positions. Interestingly, the second largest occupation reported was administrative support (11.4%). Given that many administrative support positions do

not require a college education, it is possible that these participants might account for the slightly lower education levels reported in this study. It is important to note that the overall occupation distribution for all employees was not available. The participating organizations include a health insurance plan and two government organizations, which likely have a much greater proportion of positions that are professional or managerial than organizations such as a manufacturing or retail services company. As such, replication of this intervention at different organizations might expand the reach of CSA participation to a greater extent than what was illustrated in this study.

Household Characteristics

The household characteristics were consistent with previous research in that the majority of participants lived in households with two adults. A slight majority of households also had children (54.9%) whereas the findings in the literature were mixed. For example, the majority of the 592 participants in Cone and Myhre's study reported that they lived in a household with children (71.9%)⁸⁷. In contrast, Russell and Zepeda showed that CSA members were less likely to have children living in the household⁹². Kolodinsky and Pelch also showed that having children was inversely associated with a household's likelihood to join a CSA farm⁶⁵. Two factors that might account for the discrepancy in results are the employment status of adults in the household and income level. For example, households in which both parents are working might find it more difficult to find time to pick-up and prepare the foods in a CSA share. In the case of this study, the

time related to pick-up of the CSA share is minimized due to worksite delivery, which might increase the number of households who are able to participate. Another potential factor for the discrepancy in results, which wasn't assessed in any of the studies identified, is the age of the children. For example, families with older children might find it more difficult to participate in CSA due to children's activities such as sporting events.

Reasons for Joining CSA

It was hypothesized that study participants' reasons for joining would be consistent with those identified by CSA members in the previous research including a desire for fresh, organic food; concern for the environment; and a desire to support local farmers.

Although the results showed that study participants reasons for joining were similar to those described in the previous literature, there were some discrepancies. The most frequent reason study participants cited for joining – fresh food – was also one of the most commonly cited reasons in the literature on this topic. For example, a desire for fresh food was ranked as “very important” by 76 percent of the 276 participants in Oberholtzer's study that surveyed members of four Mid-Atlantic farms⁸¹. The majority of study participants also indicated that concern for the environment was a reason for joining (55.3%), which is consistent with the previous research. The study results show that very few participants selected support for local farmers as a reason for joining (15.7%). In contrast, 74 percent of the participants in Oberholtzer's study ranked this as “very important”⁸¹. Similarly, almost all CSA members (94.8%) in a study by Landis et

al. selected supporting local farms as a reason for joining⁸⁵. A dislike for grocery stores was the second most commonly cited reason for joining a CSA in this study (93.8%), which was not a factor frequently cited in other studies. However, it should be noted that the majority of studies did not include this as a response option. Interestingly, education and family experience were both cited as important factors in joining a CSA. This finding could be valuable in enhancing future employer based CSA interventions. For example, the only education provided in this intervention was through the farm newsletters and a cookbook. Employers or farms could provide additional education about healthy eating and CSA to enhance the CSA experience and its potential benefits. Providing support to enhance the family experience might also be beneficial in helping to extend the benefits of CSA participation to household members. For example, educational events such as cooking lessons using CSA items or social events to connect with other CSA members could be provided for all family members. Wellness programs and incentives related to CSA could also be provided to participants and family members such as incentives for program participation, tracking dietary intake, or completion of educational materials related to CSA.

The results of this study provide some evidence to support the idea that employees' reasons for joining a CSA might differ somewhat from those members who typically join a CSA from the general population. However comparison of the results with the previous research is limited by the fact that the question format and response options are inconsistent across the various studies. For example, the study by Landis et al. does not

include “dislike grocery store”, “educational experience”, “family experience”, or “recipes” as possible response options in their study and these options were all frequently cited as factors for joining this study. In addition, some studies asked participants to select those options that were factors for joining a CSA whereas others asked participants to rank the importance of various factors, which also makes direct comparison of results difficult.

Satisfaction

The results regarding member satisfaction showed that participants were generally satisfied with their overall experience, which is consistent with previous research findings. CSA members in the 2004 study conducted by Oberholtzer found that 76 percent of participants’ expectations were met or exceeded which is identical to the percentage of participants in this study who indicated their expectations were met or exceeded⁸¹. Review of the individual level satisfaction variables also illustrates participants’ high overall satisfaction with the majority of participants indicating that they were satisfied or very satisfied with all variables measured. Like in the previous research, participants in this study were most satisfied with produce freshness, quality, and logistics. For example, the study by Oberholtzer found that 99 percent of participants were satisfied or very satisfied with produce freshness, and 92 percent were satisfied or very satisfied with the quality of produce⁸¹. In comparison, 95 and 93 percent of participants in this study were satisfied or very satisfied with freshness and quality

respectively. Although Oberholtzer's study also indicated high levels of satisfaction with CSA share logistics, participants were slightly less satisfied than those in this study with 82 percent reporting that they were satisfied or very satisfied with the CSA distribution time in comparison to 94 percent of participants in this study. Similarly, 80 percent were satisfied or very satisfied with the CSA pick-up site whereas 98 percent of participants were satisfied or very satisfied in this study. The higher level of satisfaction regarding CSA share logistics in this study is likely due to the fact that most participants were able to pick-up their share at the worksite rather than making a separate stop. In addition, it is possible that the distribution time is better aligned with participants' schedules (e.g., end of work day) given that it is likely based on the employer's standard hours of operation rather than an individual CSA host's schedule.

CSA share cost and quantity of produce were also cited as factors that CSA members were most satisfied with in the literature. Although the majority of members in this study were satisfied with the quantity and price of CSA, the satisfaction levels were not as high as they were for some of the other variables assessed such as freshness, quality, and pick-up site. However, the percentage of participants who were satisfied or very satisfied was not necessarily lower than the satisfaction levels found in other studies. For example, Oberholtzer's study found that 80 percent of members were satisfied or very satisfied with quantity which is identical to the results in this study⁸¹. Precise comparison of satisfaction levels regarding quantity with the previous research is limited by the fact that not all studies provided detailed data but instead just indicated that participants were very

satisfied with this aspect of their membership. Direct comparison of satisfaction levels regarding price with previous research was also difficult due to inconsistent response options or a lack of data. For example, the study by Cone and Kakaliouras reported that members of the four farms surveyed were very satisfied with the cost of their CSA share but did not provide any specific data⁷⁹. Another study by Farnsworth et al. asked participants about whether the price of CSA was acceptable using response categories ranging from (1) strongly disagree to (5) strongly agree and found that the average score was 4.5⁶⁴. In contrast, this study asked participants about share price using three response categories (too low, about right, and too high), and although the majority of participants reported that the price was about right (71.7%), it is difficult to discern whether this was consistent with the results in Farnsworth's study given the different measurement scale.

As with much of the previous research, produce variety was one of the factors that study participants were less satisfied with, although it is important to note that despite being lower in satisfaction than some of the other variables measured, satisfaction levels were still relatively high with 78.4 percent of members reporting that they were either very satisfied (32.6%) or satisfied (45.8%) with produce variety. Perez et al. found that 24 percent of members were very satisfied with produce mix, but this study did not report the percentage of participants in other response categories, so direct comparison of satisfaction levels was not possible. Results from Oberholtzer's study were very similar to those in this study in that participants were less satisfied with the variety of produce than other variables measured, but satisfaction levels were still relatively high with 76

percent of respondents reporting that they were satisfied or very satisfied. Some of the other variables that participants in this study were less satisfied with were related to the farm aspects of CSA membership such as the website, communications, and community. These variables also had a lot of respondents who selected “not applicable” in comparison to other variables which indicates satisfaction levels might be higher than they appear. For example, only 56.8 percent of participants indicated they were satisfied or very satisfied with farm communications, but when the 120 participants who selected “not applicable” are removed, this jumps to 90.4 percent. It is possible that not all farms provided opportunities for engaging with the farm community or that some participants didn’t have time to participate in farm events.

Factors Liked about CSA Experience

It is not surprising that the most common reason cited for joining a CSA on the baseline CSA survey – fresh food – was also one of the factors CSA participants reported liking most about CSA participation on the follow-up CSA survey. In contrast, family experience was only selected by approximately 35 percent of participants as a factor they liked despite the fact that it was indicated as a reason for joining CSA by approximately 70 percent of participants. There was a similar, but less dramatic discrepancy in the results for educational experience with over 80 percent of participants selecting this as a factor for joining CSA but only around 56 percent of participants indicating that they liked this most about CSA membership. This suggests that these aspects of the CSA

experience might have fallen short of participants' expectations. For example, perhaps participants received less education about CSA and the food they received than anticipated. No previous studies were identified that evaluated the factors CSA participants liked about their CSA experience independent of satisfaction levels, so direct comparison of these findings with previous literature was not possible, although factors liked about CSA and satisfaction levels with those factors are likely associated.

Future CSA Plans

Two separate questions, one regarding future CSA plans for the same farm and one regarding a different farm, were used to assess future CSA plans (see page 51). As hypothesized, the majority of participants in this study indicated that they planned to purchase a CSA share from the same or a different farm in the following year (same farm = 32.7%, different farm = 5.7%) or that they were unsure of their plans (same farm = 34.3%, different farm = 32.4%). These results indicate a somewhat lower CSA member retention rate than in previous research studies. For example, a study by Oberholtzer found that 60 percent of members planned to renew their membership and 18 percent were unsure⁸¹. Perez et al. also showed that 78 percent of members planned to join the following year⁹⁵. The fact that fewer participants reported they planned to renew their membership in this study than in the previous research is somewhat surprising given the high levels of participant satisfaction and the fact that satisfaction is often related to an increased likelihood of share renewal^{81,95}. However, prior CSA experience has also been

shown to be related to CSA renewal plans^{81,87,95}, and only 62 (19%) of the 324 participants in this study indicated that they had previous CSA experience. The large majority of the individuals who did have previous CSA experience had only purchased a CSA share once before (60%). There is a likely a learning curve related to the processing and preparation of foods received in a CSA share. Although no studies were identified that examined food processing and preparation, it is possible that an individual's baseline level of knowledge might play a significant role in their experience with CSA and future plans. Marketing CSA through employers could increase the likelihood that someone who was not previously familiar with CSA might join, and these individuals might also have a lower baseline knowledge level than individuals who opt to join a CSA from the general population. An individual who starts with a higher level of knowledge is likely to utilize more of their CSA share than someone who is not familiar with some of the produce received in their share or how to prepare it.

A lack of produce variety was expected to be the most frequently cited reason for participants to indicate they did not plan on purchasing a CSA share in the following year based on the previous literature. However, this was not the case with only 15.4 percent of participants citing this as a reason for not renewing their CSA membership. In contrast, Perez et al. reported that two-thirds of participants did not renew due to factors related to produce variety such as a lack of choice and product mix⁹⁵. Similarly, a study conducted by Goland reported that participants who were most dissatisfied with variety, particularly with receiving too many unfamiliar items and not enough staple items, were least likely

to renew their membership⁷¹. The fact that a preference for shopping at the grocery store was the third most common reason (18.8%) participants in this study selected for not renewing their membership was also unexpected given that so many people joined a CSA due to a dislike of grocery stores. This might partly be explained by the fact that CSA participation typically doesn't eliminate the need to go to the grocery store. Goland's study showed that 61 percent of participants reported that they expected their CSA share to meet all or most of their produce needs⁷¹. If study participants in this study had similar expectations, it is likely that they were disappointed with this aspect of CSA participation. A question on the follow-up survey asked participants what percentage of total fruit and vegetable purchases the CSA comprised, and only 10 participants (3.1%) indicated that it comprised 100 percent of their households' produce purchases. However, the CSA share comprised the majority of produce purchases for more than three quarters of the study participants with 43.0 percent reporting that it provided 75 to 99 percent of their households' produce and another 34.5 percent reporting that it comprised 50 to 74 percent of their household produce purchases.

As hypothesized, the results of this study showed that prior CSA experience and high weekly utilization were positively associated with plans to purchase a CSA share in the following year. This is consistent with the results of Oberholtzer's study which found that participants who had been members of a CSA longer were more likely to continue their membership⁸¹. Similarly, a study by Cone and Myhre found that longer-term CSA members were more likely to report that CSA fit into their schedules and to have a higher

level of commitment to the farm⁸⁷. Effectively integrating CSA into one's lifestyle likely takes some knowledge and extra effort to process and prepare the foods received. For example, respondents in Goland's study reported that food sometimes went uneaten because they were unfamiliar with the food item and how to prepare it⁷¹. It is possible that the effort related to CSA participation decreases after the first year due to members becoming more familiar with produce and preparation methods. It is not surprising that members who utilized a higher percentage of their CSA share were also more likely to indicate plans to renew their membership. This finding supports Oberholtzer's research which found that members whose CSA comprised a larger proportion of their produce purchases and who had higher weekly utilization were more likely to renew their membership⁸¹. Unlike with this study, the previous research did not control for potential covariates that could relate to future plans^{81,87}.

Not surprisingly, participants who had higher levels of satisfaction were also more likely to plan on renewing their CSA membership. This was the case for individuals whose CSA experience exceeded their expectations and who were satisfied with factors such as the quality, quantity, freshness, and the price of the CSA share. Additionally, participants who liked the convenience of CSA and the farm activities were more likely report plans to renew their membership. Oberholtzer also found that members who were satisfied with the quality, quantity, and freshness of the produce received were more likely to renew their membership. Another study conducted by Goland found that satisfaction with the variety of produce received was the most strongly correlated factor with future plans.

This study also showed produce quality and convenience of CSA distribution time to be correlated with future plans but not as much so as variety. Goland suggests that CSA members most likely to renew are those who are not just looking for high quality, fresh produce but who also join a CSA due to social and environmental concerns⁷¹. The fact that participants in this study who liked the farm activities were more likely to report plans to purchase a CSA share in the following year lends some support to this idea. Perhaps the camaraderie with the farmer and farm members increases participants' dedication to the concept of CSA and willingness to make the effort necessary to incorporate CSA into their households. Farm activities might also increase participants' knowledge about some of the other benefits of CSA aside from just the produce itself such as the environmental, social, and economic advantages.

Of particular interest is the fact that participants who reported an increase in the variety of produce they consumed during the CSA season were also more likely to report plans to renew their membership. This is promising in that one of the key objectives of this intervention was to increase the amount and variety of fruit and vegetable consumption among employees. It suggests that an employer based CSA intervention could help support sustained rather than just short-term changes in dietary intake given that those employees who reported an increase in produce variety consumed were also more likely to continue CSA participation in the future. The study conducted by Perez et al. found similar results in that 82 percent of participants who indicated their household experienced a change in eating habits were likely to renew their membership in contrast

to 65 percent of members who did not experience a change in household eating habits⁹⁵. Similarly, a study by Russell and Zepeda found that almost all renewing CSA members experienced a change in attitude or behavior, including those related to dietary change, since joining a CSA⁹². It is also interesting that employees at the State of MN were more likely to report plans to renew their membership when compared to Hennepin County and HealthPartners. Employer was not a significant covariate in the majority of the bivariate analyses, so it is possible that there could be other differences across the three participating employers related to future plans that were not evaluated in this study such as workplace culture, differences in CSA marketing, or differences in the CSA farms used.

Household Food Environment and Meal Patterns

Household Presence of Fruits and Vegetables

This was the first study to assess whether CSA participation is related to a change in the household food environment. It was hypothesized that CSA participation would increase the household presence and visibility of fruits and the presence of vegetables. As expected, the number of vegetables present in the household increased from baseline to follow-up. However, when assessed independently, the household presence of fruits decreased and the household presence and visibility of fruits increased slightly, but this increase was not significant. When the presence and presence and visibility fruit scores

were combined, the results showed a significant increase from baseline to follow-up. In the combined model, the fruits present and visible category was assigned a higher score than the fruits present category. The fact that there was a significant increase from baseline to follow-up in the combined model likely means that there was a greater proportion of fruits present and visible relative to the number of fruits present at follow-up than at baseline. In other words, even though the number of fruits present and visible didn't increase significantly from baseline to follow-up, the slight increase and higher score assigned to this category were enough to offset the decrease in the number of different of fruits present in the household.

The produce received in CSA shares is typically comprised of mostly vegetables and very little, if any, fruit depending on the farm and geographic location. For example, only four of the thirty one different summer crops grown by Featherstone Farm - the most frequently used farm by participants in this study - are fruit. It is possible that participants relied primarily on the CSA for their household produce rather than supplementing with other produce items, which could provide some explanation for the decrease in household fruits present from baseline to follow-up. As mentioned previously, over 46 percent of participants reported that the CSA provided 75 to 100 percent of their household produce, and approximately 34 percent reported that it provided 50 to 74 percent. The results of Oberholtzer's study also provide some support for this theory. The majority (61%) of survey respondents reported that the CSA share made up 75 to 93 percent of their vegetable purchases during the season, and 30 percent reported that it made up 50 to 74

percent.⁸¹ It is possible that the increase in the number of vegetables present in the household related to CSA participation displaced fruits participants might otherwise typically have in the household. Seasonality and the availability of specific produce items might also play a factor in whether the number of fruits and vegetables in the household increase or decrease. There are some farms who also offer fruit CSA shares by working with farmers in other regions to deliver fruits that might not grow or be in season locally. Offering farm options with a fruit and vegetable share might help to increase the household presence of both fruits and vegetables.

Frequency of Serving Fruits and Vegetables

As hypothesized, CSA participation was associated with an increase in the frequency that fruits and vegetables were served as snacks and meals. It is interesting that the number of times fruits were served increased despite the fact that the household presence and presence and visibility of fruits did not increase significantly when these categories were assessed individually. Perhaps CSA participation resulted in a greater focus on incorporating produce into the diet, and as such, fruits were served more often despite the fact that there was not a significant increase in their availability in the household.

Previous research supports this theory including a study by Russell and Zepeda which found that changes in food preparation behaviors were common among CSA members⁹². Regardless, these results provide support for the fact that CSA participation has the potential to improve not just the dietary habits of the employee but also their household

members. This supports the results in Russell and Zepeda's study in which CSA members reported that CSA participation benefited their children and other family members⁹².

Although the increase in the number of fruits and vegetables served at snacks and meals was relatively small, even a small increase in serving fruits and vegetables that is sustained over time might have substantial benefits such as a reduced risk of obesity and other chronic diseases. Additionally, it is possible that the increase in fruits and vegetables served at snacks and meals could be further enhanced by education regarding the health benefits of produce and preparation methods for the items provided by the farm.

Household Meal Planning and Frequency

As expected, household members increased the frequency in which they ate meals together from baseline to follow-up. However, there was not a significant difference in the frequency with which household members planned meals together. It is possible that although household members didn't plan meals together more often, there could have been other changes in meal planning that had a positive impact on dietary intake. This is supported by previous research in which CSA members reported that they changed their cooking practices⁹⁵ and planned their meals around their CSA share^{92,95,111}. Anecdotal reports from CSA members in two studies indicated that some participants ate less meat as a result of CSA participation^{92,95}. Other research illustrates the potential benefits of the increased frequency of household meals. For example, a study by Welsh et al. showed

that an increase of one family meal per week was associated with an increase of .18 servings of fruit and .30 servings of vegetables in adults. This study also found that family meal frequency was negatively associated with adolescents' intake of sweets and sugar-sweetened beverages.¹⁴⁵ Similarly, a study by Neumark-Sztainer et al. found that the frequency of family meals was positively associated with the intake of fruits, vegetables, grains, and calcium-rich foods and negatively associated with soft drink consumption¹⁴⁶. The results of this study, combined with the previous research, provide support for the fact that an employer based CSA intervention could improve the dietary habits of participants and their families indirectly by increasing the frequency of household meals.

Restaurant Frequency

The potential for an employer based CSA intervention to improve dietary habits is also supported by the finding that participants reported a decrease in the frequency with which they ate at all restaurants combined and fast food restaurants specifically. This is consistent with anecdotal reports from CSA members in two previous studies, but these studies did not quantify baseline and follow-up restaurant frequency^{92,95}. These results are important due to the potential negative health implications of eating out. Restaurant eating, particularly fast food, has been associated with higher energy intake, higher fat intake, and increased body weight^{141,147-149}. For example, a study by French et al. found that increases in the frequency of fast food use were associated with an average weight

gain of 1.7 kg over a three year period. This study also found that frequent fast food users had a lower intake of fruits and vegetables.¹⁴⁸ Another study found that eating out was associated with a lower intake of micronutrients such as vitamin C, calcium, and iron¹⁴⁹. The reduction in restaurant eating might at least be partially be explained by household environmental changes related to the consistent delivery of produce. Participants likely wanted to avoid wasting the produce received in their CSA share and thus choose to eat at home more often.

Dietary Intake and Health Outcomes

Produce Amount and Variety

As expected, study participants' responses to the follow-up CSA survey questions regarding dietary intake indicated that they felt they had increased the amount (71.5%) and variety (87%) of produce consumed as a result of CSA participation. This is consistent with previous research that looked at post-hoc survey results regarding produce intake^{81,93,95}. For example, MacMillan's study of CSA participants in Arizona found that 68 percent of respondents reported an increase in the amount of produce consumed, and 92 percent reported that they increased the variety of produce consumed⁹³. It is surprising that participants did not experience a significant increase in the number of daily produce servings or weekly produce variety from baseline to follow-up when compared to matched controls given the follow-up survey results. One possible

explanation for this is that the questions regarding daily produce servings and weekly produce variety were asked on the health assessment, and this survey was administered annually between late fall and early winter depending on the employer. The fact that there was a significant time delay between completion of the CSA season and administration of the health assessment survey could have a significant effect on the results. The health assessment questions asked about produce servings and variety consumed within the past seven days, and it is possible that participants' diets were different months after completion of the study than they were during or just after the end of the CSA season. In other words, dietary changes participants experienced as a result of CSA participation might not be sustained once CSA shares are no longer being received. Additionally, because the health assessment was administered during the late fall or winter season – a time when produce availability is lower in Minnesota – responses might not be reflective of participants' typical dietary intake which likely ebbs and flows throughout the year based on produce availability and other factors. Recall error could also partially explain the discrepancy in results.

It was hypothesized that participants who purchased a full CSA share would report consuming a greater number of daily produce servings than those who purchased a half share or less, but the results of this study did not show share type to be predictive of daily produce servings. Similarly, weekly CSA utilization and a history of CSA participation were not significant predictors of daily produce servings in contrast to initial expectations. One factor that could account for the lack of association between CSA

share type and daily produce servings might be the number of household members who consumed foods from the CSA. Although the number of household members was considered as a potential confounding variable, no data was collected regarding the number of household members who actually consumed food from the CSA. Some CSA participants might have had roommates or older children that did not consume food from their CSA whereas other participants might have shared their CSA share amongst all household members. If a greater number of household members shared the same amount of produce in some households than others, this could confound the relationship between share type and daily produce servings. The number of household members who consumed foods from the CSA could also be a confounding variable in the relationship between CSA utilization and daily produce servings. For example, if one participant utilized 100 percent of their CSA share but split it amongst four household members whereas another participant utilized 100 percent of the CSA share themselves, the latter participant's daily produce servings would likely be higher despite the same share utilization rate. The aforementioned time delay between completion of the CSA season and administration of the health assessment survey could have affected the results of all three analyses (i.e., share type, CSA utilization, CSA history). For example, it is possible that those participants who utilized a greater percentage of their share ate more daily servings of produce during or just after completion of the CSA share, but that daily produce servings decreased by the time they took the health assessment. Additionally, the questions only ask about produce intake during the seven previous days, which might not be reflective of the participants' typical daily produce intake. There is also a lot of

variability across different farms in the amount and the variety of produce received in CSA shares, and these differences were not accounted for in the analysis and could have had an impact on the results.

BMI and Health Outcomes

It was postulated that CSA participants would experience a reduction in BMI and an improvement in health status from baseline to follow-up when compared to matched controls, but the results did not support this theory. The results are not surprising given the lack of a significant change in daily produce servings and weekly produce variety from baseline to follow-up and the fact that produce intake has been found to play a role in weight management^{34,39}. BMI is associated with morbidity and mortality as discussed previously^{6,9}, so the lack of a significant change in health status is also unsurprising. As with weekly produce variety and daily produce servings, BMI and health status were measured annually via the health assessment, so any changes related to CSA participation could have dissipated by the time participants took the health assessment. Additionally, if there were changes in the amount and variety of produce consumed during or shortly after the CSA as suggested by participants' responses to the follow-up CSA survey questions, those changes might not have been large enough or sustained for a long enough time period to affect BMI and health status. No previous studies quantified the change in health status or BMI associated with CSA participation, but a study by Berning found geographic access to CSA to be inversely related to BMI and positively associated

with weight loss¹¹⁴. Although the results of this study do not support Berning's findings, that doesn't necessarily mean that CSA participation does not have the potential to result in positive changes in BMI and health status. Subtle changes in dietary intake could have a substantial impact on BMI and health status over a longer timeframe. Additionally, it is possible that dietary changes could increase with repeat CSA participation as participants gain more familiarity with the produce items received and processing methods. If so, these dietary changes could be associated with improvement in BMI and health status. This theory was not supported by the results of this study given that CSA history was not associated with an increase in daily produce servings, but there could be other confounding factors that were not accounted for as mentioned earlier.

Strengths and Limitations

This study is the first to empirically investigate the impact of CSA on meal patterns, the household food environment, dietary intake, and health outcomes by quantitatively measuring these factors before and after CSA participation using previously validated measurement tools. The results of this study build upon the post-hoc survey results illustrated in previous studies which suggest that CSA participation has the potential to improve meal patterns^{92,95,111}, dietary intake^{81,93,95} and health status¹¹⁴. This research also provides valuable information to employers and insurers by exploring the effectiveness of a novel, experiential, and far-reaching approach to health promotion. In addition, it builds upon the existing literature by examining demographic factors and the CSA experience in

the context of an employer based intervention. This is important in that it helps CSA farmers identify and understand new market opportunities and provides them with knowledge regarding the unique motivations and needs of different CSA members.

This study is limited by the fact that it was not a randomized trial. Study investigators chose a quasi-experimental design because it was the most feasible design in the context of a workplace intervention given that employees could not be randomized to purchasing a CSA versus not purchasing a CSA. In addition, the study was only conducted in the Twin Cities area and did not include employers from a variety of different industries. As such, the findings might not be generalizable to employers in other regions or industries. The overall demographic characteristics of the employees for the participating employers were not assessed and some age groups, minorities, and occupations might have been underrepresented. Additionally, participants were not provided any support or financial incentive to help with purchasing the CSA. As such, the cost of a CSA share might have precluded some socioeconomic groups from participating.

There are also study limitations related to data collection. The health assessment (HA) was administered annually between late fall and early winter depending on the employer and assessed variables such as daily produce servings, weekly produce variety, health status, and BMI. Dietary changes and health benefits related to CSA participation might be attenuated once participants stop receiving CSA shares. As such, the HA might not have accurately captured changes in these variables due to the time delay between the end

of the CSA season and administration of the HA. This might especially be the case with weekly produce variety given that participants were asked about the produce items they consumed within the past seven days. Even if dietary changes were sustained beyond CSA participation, it is possible that dietary intake during seven days in the winter might not be reflective of participants' typical dietary variety due to seasonal variation in produce availability. In addition, the questions that assessed weekly produce variety were limited to a select number of produce items and did not include an "other" category as a response option. Asking questions about only a subset of fruits and vegetables has the potential to misrepresent the actual change in weekly produce variety. For example, parsnips are not included in the list of produce items participants were asked about on the HA but are a food item commonly included in a CSA share. The self-report nature of the HA and surveys is also a limitation, but budgetary constraints prevented the use of more objective measurements such as biomarkers of health and nutritional status. For example, inaccurate reporting of anthropometric measurements such as weight and height could result in underestimation of BMI. It is possible that study participants might be biased to underestimate their weight and height due to CSA participation more than controls, although the study results do not necessarily support this limitation. Furthermore, recall bias could have impacted the accuracy of responses to survey questions. Also, no data was collected regarding household members' dietary intake or health status. As such, the ability to draw conclusions regarding the household-wide impact of an employer based CSA intervention is limited to the data collected regarding changes in the household food environment and meal patterns.

Future Research Opportunities

The results of this study set the foundation for future research regarding CSA's efficacy as a health promotion intervention. Studies that replicate this intervention at employers across different regional areas and in different industries would help to determine whether the benefits of CSA illustrated in this study can be realized more broadly. This information might be particularly useful for employers with multiple offices across the country to determine whether a CSA intervention could effectively be implemented and administered at a corporate-wide level or whether there are regional differences in the motivations and receptiveness of employees to CSA that would preclude wide-scale implementation. Similarly, this would elucidate whether an employer based CSA intervention has the potential to expand the reach of CSA to include a more heterogeneous group of employees than what was illustrated in this study. This is important for two reasons. The first of which is that it identifies expansion opportunities for CSA farmers, which supports a more environmentally sustainable method of agriculture and local economic growth. The second is that expanding the reach of CSA might help target populations who are at particularly high risk for chronic disease due to poor dietary and health behaviors such as minorities or individuals of lower socioeconomic status.

Research to investigate the potential benefits and cost-effectiveness of offering a financial incentive for employees to participate in CSA is also warranted. In addition to

reducing or eliminating economic barriers to participation, it potentially increases the diversity of employees who participate in CSA as mentioned previously. Given that individuals of lower socioeconomic status are at greater risk for low intake of fruits and vegetables^{47,48}, it is possible that these individuals might have the potential to experience more dramatic improvements in dietary intake associated with CSA participation. For example, individuals of lower socioeconomic status often have limited access to healthy foods whether due to difficulties affording healthier foods or living in neighborhoods where affordable and nutritious food is challenging to obtain. Providing an employer based CSA and economic support to participate might help overcome these barriers to healthy eating.

Another significant opportunity for future research is with regard to data collection methods. Administration of the HA and CSA surveys just prior to the start of the CSA season, at multiple time points during the CSA season, immediately upon completion of the CSA season, and a few months after the CSA season would help to improve the accuracy of results regarding CSA's association with the household food environment, meal patterns, dietary intake, and health status. More specifically, data collection at multiple time points would help to account for variations in the produce delivered throughout the CSA season due to weather related factors or seasonality. It would also illustrate whether any changes associated with CSA participation occur only during the CSA season or whether they are maintained after participation. The method of assessing dietary variety could also be improved using a couple of different options. An "other"

category could be added to this question to ensure that all produce items are captured rather than just a subset of preselected items that may or may not be provided in the CSA share. It would also be helpful to customize the question regarding dietary variety to include all produce items that were offered by the participating CSA farms. Alternatively, a 24-hour dietary recall or dietary record could be used to capture more detailed dietary intake information. Some employers already offer online dietary tracking tools as part of their existing health promotion programming, and these tools might provide an efficient and cost-effective opportunity to collect more detailed dietary information.

Further study should also be conducted to better understand the impact of CSA on household members. This includes collecting data regarding the number of household members who actually consumed produce from the CSA share. In addition, direct assessment of household members' dietary intake and health outcomes would provide a more accurate understanding of the impact of CSA on participants' family members. This information would help employers and insurers to more accurately investigate the return-on-investment of any costs related to a CSA intervention. For example, health claims data could be analyzed for participants and the household members covered under the participants' health plans to determine whether CSA has the potential to reduce health care costs. Although this study did not show significant changes in BMI or health status related to CSA participation, health claims data would provide a more accurate measurement of health than self-reported data and might show different results than this study.

It is also important to note that potential health benefits related to CSA participation, particularly those that result in a significant reduction in health care costs, might take longer to realize than just one season of CSA participation. As such, longitudinal studies should be conducted to determine whether participation in an employer-based CSA intervention for multiple years has the potential to enhance the benefits of CSA participation. Additionally, studies that investigate the benefit of providing support to participants in the form of education, family events, social opportunities, and other incentives would be helpful to determine whether the benefits of CSA participation can be enhanced. For example, a farm visit or educational event about cooking the produce received in a CSA share could be utilized as a department or business unit's team outing to enhance the CSA experience and to provide social support for healthy eating. Incentives such as reductions in health insurance premiums for tracking dietary information during the CSA season or for completing online educational materials related to CSA participation are also examples of complementary support that future research studies could investigate.

CHAPTER 6.0: CONCLUSION

This study investigated the potential for an employer based health promotion intervention using CSA to improve the household food environment, meal patterns, dietary intake, and health outcomes. As with CSA members in previous studies, demographic characteristics of study participants were relatively homogenous. There was some evidence to suggest that an employer based intervention has the potential to expand the reach of CSA to a slightly more diverse population, but further research is needed that includes employers in different industries and regions.

Although many of the reasons participants joined a CSA were the similar to those reported in previous studies, there were some distinct differences that illustrate employees may differ somewhat in their motivations for purchasing a CSA share than typical CSA members. For example, support for local farmers was not a common reason for joining in contrast to previous findings. Two of the most frequently cited reasons for joining a CSA – family experience and education – were selected by a relatively small number of participants as factors they liked most about CSA participation. This suggests that there is an opportunity for future CSA interventions to make enhancements to these areas to better align the CSA experience with employees' unique motivations for joining a CSA.

Employees who participated in the study were generally very satisfied with their CSA experience, particularly with regard to produce freshness, quality, and logistics. The slightly higher rate of satisfaction with CSA share logistics relative to the results reported in previous research illustrates the added convenience of an employer delivered CSA. Despite high overall satisfaction rates, a lower percentage of employees indicated they planned to renew their CSA participation than reported in the previous research although member retention is an issue for many CSA farms^{81,92,95}. The reasons for not renewing were somewhat different for employees than CSA members in previous studies, particularly in that a lack of produce variety was not a commonly cited reason. However, the results of this study confirmed post-hoc survey results of previous studies and showed that previous CSA experience and weekly CSA share utilization rates were predictive of participants' future plans. Additionally, a number of individual satisfaction variables were predictive of participants' future plans as was the change in the weekly produce variety consumed. Focusing on these particular factors of the CSA experience might provide an opportunity to improve the somewhat low member retention rate.

This study showed that CSA participation was associated with an improvement in the household food environment. The number of vegetables present in the household increased significantly from baseline to follow-up as did the frequency of serving fruits and vegetables for snacks and meals. Although household members did not plan meals together more frequently, CSA participation was associated with an increase in the frequency with which they ate meals together. Environmental influences and household

meal frequency have been demonstrated to have a significant influence on dietary intake⁴⁹⁻⁵¹, and as such, these results provide support for utilizing CSA as a tool to improve dietary intake. This premise is further supported by the fact that CSA participants reported a decrease in the frequency of eating at all restaurants and fast food restaurants specifically.

Participants reported that they felt that CSA participation increased the amount and variety of produce they consumed. However, baseline and follow-up analysis of daily produce servings and weekly produce variety did not confirm participants' perceptions regarding dietary changes. Not surprisingly due to the lack of quantifiable change in dietary intake, the results also did not show an association with CSA participation and BMI and health status. Timing of survey administration along with other limitations related to the survey methodology might provide some explanation for the discrepancy in results. The improvement in the household food environment, reduction in restaurant frequency, and participants' perception of dietary improvement supports the use of an employer based CSA intervention for health promotion, but further research is needed to better understand the degree to which CSA can improve employee dietary intake and health outcomes.

Table 1.1: Summary of CSA Farm Data

Farm	# of Participants^a	Share Options	URL
Featherstone	180	Grande (4 people) & Chica (2-3 people)	http://featherstonefarm.com/sign-up/
Burning River Farm	58	Full, Single	http://www.burningriverfarm.com/content/291
Ploughshare	42	Full, Mini and others	http://www.ploughsharefarm.com/
Earth Dance	30	Full	http://www.earthdancefarm.net/
Four Seasons Farm	24	Unknown	http://fourseasonsorganicfarms.com/
Women’s Environmental Institute	22	Unknown	http://www.w-e-i.org/
Other ^b	23	Not applicable	Not applicable

^a This data includes farm information for participants who did not complete the study because data wasn’t available for the final list of participants (n = 324)

^b Includes Harmony Valley, Culinary Delights, North Creek Community Farm, Rock Spring Farm, Common Harvest Farm, Community Homestead, Driftless Organic, Easy Bean, Loon Organics, Riverbend and Will Heal Farm.

Table 1.2: CSA Share Type

CSA Share Type	n	%
A whole share for my household	54	16.7
A whole share of which I am purchasing a 1/2 portion	173	53.4
A full share of which I am purchasing a 1/3rd portion	37	11.4
A full share of which I am purchasing a 1/4 portion	18	5.6
A half share as offered by the CSA program	18	5.6
A half share of which I am purchasing a 1/2 portion	16	4.9
Other share type	8	2.5

Table 2: Baseline Demographic Characteristics of Participants^a

	Participants (n=324)	
	n	%
Gender		
Male	45	13.9
Female	279	86.1
Race		
American Indian or Alaska Native	3	.9
Asian or Pacific Islander	8	2.5
Black or African American	2	.6
White	299	92.3
Some other race	3	.9
Choose not to answer	8	2.5
Unknown	1	.3
Ethnicity		
Hispanic or Latino	7	2.2
Not Hispanic or Latino	297	91.7
Choose not to answer	20	6.2
Education		
8th grade or less	1	.3
High school diploma or GED	6	1.9
Technical training or Associate degree	20	6.2
Some college	32	9.9
College degree	125	38.6
Graduate studies	140	43.2
Occupation		
Professional/management	244	75.3
Administrative support	37	11.4
Sales	11	3.4
Technician	7	2.2
Service	7	2.2
Skilled craft	2	.6
Labor or production	1	.3
Other	15	4.6

	Participants (n=324)	
	n	%
# of adults in household		
1	63	19.4
2	230	71.0
3	23	7.1
4	8	2.5
# of children in household		
0	76	35.7
1	62	29.1
2	55	25.8
3	16	7.5
4	3	1.4
5	1	.5
BMI		
Underweight (<18.5)	2	.6
Normal weight (18.5-24.9)	147	45.4
Overweight (25-29.9)	101	31.2
Obese (≥30)	74	22.8

^aThe sample size for different variables may vary from the total sample size due to missing responses

Table 3.1: Comparison of Demographic Characteristics for Participants and Controls at Baseline^a

	Participants^b		Controls	
	(n=188)		(n=503)	
	n	%	n	%
Gender				
Male	27	14.4	71	14.1
Female	161	85.6	432	85.9
Race				
American Indian or Alaska Native	1	.5	2	.4
Asian or Pacific Islander	8	4.3	31	6.2
Black or African American	2	1.1	22	4.4
White	171	91.0	421	83.7
Some other race	1	.5	10	2.0
Choose not to answer	4	2.1	16	3.2
Unknown	1	.5	1	.2
Ethnicity				
Hispanic or Latino	3	1.6	13	2.6
Not Hispanic or Latino	173	92.0	433	86.1
Choose not to answer	12	6.4	57	11.3
Education**				
8th grade or less	1	.5	1	.2
High school diploma or GED	2	1.1	17	3.4
Technical training or associate degree	10	5.3	53	10.5
Some college	18	9.6	80	15.9
Bachelor's degree	73	38.8	192	38.2
Graduate studies	84	44.7	160	31.8
Occupation				
Professional/management	135	71.8	367	73.0
Administrative support	19	10.1	43	8.6
Sales	11	5.9	32	6.4
Technician	5	2.7	11	2.2
Service	4	2.1	11	2.2
Labor or production	1	.5	6	1.2
Skilled craft	1	.5	2	.4
Other	12	6.4	31	6.2

	Participants ^b (n=188)		Controls (n=503)	
	n	%	n	%
BMI				
Underweight (<18.5)	1	.5	5	1.0
Normal weight (15.5-24.9)	94	50.0	215	42.7
Overweight (25-29.9)	52	27.7	157	31.2
Obese (≥30)	41	21.8	126	25.1

** $\chi^2(5) = 17.58, P = .004$

^aThe sample size for different variables may vary from the total sample size due to missing responses

^bOnly participants with matched controls were included (n=188)

Table 3.2: Comparison of Participants and Controls for Continuous Variables

Variable	Participants ^a (n=188)		Controls (n=503)		<i>t</i>	<i>P</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age baseline	44.4	10.95	44.8	10.64	.41	.68
BMI baseline	26.4	5.60	27.3	6.52	1.79	.07
BMI follow-up	26.5	5.62	27.4	6.63	1.84	.07
BMI baseline (log transformed)	3.3	.20	3.3	.22	1.59	.11
BMI follow-up (log transformed)	3.3	.20	3.3	.22	1.60	.11

^aOnly participants with matched controls were included (n=188)

Table 4: Reasons for Joining a CSA^a

	n	%
Fresh food		
Yes	319	100.0
No	0	.0
Dislike grocery store		
Yes	304	93.8
No	20	6.2
Educational experience		
Yes	261	80.6
No	63	19.4
Family experience		
Yes	226	69.8
No	98	30.3
Recipes		
Yes	219	67.6
No	105	32.4
Concern for the environment		
Yes	179	55.3
No	145	44.8
Improve health		
Yes	137	42.3
No	187	57.7
Organic food		
Yes	134	41.4
No	190	58.6
Support sustainable agriculture		
Yes	112	34.6
No	212	65.4
Desire to eat produce in season		
Yes	91	28.1
No	233	71.9
Improve eating habits		
Yes	85	26.2
No	239	73.8
Support small farmers		
Yes	81	25.0
No	243	75.0
Support local farmers		
Yes	50	15.4
No	274	84.6

^aThe sample size for different variables may vary from the total sample size due to missing responses

Table 5.1: CSA Satisfaction^a

	n	%
Pick-up site		
Very satisfied	267	83.7
Satisfied	44	13.8
Unsatisfied	6	1.9
Not applicable	2	0.6
Quantity		
Very satisfied	153	48.0
Satisfied	103	32.3
Unsatisfied	49	15.4
Very unsatisfied	14	4.4
Quality		
Very satisfied	195	61.1
Satisfied	103	32.3
Unsatisfied	19	6.0
Very unsatisfied	2	0.6
Freshness		
Very satisfied	223	69.9
Satisfied	81	25.4
Unsatisfied	13	4.1
Very unsatisfied	2	0.6
Variety		
Very satisfied	104	32.6
Satisfied	146	45.8
Unsatisfied	62	19.4
Very unsatisfied	7	2.2
Distribution time of day		
Very satisfied	220	69.0
Satisfied	81	25.4
Unsatisfied	11	3.5
Very unsatisfied	5	1.6
Not applicable	2	0.6
Window of time for pick-up		
Very satisfied	225	70.5
Satisfied	75	23.5
Unsatisfied	15	4.7
Very unsatisfied	1	0.3
Not applicable	3	0.9
Quality of newsletter		
Very satisfied	176	55.2
Satisfied	98	30.7
Unsatisfied	24	7.5
Very unsatisfied	3	0.9
Not applicable	18	5.6

Farm community		
Very satisfied	90	28.2
Satisfied	90	28.2
Unsatisfied	14	4.4
Very unsatisfied	5	1.6
Not applicable	120	37.6
Farm communication		
Very satisfied	110	34.5
Satisfied	98	30.7
Unsatisfied	14	4.4
Very unsatisfied	3	0.9
Not applicable	94	29.5
Quality of farm website		
Very satisfied	111	34.8
Satisfied	109	34.2
Unsatisfied	17	5.3
Very unsatisfied	6	1.9
Not applicable	76	23.8
Packaging of produce		
Very satisfied	152	47.7
Satisfied	137	43.0
Unsatisfied	21	6.6
Very unsatisfied	3	0.9
Not applicable	6	1.9
Employer communications		
Very satisfied	126	39.5
Satisfied	129	40.4
Unsatisfied	17	5.3
Not applicable	47	14.7
Cookbook		
Very satisfied	172	53.9
Satisfied	120	37.6
Unsatisfied	12	3.8
Very unsatisfied	6	1.9
Not applicable	9	2.8
Price		
Too high	88	27.7
About right	228	71.7
Too low	2	0.6
Overall expectations		
The CSA experience exceeded my expectations	100	31.5
The CSA experience matched my expectations	142	44.7
The CSA experience fell short of my expectations	67	21.1
I had no expectations	9	2.8

^aThe sample size for different variables may vary from the total sample size due to missing responses

Table 5.2: Factors Participants Liked Most About CSA Membership^a

	n	%
Fresh food		
No	35	10.8
Yes	289	89.2
Healthy eating		
No	40	12.4
Yes	284	87.7
Supporting sustainable agriculture		
No	62	19.1
Yes	262	80.9
Exposure to new foods		
No	82	25.3
Yes	242	74.7
Organic food		
No	120	37.0
Yes	204	63.0
Farm connection		
No	138	42.6
Yes	186	57.4
Educational experience		
No	143	44.1
Yes	181	55.9
Convenience		
No	148	45.7
Yes	176	54.3
Recipes		
No	175	54.0
Yes	149	46.0
Newsletter		
No	178	54.9
Yes	146	45.1
Camaraderie with co-workers		
No	209	64.5
Yes	115	35.5
Family experience		
No	211	65.1
Yes	113	34.9
Other		
No	295	91.1
Yes	29	9.0

^aThe sample size for different variables may vary from the total sample size due to missing responses

Table 6.1: Future Farm Intentions

	n	%
Winter share		
Yes, I have signed up for a winter share	29	9.1
No, I was offered a winter share and declined	191	60.1
No, I was not offered a winter share option	98	30.8
Purchase share from same farm		
Yes	104	32.7
No	109	34.3
Unsure	105	33.0
Purchase share from different farm		
Yes	18	5.7
No	197	62.0
Unsure	103	32.4

Table 6.2: Reasons for Not Purchasing a CSA Share in the Future

	n	%
Too much produce		
No	280	86.4
Yes	44	13.6
Too little produce		
No	287	88.6
Yes	37	11.4
Too little variety		
No	274	84.6
Yes	50	15.4
Dissatisfied with quality		
No	299	92.3
Yes	25	7.7
Household issues		
No	305	94.1
Yes	19	5.9
Prefer farmers market		
No	204	63.0
Yes	120	37.0
Prefer grocery store		
No	263	81.2
Yes	61	18.8
Inconvenient pick-up		
No	308	95.1
Yes	16	4.9
Not worth cost		
No	256	79.0
Yes	68	21.0
Personal financial situation		
No	297	91.7
Yes	27	8.3
Planning on growing own produce		
No	283	87.4
Yes	41	12.7

Table 7: Multiple Multinomial Logistic Regression Predicting Future Farm Intentions from CSA Utilization and History

	Unsure			Yes				
	OR	95% CI		OR	95% CI			
CSA utilization	0.93	0.36	2.44	0.10	**	0.02	0.39	
CSA history	1.60	0.52	4.66	7.70	**	2.21	26.82	
CSA matched expectations	1.22	0.52	2.89	1.43		0.36	5.63	
CSA exceeded expectations	1.78	0.49	6.39	13.93	**	2.63	73.83	
CSA price	0.79	0.37	1.68	4.23	*	1.22	14.71	
CSA share type (whole share vs. less than half share)	1.64	0.58	4.61	1.47		0.38	5.75	
CSA share type (half share vs. less than half share)	2.06	0.95	4.47	2.00		0.70	5.63	
Employer (Hennepin County vs. HealthPartners)	1.18	0.44	3.13	2.60		0.74	9.17	
Employer (State of MN vs. HealthPartners)	3.90	***	1.76	8.66	7.10	***	2.55	19.81
Change in amount of produce consumed	1.06	0.52	2.18	2.22		0.78	6.38	
Change in variety of produce consumed	1.65	0.64	4.24	5.77	*	1.17	28.41	
Education (college degree vs. some college or less)	0.69	0.30	1.57	0.92		0.28	3.03	
Education (graduate studies vs. some college or less)	1.65	0.69	3.93	3.45		0.98	12.16	
Join reason - environment or agricultural	1.13	0.90	1.42	1.01		0.75	1.37	
Join reason - experience or health	1.02	0.80	1.29	0.87	*	0.63	1.20	
Liked reason - food or health	1.28	0.93	1.77	1.47		0.88	2.43	
Liked reason - experience	0.97	0.78	1.20	1.39	*	1.06	1.83	
Satisfaction - food	1.30	**	1.08	1.55	1.45	**	1.13	1.87
Satisfaction - logistics	1.12	0.89	1.40	0.94		0.68	1.30	
Satisfaction - community and farm	0.95	0.88	1.02	0.92		0.83	1.01	

Note: $\chi^2(40) = 236.04, P < .001, R^2 = .526$

Table 8: Household Food Environment^a

	Baseline			Follow-up			<i>t</i> ^a	<i>P</i>
	n	<i>M</i>	SD	n	<i>M</i>	SD		
Fruits present in household	324	3.58	2.12	318	3.08	2.23	3.69	< .01
Fruits present and visible in household	324	2.38	1.88	318	2.38	2.02	.11	.91
Fruits present or present and visible in household	324	8.34	3.26	318	8.79	3.69	2.36	.02
Vegetables present in household	324	11.52	3.30	318	12.52	3.41	6.29	< .01
Fruits served at snacks or meals	324	4.91	1.38	318	5.20	1.40	3.67	< .01
Vegetables served at snacks or meals	324	5.26	1.20	318	5.75	1.25	7.04	< .01
Frequency of household members eating meals together	277	8.54	3.87	274	8.98	4.25	2.07	.04
Frequency of household members planning meals together	277	2.39	1.96	272	2.50	2.15	414.5	.37
Frequency of restaurant eating	324	2.65	1.83	318	2.21	1.82	-3,248.0	< .01
Frequency of fast food eating	324	1.56	.75	318	1.37	.63	-1,503.5	< .01

^a Paired samples t-tests used in all analyses with the exception of the frequency of household members planning meals together, restaurant eating, and fast food restaurant eating. The Wilcoxon signed-rank test was used for these analyses. In these analyses, the signed rank test statistic is illustrated.

Table 9: Participants' Change in Amount and Variety of Produce Consumption

	n	%
Produce amount		
Decreased	1	.3
Stayed the same	90	28.2
Increased	228	71.5
Produce variety		
Decreased	1	.3
Stayed the same	39	12.2
Increased	279	87.5

Table 10: Multiple Regression Analysis for Change in Daily Produce Servings^a between Baseline and Follow-up

	Unstandardized B	SE	<i>t</i>	<i>P</i>
Group (participant, controls)	-.040	.11	-0.37	.71
Baseline consumption of sugary food and drinks	-.039	.10	-0.39	.70
Baseline age	.000	.00	0.05	.96
Baseline health status	-.056	.07	-0.81	.42
Baseline BMI (log transformed)	-.282	.25	-1.13	.26
Baseline weekly produce variety	-.021	.03	-0.82	.41
Baseline gender	-.123	.14	-0.88	.38
Baseline education (graduate studies vs. some college or less)	-.038	.13	-0.29	.77
Baseline education (college degree vs. some college or less)	.151	.13	1.21	.23

Note: $F(9, 681) = .77, P = .643, R^2 = -.003$

^aLog transformed

Table 11: Multiple Regression Analysis for Change in Weekly Produce Variety between Baseline and Follow-up

	Unstandardized B	SE	t	P
Group (participant, controls)	-.002	.15	-0.01	.99
Baseline consumption of sugary food and drinks	-.021	.14	-0.15	.88
Baseline age	-.002	.01	-0.26	.79
Baseline health status	.118	.10	1.22	.22
Baseline BMI (log transformed)	.369	.35	1.05	.29
Baseline daily produce services (log transformed)	-.365	.15	-2.49	.01
Baseline gender	.375	.20	1.9	.06
Baseline education (graduate studies vs. some college or less)	-.184	.18	-1.01	.31
Baseline education (college degree vs. some college or less)	.036	.17	0.21	.83

Table 12.1: Multiple Regression Analysis to Predict Change in Daily Produce Servings^a from CSA Share Type

	Unstandardized B	SE	<i>t</i>	<i>P</i>
Share type (whole share)	-.090	.27	-.33	.74
Share type (half share)	-.124	.19	-.64	.52
Baseline BMI	-.013	.02	-.85	.39
Baseline weekly produce variety	-.045	.05	-.94	.35
Baseline readiness to change	-.127	.07	-1.71	.09
Baseline household presence of vegetables	-.022	.03	-.83	.41
Baseline restaurant frequency	-.039	.04	-.87	.38
Baseline frequency of serving fruit at snacks or meals	-.024	.06	-.40	.69
Baseline frequency of household meals	.017	.02	.79	.43
Baseline consumption of sugary foods and beverages	-.034	.16	-.21	.83

Note: $F(10, 208) = .83, P = .60, R^2 = .038$.

^aLog transformed

Table 12.2: Multiple Regression Analysis to Predict the Change in Daily Produce Servings^a from CSA Utilization

	Unstandardized B	SE	<i>t</i>	<i>P</i>
Weekly CSA utilization	.127	.22	0.57	.57
Baseline BMI	-.011	.01	-0.79	.43
Baseline weekly produce variety	-.034	.05	-.72	.47
Baseline readiness to change	-.123	.08	-1.63	.10
Baseline household presence of vegetables	-.022	.03	-.80	.43
Baseline restaurant frequency	-.040	.05	-.89	.37
Baseline frequency of serving fruit at snacks or meals	-.026	.06	-.43	.67
Baseline frequency of household meals	.015	.02	.69	.49
Baseline consumption of sugary foods and beverages	-.057	.16	-.35	.72

Note: $F(9, 205) = .85, P = .57, R^2 = .036$.

^aLog transformed

Table 12.3: Multiple Regression Analysis to Predict the Change in Daily Produce Servings^a from CSA History

	Unstandardized			
	B	SE	t	P
CSA history	-.003	.20	-.01	.99
Baseline BMI	-.011	.01	-.83	.41
Baseline weekly produce variety	-.040	.05	-.84	.40
Baseline readiness to change	-.130	.08	-1.73	.08
Baseline household presence of vegetables	-.024	.03	-.88	.38
Baseline restaurant frequency	-.047	.04	-.83	.41
Baseline frequency of serving fruit at snacks or meals	-.024	.06	-.41	.68
Baseline frequency of household meals	.015	.02	.72	.47
Baseline consumption of sugary foods and beverages	-.029	.16	-.19	.85

Note: $F(9,209) = .88$, $P = .54$, $R^2 = .037$.

^aLog transformed

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APPENDIX A

*Ten Principles of Teikei*⁷²

1. Principle of mutual assistance. The essence of this partnership lies, not in trading itself, but in the friendly relationship between people. Therefore, both producers and consumers should help each other on the basis of mutual understanding: This relation should be established through the reflection of past experiences.
2. Principle of intended production. Producers should, through consultation with consumers, intend to produce the maximum amount and maximum variety of produce within the capacity of the farms.
3. Principle of accepting the produce. Consumers should accept all the produce that has been grown according to previous consultation between both groups, and their diet should depend as much as possible on this produce.
4. Principle of mutual concession in the price decision. In deciding the price of the produce, producers should take full account of savings in labor and cost, due to grading and packaging processes being curtailed, as well as of all their produce being accepted; and consumers should take into full account the benefit of getting fresh, safe, and tasty foods.
5. Principle of deepening friendly relationships. The continuous development of this partnership requires the deepening of friendly relationships between producers and consumers. This will be achieved only through maximizing contact between the partners.
6. Principle of self-distribution. On this principle, the transportation of produce should be carried out by either the producer's or consumer's groups, up to the latter's depots, without dependence on professional transporters.
7. Principle of democratic management. Both groups should avoid over-reliance upon limited number of leaders in their activities, and try to practice democratic management with responsibility shared by all. The particular conditions of the members' families should be taken into consideration on the principle of mutual assistance.
8. Principle of learning among each group. Both groups of producers and consumers should attach much importance to studying among themselves, and should try to keep their activities from ending only in the distribution of safe foods.
9. Principle of maintaining the appropriate group scale. The full practice of the matters written in the above articles will be difficult if the membership or the territory of these groups becomes too large. That is the reason why both of them should be kept to an appropriate size. The development of this movement in terms of membership should be promoted through increasing the number of groups and the collaboration among them.
10. Principle of steady development. In most cases, neither producers nor consumers will be able to enjoy such good conditions as mentioned above from the very beginning. Therefore, it is necessary for both of them to choose promising partners, even if their present situation is unsatisfactory, and to go ahead with the effort to advance in mutual cooperation.

APPENDIX B

HealthPartners Local Food/Health Renewed Study Consent Form

You are invited to take part in a research study to learn about the impact of Community Supported Agriculture (CSA) Farm membership on the eating patterns of adults and their family members. CSA memberships provide participants with fresh, locally grown produce on a weekly basis during the growing season for a membership fee. Participants and their families will receive a variety of new foods and often recipes and suggestions for preparing these foods. This study may help develop new programs to promote healthy eating. You were selected because you are a HealthPartners, Hennepin County or State of Minnesota employee who is interested in purchasing a share in a CSA Farm for the 2009 growing season. This project is funded by the HealthPartners Research Foundation Partnership Grant Program.

CSA Procedures

You may purchase a full or half CSA membership; the costs are approximately \$500 - \$600 per full share or approximately \$300 for a half share for the summer 2009. You will be responsible for paying for the CSA share to the farm before the growing season. You will receive your weekly delivery of fresh vegetables and fruits at your worksite on a set day of the week. If you work at a site that is not a drop site, you will be provided with a list of participating CSA's to find a drop site appropriate for you.

Study Procedures

If you agree to take part in the study, you will be asked to take an on-line survey that asks questions about your eating patterns, typical foods available in your home, and the eating habits of family members before the start of the growing season and again in the fall. Each survey will take approximately 20 minutes.

If you agree to participate, we will also ask you to complete your employer's on-line Health Assessment prior to and after the growing season and request your permission to access your Health Assessment results for both Health Assessments. This may involve sharing your log in information for taking the Health Assessment with the research staff.

You will receive a cookbook after you complete your first survey and a canvas grocery bag after you complete the second and final survey. The study will last approximately one year.

Risks

CSA Membership Risks

If you purchase a CSA membership, you may not always like the produce you receive from the CSA farm. The growing season could be shorter than usual due to weather which would result in smaller and fewer food deliveries. Though extremely rare, fresh produce has been the source of food borne illness.

If you have concerns about your CSA membership or an illness that could possibly be related to the food you receive, you will need to contact the CSA Farm directly.

Study Risks

Answering the questions about your eating habits, physical activity and other health-related behaviors may cause you some discomfort or embarrassment.

Benefits

You and your family may experience improved dietary intake and eating patterns as a result of purchasing a CSA membership

We hope the information from the surveys will help in planning future programs to promote healthy eating.

Alternatives to Study Participation

An alternative to participating in the present study is to participate in other community programs to help you improve your eating patterns. You may also choose to join a CSA farm on your own.

Confidentiality

The records of this study will be kept private. In any report that might be published or presented, only group data will be shown. No information will be included that will make it possible to identify you. Data about you will be identified only by a code number.

Voluntary Nature of the Study

Your decision whether to take part in this study is voluntary and will not in any way affect your current or future relationship with the HealthPartners Research Foundation, HealthPartners, Hennepin County or the State of Minnesota. If you decide to take part, you are free to withdraw from this study at any time without affecting those relationships.

New Information

If during the study there are new findings discovered which might influence your willingness to continue in the study, you will be informed. You can decide at that time whether you still wish to continue in the study.

Contacts and Questions

The researchers conducting this study are Nancy Sherwood, PhD, N. Marcus Thygeson, MD, Marcia Hayes, MPH, RD and Emily Parker, PhD at the HealthPartners Research Foundation. If you have any questions about the study at any time, you may call Principal Investigator Nancy Sherwood at 952-967-7303 or Project Manager Marcia Hayes at 952-967-6778.

Events Requiring Medical Attention

If you have an event requiring medical attention while in this study, you should seek care from your usual medical care provider, or dial 911 if your situation is an emergency. Payment for any such treatment must be provided by you or your third party payer, (such as health insurance, Medicare, etc.).

If you think the event is related to being in this study, please report this as soon as possible to the Project Manager (Marcia Hayes, 952-967-6778).

You will be given a copy of this consent form to keep.

I have had a chance to ask questions about the study including the risks that might occur as described in this consent form. Based on this information, I agree to take part in the study.

Signature of Subject

Date

I, the investigator, certify that to the best of my knowledge, the patient/participant/person responsible signing this consent form has had the study fully explained and clearly understands the nature, risks, and any benefits of participating in this research project.

Signature of Investigator

Date

APPENDIX C

Baseline Survey

(Includes only the subset of survey questions used for this study)

Demographic and Household Characteristics

Which participating employer are you affiliated with?

- I am a HealthPartners employee
- I am an employee of Hennepin County
- I am a State of Minnesota employee

Please enter your Birth Date.

Date of Birth: MM DD YYYY
 / /

What is your Gender?

- Female
- Male

How many people currently live in your household?

Adults
Children

What is the highest grade or year of school you have completed?

- Grades 1 through 11 (Some or No High School)
- Grade 12 or GED (High School Graduate)
- College 1 year to 3 years (Some College or Technical School)
- College 4 years or more (College Graduate)
- Graduate Degree (Master's, Doctorate)

CSA Experience

What type of CSA Share have you purchased?

- A whole Full Share for my Household
- A Full Share of which I am purchasing a 1/2 portion
- A Full Share of which I am purchasing a 1/3 portion
- A Full Share of which I am purchasing a 1/4 portion
- A whole Half Share as offered by the CSA program
- A Half Share which I am purchasing a 1/2 portion
- Other (please specify):

Where have you made arrangements to pick up your share from?

- Work
- Location near my home (e.g.: church, co-op, etc)
- Other (please specify)

Have you ever purchased a CSA farm share (or a part of a share) before?

- No
- Yes

Why did you decide to join a CSA farm and sign up for this study? (Check all that apply.)

- Fresh Food
- Family Experience
- Improve Health
- Improve Eating Habits
- Good Recipes
- Support Small Farmers
- Desire to Eat Produce in Season
- Support Local Farmers
- Organic Food
- Educational Experience
- General Concern for the Environment
- Dislike Grocery Stores
- Support Sustainable Agriculture
- Other (Please Specify)

Household Environment & Meal Patterns

During the past seven days, how many times did all, or most, of your Household eat breakfast together?

- N/A or One Person Household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

During the past seven days, how many times did all, or most, of your Household eat lunch together?

- N/A or One Person Household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

During the past seven days, how many times did all, or most, of your Household eat dinner together?

- N/A or One Person Household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

During the past seven days, how many times did all, or most, of your Household plan meals together?

- N/A or One Person Household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

How often do you ...

	Never	Rarely	Sometimes	Usually	Always
Serve/Offer Fruit as a Snack?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/Offer Fruit at Meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/Offer Vegetable(s) as a Snack?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/Offer Vegetable(s) at Meals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

During the past seven days, how often did you eat something from a fast food restaurant (like McDonalds, Burger King, Taco Bell, Pizza Hut, etc)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

During the past seven days, how often did you eat something from a fast casual restaurant (like Panera Bread, Boston Market, Chipotle, Fuddruckers, etc)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

During the past seven days, how often did you eat something from a casual, full table service restaurant (like Applebee's, California Pizza Kitchen, Olive Garden, and most neighborhood restaurants)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

During the past seven days, how often did you eat something from a fine dining restaurant (like W.A. Frost & Company, Oceanaire Seafood Room, St. Paul Grill, etc)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

Please think about all of the places in your home where food is stored (e.g., refrigerator, cabinets, countertops, etc.) and indicate whether or not each specific food is currently present in your home. The amount does not matter, only that it is present. Then, for each specific food that is present indicate whether it is also visible, that is, you can see it without opening any cabinets, drawers, refrigerator, or freezer (e.g., stored on a countertop or kitchen table).

Fruits (include: fresh, frozen, canned or dried):

	NOT Present in Household	Present in Household	Present in Household AND Readily Visible
Apples or Applesauce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apricots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bananas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Berries (e.g.: Strawberries, Blackberries, Blueberries, Raspberries, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Melon (e.g.: Cantaloupe, Honey Dew, Watermelon, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cherries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapefruits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oranges or Tangerines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peaches or Nectarines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pears	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plums	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Fruits (e.g.: Pineapple, Guavas, Kiwi, Mango, Papaya, etc)*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
100% Orange Juice or Grapefruit Juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Any other 100% Fruit Juice (e.g.: Apple, Grape, Guava, Papaya, Passion Fruit, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* Please specify the Other Fruits present in your Household:

Please think about all of the places in your home where food is stored (e.g., refrigerator, cabinets, countertops, etc.) and indicate whether or not each specific food is currently present in your home. The amount does not matter, only that it is present.

Vegetables (include: fresh, frozen or canned):

	NOT Present in Household	Present in Household
Asparagus	<input type="radio"/>	<input type="radio"/>
String Beans or Green Beans	<input type="radio"/>	<input type="radio"/>
Broccoli	<input type="radio"/>	<input type="radio"/>
Carrots	<input type="radio"/>	<input type="radio"/>
Cauliflower	<input type="radio"/>	<input type="radio"/>
Celery	<input type="radio"/>	<input type="radio"/>
Corn	<input type="radio"/>	<input type="radio"/>
Cucumbers	<input type="radio"/>	<input type="radio"/>
Eggplant	<input type="radio"/>	<input type="radio"/>
Green Salad, Lettuce, or Salad Mixtures	<input type="radio"/>	<input type="radio"/>
Mixed Vegetables	<input type="radio"/>	<input type="radio"/>
Mushrooms	<input type="radio"/>	<input type="radio"/>
Peas or Snow Peas	<input type="radio"/>	<input type="radio"/>
Peppers (Green, Red, or Yellow)	<input type="radio"/>	<input type="radio"/>
Potatoes (NOT: French Fries, Tater Tots, or Hash Browns)	<input type="radio"/>	<input type="radio"/>
Sweet Potatoes or Yams	<input type="radio"/>	<input type="radio"/>
Spinach, Collards, Turnip Greens, Mustard Greens, or Kale	<input type="radio"/>	<input type="radio"/>
Summer Squash (Yellow or Zucchini)	<input type="radio"/>	<input type="radio"/>
Winter Squash (e.g.: Acorn, Butternut, or Spaghetti Squash)	<input type="radio"/>	<input type="radio"/>
Tomatoes	<input type="radio"/>	<input type="radio"/>
Other Vegetables (e.g.: Lima Beans, Radishes, Avocado, Beets, Cabbage, Brussels Sprouts, etc) *	<input type="radio"/>	<input type="radio"/>

* Please Specify the Other Vegetables present in Household:

Dietary Behaviors

Are you currently a practicing vegetarian?

- Yes
- No

Are you currently trying to:

- Lose Weight
- Maintain Your Weight
- Gain Weight
- Other (please specify):

APPENDIX D

Follow-up Survey

(Includes only the subset of survey questions used for this study)

12. Did you visit the farm during the 2009 season (other than for picking up your CSA share)?

- No
- Yes, 1 time
- Yes, 2 times
- Yes, 3 or more times

**19. On average, about what percentage of the CSA share did you use each week?
(If you split a share with another household, please tell us how much of your portion of the CSA share you used each week.)**

- 100%
- 75-99%
- 50-74%
- 25-49%
- 10-24%
- Less than 10%

22. Please rate your level of satisfaction with each of the following aspects of the CSA experience.

(4 = very satisfied; 3 = satisfied; 2 = unsatisfied; 1 = very unsatisfied; NA = not applicable)

	4	3	2	1	NA
Quantity of produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Freshness of produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Variety/mix of produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenience of pick-up site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenience of distribution time/day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Window of time to pick up produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of newsletter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social/community activities/aspect of farm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Communication with the farmer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of farm website	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Packaging of produce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internal communication from your employer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
From Asparagus to Zucchini (cookbook)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Is there another Aspect you wish to comment on?:
(Please specify.)

**23. What, if any, activities or aspects of the CSA would you like to see more of?
(e.g.: more social activities, variety/mix of other foods, etc.)**

**24. What, if any, activities or aspects of the CSA did you dislike?
(e.g.: pick-up took too much time, etc.)**

**25. Overall, were your expectations regarding the CSA experience met this past season?
(Please mark the box that most closely reflects your experience.)**

- The CSA experience exceeded my expectations.
- The CSA experience matched my expectations.
- The CSA experience fell short of my expectations.
- I had no expectations.

26. Given what you received from the CSA this year, do you feel the price of your share was:

- Too high
- About right
- Too low

27. Some Farms offer a Winter Share. Have you signed up for a Winter Share?

- Yes
- No

28. Do you plan on purchasing a share from this CSA farm again next year?

- Yes
- No
- Unsure

29. Do you plan on purchasing a share from a different CSA farm next year?

- Yes
- No
- Unsure

30. You indicated that you definitely won't or may not purchase a CSA share next year. Please indicate which of the following issues contributed to your decision (check all that apply):

- Too much produce during the season
- Too little produce during the season
- Too little variety during the season
- Dissatisfied with quality of the produce
- Household issues (moving, don't cook, etc.)
- Prefer choosing own produce at farmers market
- Prefer choosing own produce at grocery store
- Pick-up time and/or pick-up location inconvenient
- Share not worth the cost (e.g., for the amount of produce provided)
- Personal financial situation
- Planning on growing own produce
- *Other (please specify):

31. What did you like about your 2009 CSA membership? (Check all that apply.)

- Educational experience
- Being connected to a farm
- Camaraderie with co-workers
- Healthy eating
- Family experience
- Newsletter
- Supporting sustainable agriculture
- Fresh food
- Farm activities
- Good recipes
- Organic food
- Convenience
- Exposure to new foods
- Other*

*Other (please specify):

Household Environment & Meal Patterns

35. During the past seven days, how many times did all, or most, of your family living in your house eat breakfast together?

- N/A or one person household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

36. During the past seven days, how many times did all, or most, of your household eat lunch together?

- N/A or one person household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

37. During the past seven days, how many times did all, or most, of your household eat dinner together?

- N/A or one person household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

38. During the past seven days, how many times did all, or most, of your household plan meals together?

- N/A or one person household
- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times

39. During the past seven days, how often did you eat something from a fast food restaurant (like McDonalds, Burger King, Taco Bell, Pizza Hut, etc)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

40. During the past seven days, how often did you eat something from a fast casual restaurant (like Panera Bread, Boston Market, Chipotle, Fuddruckers)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

41. During the past seven days, how often did you eat something from a casual, full table service restaurant (like Applebee's, California Pizza Kitchen, Olive Garden, and most neighborhood restaurants)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

42. During the past seven days, how often did you eat something from a fine dining restaurant (like W.A. Frost & Company, Oceanaire Seafood Room, St. Paul Grill)?

- 0 times
- 1-2 times
- 3-4 times
- 5-6 times
- 7 times
- More than 7 times

43. How often do you:

(1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Usually, 5 = Always)

	Never 1	2	3	4	Always 5
Serve/offer fruit as a snack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/offer fruit at a meal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/offer vegetable(s) as a snack	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Serve/offer vegetable(s) at meal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

44. Please think about all of the places in your home where food is stored (e.g., refrigerator, cabinets, countertops, etc.) and recall whether or not each specific type of food is currently present in your home. The amount does not matter, only that it is present. Then, for each specific type of food that is present, indicate whether or not it is also visible. That is: you can see it without opening any cabinets, drawers, refrigerator, or freezer (e.g., stored on a countertop or kitchen table).

Fruits: include fresh, frozen, canned or dried

	<u>Not Present</u> in Household	<u>Present</u> in Household	<u>Present & Visible</u> in Household
100% Orange Juice or Grapefruit Juice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Any other type of 100% Fruit Juice (e.g.: Apple, Grape, Guava, Papaya, Passion Fruit, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apples / Applesauce	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apricots	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bananas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Berries (e.g.: Strawberries, Blackberries, Blueberries, Raspberries, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Melon (e.g.: Cantaloupe, Honeydew, Watermelon, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cherries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapefruits	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grapes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Oranges or Tangerines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peaches or Nectarines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pears	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plums	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Fruits (e.g.: Pineapple, Guavas, Kiwi, Mango, Papaya, etc.)*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Please tell us which other types of Fruit you keep in your Household:

45. Please think about all of the places in your home where food is stored (e.g., refrigerator, cabinets, countertops, etc.) and indicate whether or not each specific food is currently present in your home.

Vegetables: include fresh, frozen or canned

	<u>Not Present</u> in Household	<u>Present</u> in Household
Asparagus	<input type="radio"/>	<input type="radio"/>
String Beans or Green Beans	<input type="radio"/>	<input type="radio"/>
Broccoli	<input type="radio"/>	<input type="radio"/>
Carrots	<input type="radio"/>	<input type="radio"/>
Cauliflower	<input type="radio"/>	<input type="radio"/>
Celery	<input type="radio"/>	<input type="radio"/>
Corn	<input type="radio"/>	<input type="radio"/>
Cucumbers	<input type="radio"/>	<input type="radio"/>
Eggplant	<input type="radio"/>	<input type="radio"/>
Green Salad, Lettuce, or Salad Mixtures	<input type="radio"/>	<input type="radio"/>
Mixed Vegetables	<input type="radio"/>	<input type="radio"/>
Mushrooms	<input type="radio"/>	<input type="radio"/>
Peas or Snow Peas	<input type="radio"/>	<input type="radio"/>
Peppers (Green, Red, Yellow)	<input type="radio"/>	<input type="radio"/>
Potatoes (NOT French Fries, Tater Tots, or Hash Browns)	<input type="radio"/>	<input type="radio"/>
Sweet Potatoes or Yams	<input type="radio"/>	<input type="radio"/>
Spinach, Mustard Greens, Turnip Greens, Collards, or Kale	<input type="radio"/>	<input type="radio"/>
Summer Squash (Yellow, Zucchini)	<input type="radio"/>	<input type="radio"/>
Winter Squash (e.g.: Acorn, Butternut, Spaghetti Squash, etc.)	<input type="radio"/>	<input type="radio"/>
Tomatoes	<input type="radio"/>	<input type="radio"/>
Other Vegetables (e.g.: Lima Beans, Radishes, Avocado, Beets, Cabbage, Brussels Sprouts, etc.)*	<input type="radio"/>	<input type="radio"/>

*Please tell us which other types of Vegetables you keep in your Household:

Dietary Behaviors & Intake

16. Has the amount of produce you consume changed as a result of your participation in the CSA?

- Decreased
- Stayed the same
- Increased

17. Has the variety of produce you consume changed as a result of your participation in the CSA?

- Decreased
- Stayed the same
- Increased

53. Are you currently a practicing vegetarian?

- Yes
- No

56. Are you currently trying to:

- Lose Weight
- Maintain Your Weight
- Gain Weight
- Other (please specify):

APPENDIX E:

Health Assessment

(Includes only the subset of survey questions used for this study)

Demographic Characteristics

2. What is your gender? Male
 Female
3. How tall are you? _____ feet, _____ inches
(round to the nearest inch)
4. An accurate body weight is an important measure of health. How much do you weigh? _____ pounds
5. What is your race? American Indian or Alaska Native
 Asian or Pacific Islander
 Black or African American
 White
 Some other race
 Unknown
 Choose not to answer
6. What is your ethnicity? Hispanic or Latino
 Not Hispanic or Latino
 Choose not to answer
7. What is the highest level of education that you have completed? 8th grade or less
 Some high school
 High school diploma or GED
 Technical training or Associate degree
 Some college
 College degree
 Graduate studies
8. What is your job type? Administrative support
 Labor or production
 Professional/management
 Retired
 Sales
 Service
 Skilled craft
 Student
 Technician
 Other
- P2. Are you currently employed (working for pay)? Yes
 No → SKIP to question 9

115. How ready are you to make changes in your *food choices*?
- I do not think changes are necessary
 - I have been thinking about making some changes but I am not ready right now
 - I am seriously thinking about making some changes
 - I am currently making changes or have made changes within the past 6 months
 - I have made and maintained changes for more than 6 months

Personal Factors

115. How ready are you to make changes in your *food choices*?
- I do not think changes are necessary
 - I have been thinking about making some changes but I am not ready right now
 - I am seriously thinking about making some changes
 - I am currently making changes or have made changes within the past 6 months
 - I have made and maintained changes for more than 6 months

Health Status

13. In general, how would you describe your health?
- Excellent
 - Very good
 - Good
 - Fair
 - Poor

Dietary Intake

54. How many servings of *fruits and vegetables* do you eat in a typical day? (A serving is 1 piece of fruit, ½ cup of fruit or vegetables, 1 cup of raw leafy vegetables, or ¾ cup of juice.)
- | | | |
|-------------------------|-------------------------|----------------------------------|
| <input type="radio"/> 0 | <input type="radio"/> 4 | <input type="radio"/> 8 |
| <input type="radio"/> 1 | <input type="radio"/> 5 | <input type="radio"/> 9 |
| <input type="radio"/> 2 | <input type="radio"/> 6 | <input type="radio"/> 10 |
| <input type="radio"/> 3 | <input type="radio"/> 7 | <input type="radio"/> 11 or more |

Which of the following foods have you eaten at least once in the past 7 days?

60. Apple or pear Yes No

- | | | | |
|-----|-----------------------------------|---------------------------|--------------------------|
| 61. | Orange | <input type="radio"/> Yes | <input type="radio"/> No |
| 62. | Cantaloupe | <input type="radio"/> Yes | <input type="radio"/> No |
| 63. | Grapefruit | <input type="radio"/> Yes | <input type="radio"/> No |
| 67. | Tomato | <input type="radio"/> Yes | <input type="radio"/> No |
| 68. | Broccoli | <input type="radio"/> Yes | <input type="radio"/> No |
| 69. | Spinach | <input type="radio"/> Yes | <input type="radio"/> No |
| 70. | Mustard, turnip or collard greens | <input type="radio"/> Yes | <input type="radio"/> No |
| 71. | Carrots or mixed vegetables | <input type="radio"/> Yes | <input type="radio"/> No |
| 72. | Green salad | <input type="radio"/> Yes | <input type="radio"/> No |
| 73. | Sweet potato or yam | <input type="radio"/> Yes | <input type="radio"/> No |
| 74. | Other potato | <input type="radio"/> Yes | <input type="radio"/> No |