

Dietary Research within the Context of a Community-Based Food System

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ABSTRACT

In an effort to begin filling a gap in the scientific literature about community-based food systems and promote food environment changes to increase dietary quality, this dissertation focuses on community-based food systems research with two different populations: Head Start families in southwest Virginia and Heifer International Alternative Spring Break (ASB) college student participants at Virginia Tech.

Fresh Produce, Fresh Start (FPFS) tested the effectiveness of a local, fresh fruit and vegetable delivery program on dietary intake and purchasing patterns of Head Start families. FPFS utilized a one-group double pre-test post-test was conducted on two occasions at each of the two sites. Measures collected included: food-use questionnaire, height and weight, food security questionnaire, 24-hour recall, program process evaluation, and food receipts. Fifty-one of 67 (76%) of eligible participants were recruited. For dietary recalls completed ($n = 29$, 57%), significant increases were found in intake of vitamin A, vitamin C, fiber, vegetable, and fruit and vegetable (FV) servings combined, based upon paired t-tests ($p < .05$). Based on receipt data ($n = 22$, 43%), the proportion of fresh produce purchases significantly increased for both number of items and monetary costs, based upon a Wilcoxon Signed-Ranks Test ($p < .05$).

A second study was conducted to examine the impacts of the Heifer Alternative Spring Break (ASB) programs on Virginia Tech student's attitudes, motivations, diet, and behaviors regarding community-based food systems before and after a one-week intensive program. The design was quasi-experimental, using a one-group pre-test, post-test, and follow-up. Participants completed questionnaires, dietary recalls, and journals. Forty-three of 43 (100%) of eligible participants enrolled in the study. Although increases in local and organic foods were observed, there were no significant changes in dietary quality. The intervention showed significant increases in local and organic food consumption for individuals that consumed less than 50% of their calories from local and organic foods at baseline based upon a paired t-test ($p < .05$).

The findings from these studies offer evidence of the capacity for community-based food systems to change dietary patterns, across different populations.

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CHAPTER 1

Introduction

The current American food system has been described as fostering an ‘obesogenic’ food environment that promotes unhealthy eating and, ultimately, a number of negative health outcomes (Story, Kaphingst, Robinson-O’Brien, & Glanz, 2008). Significant increases in the number of overweight and obese individuals in the United States is perhaps the most striking example of how the food system and food environment have directly and negatively affected American health (Flegal, Carroll, Ogden, & Curtin, 2010; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). The most recent National Health and Nutrition Examination Survey (NHANES) data suggest that 33.8% of adults over 20 are obese (Flegal et al., 2010) and 9.5 percent of infants and toddlers as well as 11.9 percent of children ages 2 to 17 are at or above the 95th percentile for height and weight (Ogden et al., 2010). These increases are particularly alarming considering the multiple health consequences associated with overweight and obesity, including coronary heart disease, type 2 diabetes, some cancers, hypertension, dyslipidemia and stroke (Flegal, Graubard, Williamson, & Gail, 2007; Malnick & Knobler, 2006). Poor or excessive food consumption is a predictor of overweight, obesity, and associated health consequences (World Health Organization & Food and Agriculture Organization of the United Nations, 2003), all of which are exacerbated by food environments that do not promote healthy eating habits (Cummins & Macintyre, 2006; French, Story, & Jeffery, 2001; Reidpath, Burns, Garrard, Mahoney, & Townsend, 2002).

The term ‘food environment’ refers to the socio-ecological factors that impact individual’s choices regarding food consumption. The socioecological model incorporates individual, social, community, and political elements that ultimately influence a person’s decisions within the food environment (McLeroy, Bibeau, Steckler, & Glanz, 1988; Sallis & Glanz, 2006). To better understand how elements of the socio-ecological model impact the food environment on a macro- or micro- level, food outlets, homes, cafeterias, schools, worksites, restaurants, and public facilities are all possible sites for investigation within a particular food system (National Cancer Institute, n.d.). Several methodologies are available to measure the food environment, including an examination of sales data, food receipts, menus, food availability and affordability in a food supply, nutrient availability and intake, and accessibility through geographic analysis. In pursuit of a food environment that supports healthier dietary choices,

individuals, policymakers, and organizations are examining ways to socially, ecologically, and economically restructure the food system into one that will ultimately improve public health outcomes (Story, Hamm, & Wallinga, 2009).

In the public arena, an effort to construct or rebuild community-based food systems is evidenced by a proliferation of media attention granted to local and sustainable foods, including information from television news, online journals and newspapers, and popular culture magazines and best-selling books. In addition, leading national organizations responsible for influencing public health policy have released extensive position statements supporting sustainable, community-based food systems to improve public health outcomes (American Dietetic Association Sustainable Food System Task Force, 2007; American Medical Association, 2008; American Public Health Association, 2007). Despite such widespread and increasing interest, very little scientific literature exists about how community-based food systems actually influence dietary outcomes. In an effort to begin filling this gap in the scientific public health literature, this dissertation focuses on community-based food systems research conducted with two populations: Head Start families in Southwest Virginia and Heifer International Alternative Spring Break college student participants at Virginia Tech. Although the research that forms the basis of this dissertation was conducted with two very different populations, at the core of each study lies the same basic question, what are the dietary implications of participation in a community-based food system?

A food system considers all food inputs and outputs, including agricultural production, processing, packaging, distribution, marketing, consumption, and disposal (Wilkins & Eames-Sheavly, 2009). Community-based food systems ultimately aim to attain food security, relational proximity, self-reliance, and sustainability (Wilkins & Eames-Sheavly, 2009). Examples of increasingly familiar community food system components within a food environment include community gardens, community supported agriculture (CSAs), roadside stands, U-picks, farm-to-school and farm-to-institution programs, and farmers markets. In order to understand the dietary implications of a community-based food system, researchers need to explore the effectiveness of these components as a health improvement strategy.

It is important to study the nutritional implications of alternative food system approaches because the current food system's dietary impacts are correlated with negative health outcomes (Story et al., 2008). While there have been yearly increases in calories and pounds of food

available in every food group (grain, vegetable, fruit, dairy, protein, oils, and empty calories) since 1970 (Economic Research Service, United States Department of Agriculture, 2010), these increases were accompanied by disproportionate increases in low cost, high sugar, and fatty foods (Drewnowski & Darmon, 2005a). These energy dense and nutrient poor foods have a direct influence on the quality of the American diet and leads to diminished health and higher weight (Wells & Buzby, 2008). This is particularly significant given the food choices that limited resource populations are faced with when making decisions within their own food environment—purchasing expensive nutrient-dense food or relatively inexpensive energy-dense foods (Drewnowski & Darmon, 2005b; Drewnowski & Specter, 2004). Beyond caloric excess, there are numerous other examples of how the food system influences overall public health. Food insecurity (Economic Research Service, United States Department of Agriculture, 2011), food safety (Pouliot & Sumner, 2008), inconsistency between the recommended consumption of fruits and vegetables and their agricultural production (Buzby, Wells, & Vocke, 2006), and environmental degradation (Horrigan, Lawrence, & Walker, 2002) are all factors that plague the American population and are widely attributed to the shape and scale of the food system.

Particular attention has been given to diet-related health outcome disparities of limited resource individuals because of potential food environment inequalities and disproportionately negative health outcomes. Higher overweight, obesity, and chronic disease rates are all correlated with limited resource populations (Seligman, Laraia, & Kushel, 2009; Wilde & Peterman, 2006, 2006). At last count, approximately 17.4 million individuals report being food insecure in the U.S. population (Economic Research Service, United States Department of Agriculture, 2011). In other words, for such individuals access to healthful, nutritious, safe, and culturally acceptable food is limited by affordability and availability. In addition, access to available and affordable healthy foods may inhibit the consumers' ability to purchase nutrient dense foods in rural and urban areas (Baker, Schootman, Barnidge, & Kelly, 2006; Golan, Stewart, Kuchler, & Dong, 2008; Lovasi, Hutson, Guerra, & Neckerman, 2009).

Research has established that improving dietary quality has potential for improving health outcomes (Nicklas, Baranowski, Cullen, & Berenson, 2001). That is, a simultaneous increase in consumption of nutrient dense foods (i.e. fruits, vegetables, calcium-rich foods, and whole grains) and decrease in energy dense foods (i.e. fats (especially saturated), added sugars, and sodium) is one viable strategy for reducing excess calories, weight gain and the widespread

development of nutrition-related diseases (Nishida, Uauy, Kumanyika, & Shetty, 2007). Although a healthy diet seems relatively simple, the current obesity and chronic disease rates related to intake indicate otherwise. On the individual level, most consumers are faced with an average of 226.7 food decisions per day (Wansink & Sobal, 2007). Although the healthiness of food is a consideration for some consumers, taste and cost is significantly more likely to be ranked first (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998). The food environment itself has become complicated by a multitude of choices and consumers are forced to simultaneously consider several variables (i.e. what, where, and how much) in everyday food purchases and practices.

In the effort to understand and encourage healthier living and positive health outcomes, health behavior theory has traditionally focused on individual factors alone; current investigations seek to build upon what is known about health behavior by focusing on how the social, community, and political factors of the socio-ecological model influence individual choice when it comes to eating in given food environments (Sallis & Owen, 2008; Stokols, 1996). Although there are several initiatives that promote community-based food systems within food environments, there is little research that explores the effectiveness of these efforts as a health promotion strategy, especially in terms of diet. By exploring the dietary implications of two community-based food system programs (i.e. Head Start families and Virginia Tech college students participating in Heifer International's Alternative Spring Break) this dissertation will strengthen the scientific research base about the nutritional implications of community-based food system programs.

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CHAPTER 2
Literature Review
Introduction

As overweight, obesity, and chronic diseases reach alarming rates (Flegal, Carroll, Ogden, & Curtin, 2010; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010), due in large part to dietary patterns, public health advocates are examining food environments to find ways that will make healthy food options the easiest purchasing decision within a socio-ecological context (Booth et al., 2001). A basis for examining socio-ecological contexts is through the socio-ecological model. Born out of the science of ecology, the socio-ecological model “focuses on the nature of people’s transactions with their physical and socio-cultural surroundings” (Stokols, 1992, p. 6). Whereas past health behavior theory almost exclusively focused on individual choice, the socio-ecological model is used to address multiple influences on health behavior, in addition to individual factors (Stokols, 1996). For example, the socio-ecological model has been used to explain the interplay among individual, interpersonal, organizational, and societal factors, and the influence these factors have on the impact and efficacy of nutrition education (Robinson, 2008). In short, the socio-ecological model is a lens through which the researcher can view the multilayered issues involved in an individual’s health behavior decisions and how those choices impact overall health status when designing and evaluating interventions (Sallis & Owen, 2008).

The increasing public health problems related to dietary quality warrants research about how to change the food environment within a socio-ecological context. As an example, the clearest indication of poor dietary quality within the United States food environment is evidenced by several weight-related epidemics (Flegal, Graubard, Williamson, & Gail, 2007; Malnick & Knobler, 2006). Overweight, obesity, and chronic disease rates derive from intricate socio-ecological factors, including behavioral, environmental and genetic factors. Genetics, a predispositional factor to a given trait or disease, is nearly impossible to change at the individual level (Farooqi & O’Rahilly, 2007). Conversely, individuals or communities can feasibly modify behavioral and environmental factors in the near term (Hill, Wyatt, & Peters, 2005). Behavioral factors include choices about physical activity and eating habits, and are influenced on several levels of the socio-ecological model. It is well documented that by regulating energy intake (i.e. dietary factors) and expenditure (i.e. physical activity levels) an individual can influence weight

status (although the extent varies based on genetics) (Spiegelman & Flier, 2001). But there are other factors beyond individual regulation that can influence weight status. That is, geographic location, socio-cultural environment, and policies significantly affect opportunities for healthy eating and physical activity to varying degrees (Nestle & Jacobson, 2000; Papas et al., 2007).

Created to guide federal nutrition policy and nutrition education programs, the dietary guidelines are specific, detail-oriented messages that are updated every five years (U.S. Department of Health and Human Services & United States Department of Agriculture, 2011). MyPlate (United States Department of Agriculture, 2011), the latest edition of dietary guidelines translated to the public, provides nutrition guidance for Americans. Based upon Dietary Reference Intakes (DRIs) and aligned with the Dietary Guidelines for Americans, MyPlate presents simple messages to the consumer about grains, vegetables, fruits, milk, meats and beans, oil, energy balance, and food safety based upon personalized energy requirements. Messages are related to balancing calories, increasing nutrient dense foods, and reducing energy dense foods.

The USDA reports that Americans currently do not meet *any* of the 2005 Dietary Guideline recommendations. Even though food availability continues to increase in every food group, with approximately 2,234 calories consumed by the average American per day, consumption of nutrition-dense food is low and energy-dense food is high (Wells & Buzby, 2008). The 2005 Dietary Guidelines recommended 5 to 13 servings of fruits and vegetables per day (U.S. Department of Health and Human Services & United States Department of Agriculture, 2005). The newly released 2010 Dietary Guidelines recommend that Americans fill half of their plate with fruits and vegetables (U.S. Department of Health and Human Services & United States Department of Agriculture, 2011). Yet, on average, Americans consume less than the recommended quantity (H. Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008; Grimm et al., 2010). In fact, one study shows that 75% of Americans consume less than five servings of fruits and vegetables per day (Casagrande, Wang, Anderson, & Gary, 2007). This has significant impact when considering that evidence suggests that high fruit and vegetable intake decreases the risk of some chronic diseases, such as type 2 diabetes, hypertension, stroke, and some cancers (Bazzano et al., 2002; Bazzano, Serdula, & Liu, 2003; Liu, Manson, Lee, & others, 2000; McCullough et al., 2002; Serdula et al., 1996).

While following the recommended guidelines may seem simple, the proliferating obesity epidemic is just one example of the complexity of the food environment. In light of

this epidemic, both the general public and public health advocates are focusing on ways to change the current food system to one that promotes healthy eating and positive health outcomes. One such response is the promotion of sustainable community-based food systems, which hold the promise of promoting healthier food environments and theoretical public health benefits (Story, Hamm, & Wallinga, 2009; Wallinga, 2009; Wallinga, Schoonover, & Muller, 2009; Wilkins, Lapp, Tagtow, & Roberts, 2010).

Community-Based Food Systems: Changing the Food System to Change the Food Environment

A food system encompasses all aspects, actions, and outcomes related to food, including agricultural production, processing, packaging, distribution, marketing, consumption, and disposal (Wilkins & Eames-Sheavly, 2009).



Figure 1. Community Food System Components
 Source: C.S. Mott Group for Sustainable Agriculture, 2010, p.4. Used under fair use guidelines, 2011.

A growing number of individuals are engaging in more localized, sustainable, community-based food systems. Whereas the modern conventional food system broadens food cycle inputs and outputs to a global scale, a community-based food system is conceptualized as one where all of the components are localized to a particular place (while still cognizant of the larger global connections). Figure 1, created by the C.S. Mott Group for Sustainable Agriculture, depicts the multiple factors that influence a community-based food system (2010, p. 4). The model demonstrates the

intrinsic complexity of food consumption within a community-based food system. From farm to fork, the food cycle (inside level) requires inputs from natural and human resources, subsequently influenced by several social institutions. (Examples of social institutions include the United States Department of Agriculture, agricultural and environmental policy groups, and food advocacy organizations.) This, in turn, impacts (outside level) natural resources, human resources, and social institutions. Considering a cyclical food system model (similar in many

ways to the socio-ecological model) emphasizes the complexities of eating within a community-based food system. Generally, community-based food systems ultimately aim to support sustainability, relational proximity, self-reliance, and individual and community food security, all factors potentially impacting an individual's food choice within the food environment (Wilkins & Eames-Sheavly, 2009).

Sustainability

Sustainability is an ambiguous term applied to a myriad of systems, such as environmental, biological, economic, and industrial. In contemporary contexts, sustainability is used mainly to reference the interaction between humans and the natural environment, or ecological sustainability. The *Oxford-English Dictionary* defines sustainability rather simply as “capable of being maintained at a certain rate or level” (Oxford University Press, 1989). Recent research makes claims that current food practices place significant demands on natural environmental resources and therefore reduces ecological sustainability (Horrihan, Lawrence, & Walker, 2002). Increasing concern about natural resource depletion and climate change caused a consideration of the impacts that the food system had on sustaining human *and* environmental health needs into the future (McMichael, 2007; McMichael, Powles, Butler, & Uauy, 2007)

First coined by the Henry A. Wallace Institute of Sustainable Agriculture in 1986, the phrase “food sustainability” has since developed several colloquial synonyms (Gussow, 2006). Sustainable food is often used interchangeably with terms such as organic (Magnusson, Arvola, Hursti, Aberg, & Sjöden, 2003), fair trade (Raynolds, 2000), and local (Seyfang, 2007). The USDA loosely places all of these synonyms in the legal definition of “sustainable agriculture” in U.S. Code Title 7, Section 3103 as:

An integrated system of plant and animal production practices having a site-specific application that will over the long-term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base upon which the agriculture economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole. (United States Department of Agriculture, 2009)

Although ‘sustainable food’ is a widely applied term, it inherently implies long-term environmental health, economic profitability, and social justice, regardless of the context (Allen, Van Dusen, Lundy, & Gliessman, 1991; Feenstra, 2002). New terms such as ‘food citizen’ (Wilkins, 2005) and ‘civic agriculture’ (Lyson, 2004) have recently emerged with the hope of reframing sustainable foods. These phrases place emphasis on the need for individuals to interact within their food system locally to create place-based communities (DeLind, 2002; Lyson, 2005).

One emerging area of research in sustainability highlights the importance of promoting healthful, ecologically minded food consumption within the context of a sustainable food system (Gussow, 1996; Gussow & Clancy, 1986; Marlow et al., 2009; McMichael, 2007; Pinstrup-Andersen & Pandya-Lorch, 1998). The hypothesis is that food consumption not only influences human health, but at the same time affects the natural environment; from production to consumption, foods require numerous environmental resources, including soil, land, water, forest and air. Recognizing the connection between food and the environment, the American Dietetic Association (ADA) released a position statement on ecological sustainability and the food system stating:

It is the position of the American Dietetic Association to encourage environmentally responsible practices that conserve natural resources, minimize the quantity of waste generated, and support the ecological sustainability of the food system—the process of food production, transformation, distribution, access, and consumption ... Natural resources that provide the foundation for the food system include biodiversity, soil, land, energy, water, and air. A food system that degrades or depletes its resource base is not sustainable. Making wise food purchases and food management decisions entails understanding the external costs of food production and foodservice and how these external costs affect food system sustainability. (Harmon, Gerald, & American Dietetic Association, 2007)

In a food system, agricultural production, processing, packaging, distribution, marketing, consumption, and disposal of food all use energy (Canning, Charles, Huang, Polenske, & Waters, 2010). The different pieces of a food system can serve as a reference to understand the points of input and output that drive the system through environmental energy use. Each step inherently utilizes natural resources, although the type of resource clearly depends on the stage

of the process. Naturally, excessive demand for food or any food product places demands on virtually all other steps, thereby straining the entire cycle. Conversely, reductions in any part of the food cycle (i.e. decreasing highly processed food, decreasing how far food travels) may reduce human impact on natural resources. The Intergovernmental Panel on Climate Change (IPCC) estimates that agriculture accounts for approximately 20% of human-generated greenhouse gas emissions worldwide (Horrigan et al., 2002). Nationally, food-related energy use is responsible for 15.7% of total energy use (Canning et al., 2010).

The food system can also be quantified in terms of what it gives off—greenhouse gas emissions. Eleven percent of total greenhouse gas emissions from the transportation phase and 83% emitted from the production phase (Weber & Matthews, 2008). In terms of decreasing greenhouse gas emissions, shifting from a meat-based diet to a plant-based diet is more effective than the purchase of local food, although the combination of both is optimal (D. Pimentel & M. Pimentel, 2003). Examining the food cycle with this perspective may encourage a consumer to take multiple steps toward food system sustainability—whether it be increasing plants intake or buying locally.

In addition, greater focus on less processed and more nutritious food may promote sustainability and decrease nutrition-related weight gain (which is associated with the consumption of highly processed and energy-dense foods) (Ello-Martin, Roe, Ledikwe, Beach, & Rolls, 2007; Mendoza, Drewnowski, & Christakis, 2007). Low cost, energy dense foods are often packed with refined flour, sugar, chemicals, and fats offering high caloric value with little nutrient quality (Andrieu, Darmon, & Drewnowski, 2005; Drewnowski & Darmon, 2005a; Epstein, Paluch, Beecher, & Roemmich, 2008; Monsivais & Drewnowski, 2007). Moreover, the greater the number of food additives and ingredients in a product, the greater are food system requirements (e.g. energy, natural resources, capital expenses, etc.) (Carlsson-Kanyama, Ekström, & Shanahan, 2003). The Leopold Institute, a leading research institute for agriculture, calculated the food miles for a multi-ingredient product, strawberry yogurt. The calculated Weighted Average Source Distance (WASD) of strawberry yogurt in the United States is 2216 miles (Pirog & Benjamin, 2005). Concentrating on a condensed ingredient list not only reduces the amount of energy needed for processing each ingredient, but may also increase nutrient density counter to the caloric energy density of highly processed, multi-ingredient foods, which is aligned with the United States Dietary Guidelines for Americans (Gussow & Clancy, 1986).

Organic Foods.

While sustainable food inherently focuses on the trifecta of long-term environmental health, economic profitability, and social justice, new inquiries show the possible nutritional benefits of sustainable food—in particular organic foods. On the whole, studies focus on the differences between organic or local when compared to conventional foods. Until recently, there was no conclusive evidence of nutritional inferiority or superiority of organic foods in comparison to conventional. Despite the presumed nutritional superiority of organic foods, earlier research reviews were unable to validate such assumptions (Bourn & Prescott, 2002; Magkos, Arvaniti, & Zampelas, 2003). However, more recent review studies indicate that, because of more sensitive nutrient content measures, organic produce is indeed more nutrient dense overall, most conclusively in vitamin C content, antioxidant capacity, lower nitrates, the presence of some polyphenols, and protein content (Benbrook, Zhao, Yanez, Davies, & Andrews, 2008; Lairon, 2009; Perrigan, 2008). Still, publications call for additional research regarding the nutritional makeup of organics in order to arrive at more definitive conclusions (Dangour et al., 2009; Halweil, 2007). While nutrient quality is important, many consumers buy organic because of the health benefits associated with the decreased presence of pesticide residues (Hughner, McDonagh, Prothero, Shultz, & Stanton, 2007). For instance, the introduction of an all-organic diet in children reduces their uptake of pesticide metabolites (Lu, Barr, Pearson, & Waller, 2008; Lu et al., 2006).

Lord Northbourne first used the term “organic farming” in his 1940 publication, *Look to the Land*. He argued that much of society’s sickness stemmed from industrialization and the ecological imbalance that it created (Northbourne, 2003). Around the same time, Sir Albert Howard was hailed as the father of modern organic farming, due in large part to his book *The Soil and Health* that emphasized the connection between soil *and* human health (Howard, 2006). In 1972, Rachel Carson’s *Silent Spring* advocated for decreased pesticide application, particularly DDT, which helped spark the large scale environmental, and eventually organic, movement (Carson, 2002).

In 1990, nearly twenty years after the publication of Carson’s text, the Organic Foods Production Act was passed, requiring the USDA to create organic standards (Agriculture and Marketing Service, 2008). In 2002, the National Organic Program was signed into law, helping the USDA regulate organics by ensuring that products labeled “USDA Organic” are produced,

processed, and certified consistent with national organic standards. Producers must pay to display the “USDA Organic” label and non-compliance can result in an \$11,000 fine. Crops that are organically processed must be free of conventional pesticides, petroleum-based fertilizers, and sewage or sludge-based fertilizers (Agricultural Marketing Service, n.d.). Animals must eat organic feed that is free of antibiotics and growth hormones and be provided with outdoor access.

Despite the work of the USDA, consumer organizations continue to debate the sustainability of organically marketed food (Stagl, 2002). Questions and criticisms arise from organic food that travels numerous miles to reach grocery store shelves or organically raised animals (drug and chemical free) that are raised on factory farms with no room to graze, but still have “access” to the outdoors. Counterarguments emphasize the incremental nature of change while stressing that organic is a better alternative to the conventional food system because it brings environmentally friendly and/or healthier alternative to the masses. In either case, the USDA’s National Agricultural Statistics Service found in their 2008 Organic Productions Survey that organic farms and ranches had higher average sales and production expenses than any other United States farm sector (Vilsack, 2010).

Relational Proximity

In a community food system, components of the food system (agricultural production, processing, packaging, distribution, marketing, consumption, and disposal) are meant to occur on a localized level (Feenstra, 1997). The localization of the food system supports perceived economic, social, and ecological benefits to communities. That is, community-based food systems benefit economies by removing middlemen and keeping money circulating locally (Brown & Miller, 2008; Brown et al., 2007; Varner & Otto, 2008). Additionally, relationships are built, enhancing the social fabric of a community (Abel, Thomson, & Maretzki, 1999; Hunt, 2007). Beyond economic and social considerations, research points to the ecological benefits associated with the localization of foods. For example, less fuel is used in the transport of food: in contrast, estimates reveal that conventional produce travels an average of 1300 to 2000 miles to reach the U.S. consumer’s plate (H. Hill, 2008; R. Pirog & A. Benjamin, 2003). In addition, a large portion of the food sold in a community-based food system is organic (even if it is not USDA certified as such) or is grown without chemicals and pesticides (Kremen, Greene, & Hanson, 2004).

In the absence of a legal framework, local foods are loosely and subjectively defined. The USDA defines local as food grown within 400 miles (United States Department of Agriculture, 2008). But, local foods may refer to those produced within 50 miles, 100 miles, a days drive, a geographic or cultural region, or simply within national borders. While the spatial range is somewhat uncertain, during the past few years local foods have benefitted from a resurgence of farmers markets, community supported agriculture (CSA), and small farm sites (Brown, 2002; Ostrom, 2006). The explosive growth of farmers markets in recent years demonstrates increasing interest in community food systems. In 1994, the USDA Agricultural Marketing Service tallied 1,755 farmers markets (Agricultural Marketing Service, 2010). By the end of 2004, that number grew to 3,706. And in 2010, 6,132 farmers markets were reported. Demonstrating local food popularity, the *New Oxford American Dictionary* named “locavore” its word of the year for 2007 (Oxford University Press, 2007). Several popular books have supported the notion of eating local, including *The 100-Mile Diet: A Year of Local Eating* (A. Smith & MacKinnon, 2007), *Omnivore’s Dilemma* (Pollan, 2006), and *Animal, Vegetable, Miracle: A Year of Food Life* (B. Kingsolver, Hopp, & C. Kingsolver, 2007). These trends can be attributed to the social, economic, and dietary advantages, as well as the perception that local food is “better food” (Brown, 2003; Payne, 2002). Apart from the backyards of conscientious growers, locally grown foods can be found in farmers markets, roadside stands, restaurants, farm to school and institutional programs, and grocery stores across the country.

Since nutrient quality of local foods can vary vastly depending upon the specific location, soil conditions, and farming practices, conclusive evidence about the superiority of local foods versus non-local foods—organic or conventional—is almost impossible to achieve. Longer storage and transportation times may reduce the nutrient quality of conventional agriculture, whereas local food is freshly picked, stored for very short periods of times, and travels vastly fewer miles (Hinsch, Slaughter, Craig, & Thompson, 1993). Furthermore, defining the “local” space is difficult (Selfa & Qazi, 2005); therefore, an immense amount of data would need to be collected for each food product in order to achieve any conclusive evidence (Edwards-Jones et al., 2008).

In part because nutritional superiority is still debated, there are still few studies that show how purchasing locally may benefit the public’s health. It is hypothesized that purchasing locally does force the consumer to buy fewer processed foods and, quite possibly, more fruits and

vegetables. One specific study, “The 100-mile Diet,” tested the impacts of local food on dietary quality in Montgomery County, Virginia (Rose et al., 2008). Participants were required to eat foods from a 100-mile radius during the course of a single summer month. The most positive finding noted that fruit and vegetable consumption increased by almost 1.5 cups per day.

Another local food model allows community members to support a farm through payment and/or farm work during the growing season. Known as Community Supported Agriculture (CSA), community members become farm “shareholders,” capitalizing farmers’ salary and farm operations during the nonproduction off-season (Sustainable Agriculture Research and Education (SARE), 1995). CSAs usually cost between 300 and 600 dollars. In exchange, these CSA investors receive shares of fruits and vegetables, usually a weekly assortment of farm produce, and the satisfaction of connecting with a local farm. CSA members are usually Caucasian, and both younger and more highly educated than the general population (Forbes & Harmon, 2008). During the growing season, CSA bags are packed full of fruits and vegetables. So much in fact that one study that served CSA bags to Seattle elders who could not travel to the farmers market showed an increase of 1.04 servings of fruits and vegetables per day (Johnson, Beaudoin, Smith, Beresford, & LoGerfo, 2004).

In short, local purchasing practices may facilitate the consumer to buy foods within seasonal and regional bounds, while improving sustainability and dietary quality, but there is little scientific evidence to justify that hypothesis.

Self-reliance

A major emphasis of community food systems is for communities to be able to “meet their own food needs” (Wilkins & Eames-Sheavly, 2009). Meeting food needs means having the infrastructure and economic and social support for agricultural production, processing, packaging, distribution, marketing, consumption, and disposal components of the food system within the bounds of a community. Much of the current food system infrastructure is built upon a conventional model, where emphasis is placed on efficiency at a low-cost and not on ecological, economic, or social sustainability (Kirschenmann, Stevenson, Buttel, Lyson, & Duffy, 2008).

In order to achieve this self-reliance in a globally dominated food system, food sovereignty movements are growing in the United States and around the world (Windfuhr & Jonsén, 2005). As defined in its simplest terms, food sovereignty is the right of all people to food. Along with the right to food, comes the decision making power of communities to determine their food

future. Food sovereignty began as an international movement with the struggle of Via Campesina peasant farmers for rights to gain land in 1963 (Desmarais, 2007). Since then, the movement has moved to the United States to create a less anonymous and less global food system. In fact, the town of Sedgwick, Maine recently passed a local food and community self-governance ordinance, which declares food sovereignty (Reinhardt, 2011).

Individual and Community Food Security

Although community-based, ecologically conscious diet practices may be both healthy and environmentally friendly, some individuals in America lack the opportunity to choose to consume within this paradigm. For example, several studies link farmers market patronage (i.e. to purchase local food) to those individuals with higher educational attainment and income levels than the average population (Eastwood, 1996; Eastwood, Brooker, & Gray, 1999; Govindasamy & Nayga, 1997; Tagtow & Harmon, 2009). While there is little research about farmers markets in low-income communities, these studies stress the unique barriers (e.g. price sensitivity and transportation issues) for consumers in such areas. Following suit, markets in low-income areas need to provide culturally relevant, basic products, hire staff from the local neighborhood, and may need initial subsidization (Fisher, 1999; Suarez-Balcazar, Martinez, Cox, & Jayraj, 2006; United States Department of Agriculture, 2002). Low-income individuals also display low participation in CSAs, as it is too costly (Forbes & Harmon, 2008). Strategies to increase participation include subsidizing shares, offering work in exchange for a share, low-cost shares, transportation assistance, bartering, outreach assistance, and connection with local food emergency aid organizations. Aside from farmers markets and CSAs, there is some evidence that individuals living in low-income neighborhoods have less access to food retail outlets, in general (Moore, Roux, & Ana, 2006; Morland, Wing, Diez Roux, & Poole, 2002; Powell, Chaloupka, & Bao, 2007).

Individual food security is a measure of a household's degree of hunger and ease of access to food (Economic Research Service, United States Department of Agriculture, 2009). The first survey data regarding food security was collected and published in conjunction with the U.S. Census in April of 1995 (Hamilton et al., 1997). To measure food security in 1995, 45,000 households were interviewed using validated survey tools. Eighteen questions asked about respondent anxiety concerning food, (in) adequate quantities or quality of food, reported reduced food intake and consequences for adults, reported reduced food intake and consequences for

children and methods households use to procure foods. Levels of food security were defined as (1) food secure, (2) food insecure without hunger, and (3) food insecure with severe hunger. In 1995, 11.9% of the population experienced some sort of food insecurity.

Today, the concept of food security remains similar (Economic Research Service, United States Department of Agriculture, 2009). Food security still denotes that a household has food that provides nutritional benefits and is easily accessible. Food insecurity still means that a household lacks confidence about food availability and that their accessible food may be nutritionally inadequate. Measurement terms have changed and are now classified as: (1) high food security, (2) marginal food security, (3) low food security and (4) very low food security. The new terms are an effort to describe the hunger conditions of American citizens with greater accuracy.

Since the initial 1995 survey, a wider variety of tools for measuring individual and household food security for different audiences and a shortened version of the questionnaire have been developed. These updated food security tools have helped researchers determine that the number of food insecure people in the United States has risen since 1995. Currently 14.7% of the population reports that food is not easily accessible or nutritionally adequate, up from 11.1% in 2007 (Economic Research Service, United States Department of Agriculture, 2011).

Although the increasing prevalence of national food insecurity is worrisome, the lack of improvement in this area is even more alarming when considering the correlation between food insecurity and overweight or obesity, especially for women and children (Adams, Grummer-Strawn, & Chavez, 2003; Alaimo, Olson, & Frongillo Jr, 2001; Dinour, Bergen, & Yeh, 2007; Townsend, Peerson, Love, Achterberg, & Murphy, 2001). Studies have found that those who are food insecure are also at increased risk for obesity and/or a negatively associated health status. That is, in America, overweight and obesity demonstrates an inverse relationship with decreased socio-economic status (Baum & Ruhm, 2009). Food insecurity is associated with cardiovascular risk factors (Seligman, Laraia, & Kushel, 2010). Furthermore, it is rather perplexing to think that few persons experiencing food insecurity are underweight, although intuition says that those who experience hunger and have decreased access to food should be underweight (Rector, 2007).

Fruit and vegetable consumption is positively correlated with socio-economic status, which is to say that increases in socioeconomic status are associated with increases in fruit and vegetable intake across neighborhoods (Dubowitz et al., 2008). Urban or rural, low-income and

minority communities are correlated with having a disproportionately high number of fast food outlets and convenience stores, which rarely offer fruits and vegetables (Larson, Story, & M. Nelson, 2009; L. V. Moore et al., 2006; Powell et al., 2007).

Even when healthier food outlets and healthier food options like fruits and vegetables exist in low-income neighborhoods they are the more expensive food option both in perception and in price (Drewnowski & Darmon, 2005b; Drewnowski & Eichelsdoerfer, 2009; Drewnowski & Specter, 2004). After paying for housing needs, many low-income families do not have adequate money to purchase relatively more expensive fruits and vegetables and therefore opt for less costly and less nutritious options (Jetter & Cassady, 2006). Recognizing the importance of such economic constraints, the USDA has formulated meal plans to fit in a variety of budgets including low-cost, moderate-cost and liberal to promote healthy eating and ensure that food assistance programs provide enough resources to meet dietary recommendations (Carlson, Lino, & Fungwe, 2007). Using MyPyramid, the USDA explains how a low-income family can afford to meet nutrient guidelines. Still, current consumption practices fall short of recommendations (Kimmons, Gillespie, Seymour, Serdula, & H. Blanck, 2009).

In recent years, the phrase “community food security” has emerged as a structure that “considers all the factors within a region or community’s food system that influence the availability, cost, and quality of food to area households, particularly those in lower income communities” (Winne, n.d.) Hamm and Bellows (2003) purport that a community is truly food secure when “all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes self-reliance and social justice.” In other words, to create more community-based food systems, accessibility and availability of healthy foods for all individuals must be of paramount concern.

Aware of the realities of the national food environment, the United States government has responded with more national food assistance programs that promote community food security and, in turn, locally produced foods and healthy eating. For example, the Woman, Infants, and Children (WIC) Farmers Market Nutrition Education Program provides vouchers for low-income women and their families to purchase local foods at certain markets in some states (USDA Food & Nutrition Service, n.d.). Created in 1992 by a Congressional action, this nutrition program provides fresh and local fruits and vegetables to WIC members and seeks to increase the farmers market customer base. Prior to this program and the recently updated WIC allowable foods list,

the only fresh fruits and vegetables provided in the WIC package were carrots (Food & Nutrition Service-USDA, 2010). Upon review of the WIC packages, the Institute of Medicine called for the addition of fresh fruits and vegetables, spurring the creation of the Farmers Market Nutrition Education Program. Case studies show the programs effectiveness for increasing access to fruit and vegetables (Conrey, Frongillo, Dollahite, & Griffin, 2003; Dollahite, Nelson, Frongillo, & Griffin, 2005; Herman, Harrison, & Jenks, 2006; Herman, Harrison, Afifi, & Eloise Jenks, 2008). Similarly, the Senior's Farmers Market Nutrition Program (SFMNP) provides vouchers for low-income seniors (60 years old and up) to purchase local foods at certain markets (USDA Food & Nutrition Service, n.d.). The purpose of this program is to provide fresh, nutritious, local resources to seniors, encourage domestic consumption, and aid in development of new markets. Similar to WIC, case studies claim that SFMNP effectively increases access to fruits and vegetables (Johnson et al., 2004; Kunkel, Luccia, & Moore, 2003). A further boon to low-income fruit and vegetable consumption, some farmers markets are now accepting Supplemental Nutrition Assistance Program (SNAP) benefits, formerly known as food stamps (USDA Agricultural Marketing Service & USDA Food & Nutrition Service, 2010). There has been a surge in National Farm to School Programs that aim to serve healthy meals in schools while promoting local produce consumption and increasing farm sales opportunities (Azuma & Fisher, 2001; Bagdonis, Hinrichs, & Schafft, 2009). All of these programs help to bolster community food security within the context of a sustainable and healthy food system.

Beyond government assistance, other localized organizations are appearing to solve community food security issues. Communities are creating grassroots food system councils that support local foods by advocating for issues like social justice, land preservation, and food processing infrastructure. Through a partnership with the USDA, the Community Food Security Coalition is a national organization that supports the formation of community food projects aimed to support social justice (Community Food Security Coalition, n.d.).

Summary of Community Food Systems

As a rule of thumb, community food systems ultimately aim to attain food security (for individuals as well as the entire community), relational proximity, self-reliance, and sustainability (Wilkins & Eames-Sheavly, 2009). On top of this quadripartite focus, there is great emphasis placed on the potential of community food systems to change the current food environment and provide personal and societal benefits, including positive health outcomes

(Story et al., 2009). Even so, Americans are relatively indifferent about the intricacies of the food system (Auburn, Andrew Brown, & Grady, 2005). Reasons for this include that food availability is high, participation in food production is low, and consumers feel they have little power over modernization of food. In fact, consumers are most likely to only think about food for individual pleasure and aesthetics, a source of comfort, culture, a daily chore, for nutrients, and a cost, none of which singly requires persons to think about the big picture of the integrated food system. Now is the time to design interventions that concurrently focus on educating citizens about the potential for community food systems to change the food environment, including adding evidence which justifies apparent dietary health advantages in different populations. The following proposal discusses three research projects focused on providing support for community food systems with partnerships formed with two organizations—first a federally-funded low-income pre-school program, Head Start, and second, a non-profit, Heifer International.

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CHAPTER 3

Fresh Produce, Fresh Start: Dietary Impacts of a Fruit and Vegetable Delivery Program on Head Start Families

Introduction

Overweight and obesity have reached alarming rates in both children (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010) and adults (Flegal, Carroll, Ogden, & Curtin, 2010), largely due to poor dietary quality. In order to improve public health outcomes, scholars, policy makers, and concerned citizens from the public and private sectors are engaged in an economic, social, and ecological restructuring of the food environment (Story, Hamm, & Wallinga, 2009). One potential strategy for improving the food environment is to foster vibrant community-based food systems, which promote individual and community food security, relational proximity, self-reliance, and sustainability (Wilkins & Eames-Sheavly, 2009). A growing number of individuals are participating in community food systems as evidenced by an increase in outlets like farmers markets and community supported agriculture (CSA) (Local Harvest, 2008; USDA Agriculture Marketing Service, 2010). For example there were 50 CSA farms documented in 1990 to 1,980 in 2008. Moreover, there were 1,755 farmers markets documented in 1994 and 6,132 in 2010.

Still, disparities exist within the current food system and, as a result, some individuals in America do not have access to healthy foods within their own community (Ball, Timperio, & Crawford, 2009; Larson, Story, & Nelson, 2009). For example, increases in socioeconomic status are associated with increases in fruit and vegetable intake, across neighborhoods (Dubowitz et al., 2008). In part, this may be due to decreased access, availability, and affordability of healthy foods of any kind (Baker, Schootman, Barnidge, & Kelly, 2006; Lovasi, Hutson, Guerra, & Neckerman, 2009).

Beyond access to healthy foods, there is also evidence that limited resource individuals are less likely to participate in community-based food system efforts. For example, several studies link farmers market patronage (e.g. purchasing local food) with higher educational attainment and income levels than the average population (Elepua, Mazzocco, & Goldsmith, 2010; Onianwa, Wheelock, & Mojica, 2005; Varner & Otto, 2008). Moreover, these studies stress the unique barriers (e.g. price sensitivity and transportation issues) for consumers to support farmers markets in such impoverished areas. Farmers markets need to provide culturally relevant foods, highlight basic products, hire staff from the local neighborhood, and may need

initial subsidization (Fisher, 1999; Suarez-Balcazar, Martinez, Cox, & Jayraj, 2006; United States Department of Agriculture, 2002). Limited resource individuals also display low participation in community-supported agriculture, as memberships are perceived as too costly. (CSAs are weekly pre-paid shares of produce delivered directly from a producer to a consumer.) Example strategies to increase participation include subsidizing shares or offering work and bartering in exchange for CSA membership (Forbes & Harmon, 2008).

Compounded with reduced access to healthy foods and participation in community food systems, limited resource individuals are less likely to be food secure and, in many cases, have higher risk of overweight, obesity and/or have lower or diminished health status (Seligman, Laraia, & Kushel, 2010; Wilde & Peterman, 2006). In the United States, overweight and obesity exhibit an inverse relationship with decreased socioeconomic status (Baum & Ruhm, 2009; Shrewsbury & Wardle, 2008). Even though poverty and food insecurity do not always co-exist, food insecure individuals are five times more likely to fall at or below 185 percent of the poverty line (Nord, Andrews, & Carlson, 2007).

One strategy for addressing the aforementioned factors and barriers related to limited resource populations is to increase access to *local* fruit and vegetables in limited resource communities (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). This research implemented a free and local fruit and vegetable delivery program at limited resource preschools. A local fruit and vegetable delivery program is appropriate for a limited resource preschool audience for several reasons. First, time, cost, access and conveniences are all major barriers to purchasing and consuming healthy foods (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998), particularly given the multiple stressors of a limited resource parent with young children (Gershoff, Aber, Raver, & Lennon, 2007; Hsueh & Yoshikawa, 2007; Wiig Dammann & Smith, 2009). In addition, nurturing healthy eating habits and food preferences within young children is also noteworthy, as lifetime habits are formed at this developmental stage (Birch, 1999, 1999; Savage, Fisher, & Birch, 2007). As food gatekeepers and role models of nutrition, the involvement of parents in nutrition education is essential in a preschool program (Patrick & Nicklas, 2005). Lastly, most 'farm' projects focus on grade school environments (Bagdonis, Hinrichs, & Schafft, 2009), with little known about the impacts of farm-to-preschool projects. Such a farm project may benefit small farmers and limited resource populations alike, thereby strengthening community food systems by supporting individual and community food security,

relational proximity, self-reliance, and sustainability. The primary purpose of the *Fresh Produce, Fresh Start* study is to examine the feasibility and effectiveness of a free fruit and vegetable delivery program in increasing fruit and vegetable intake in Head Start families. Specific effectiveness outcomes of the program include changes in: (1) fruit and vegetable intake; (2) self-efficacy about fruit and vegetable consumption; (3) dietary quality; and (4) weight. The specific feasibility outcome is to design a generalizable fruit and vegetable delivery program for Head Start.

Methods

Setting

Fresh Produce, Fresh Start was a free fruit and vegetable delivery program implemented in two Head Start preschools. Head Start is a federally-funded matching grant pre-school program that was created in 1995 to increase school readiness in low-income (100% below federal poverty line) children (ages 3 to 5) and their families (National Head Start Association, 2010). To qualify for Head Start, families must meet income guidelines established (revised annually) by the Department of Health and Human Service (United States Department of Health and Human Services, 2009). Although the explicit goal of Head Start is to prepare disadvantaged children for school, it also aims to “enhance the social and cognitive development of children through the provision of educational, health, nutritional, social and other services to enrolled children and families” (National Head Start Association, 2010).

The intervention took place at two Head Start sites in Montgomery County, Virginia, during Fall 2009 and Fall 2010. Montgomery County is located in the New River Valley (NRV) of the Appalachian and is largely rural, with approximately 84,000 residents (US Census Bureau, 2000). During the 2000 US Census, the racial and ethnic makeup of Montgomery County was largely white (90%) and Non-Hispanic/Latino (98%). The per capita income was \$17,077, lower than the national average.

Partners

As each community has its own unique characteristics from income levels to cultural practices and beliefs, it is important that community-based programs involve the community partner at all stages throughout the program, beginning with the planning and identification of needs (Stith et al., 2006). The research team, local CSA owners/farmers (Good Food Good People), and Head Start preschools worked together to formulate the concept of the Fresh

Produce, Fresh Start. The consideration of the needs of all partners helps to ensure appropriate adoption and delivery of the program, as well as creating possibilities for post-intervention maintenance and sustainability (Bogart & Uyeda, 2009; Green, Lewis, & Bediako, 2005).

Research Design

Fresh Produce, Fresh Start used a mixed methods approach, whereby qualitative process evaluation interviews and questionnaires assessed feasibility and quantitative measurements assessed effectiveness. For the quantitative component, a one-group double pre-test post-test design using a double pre-test implemented twice to two different groups was utilized. (See Figure 1 for overview of measurement procedures.) Two cohorts were conducted identically at two separate times. Development of the intervention was based upon known factors about limited resource populations and their position in the food environment (i.e. decreased access, availability, and affordability of healthy foods). The intervention itself used a socio-ecological approach (Stokols, 1996), targeting individual, interpersonal, organizational, and societal factors:

- *Individual*: socio-demographic information reported through study questionnaire; fruit and vegetable knowledge, attitudes, skills changes through increase in access from delivery program and recipes reported through dietary recalls, study questionnaire, and process evaluation.
- *Interpersonal*: home availability of fruits and vegetables changes through delivery program reported through study questionnaire, fruit and vegetable checklists, and process evaluation; household food security changes through delivery program reported through USDA ERS food security questionnaire.
- *Organizational*: Head Start preschool and Good Food Good People support reported through process evaluation and time and cost effectiveness.
- *Societal*: access to fruits and vegetables and local community food system reported through study questionnaire and process evaluation.

The fruit and vegetable delivery program was targeted toward Head Start families. The intervention components studied effects of one Head Start parent or head of household, as the primary caregiver and gatekeeper of the preschooler's and home's food and nutrition. Given established knowledge about limited resource individuals varying cooking skills (Morton & Guthrie, 1997) and ability to afford foods (Drewnowski & Eichelsdoerfer, 2009), recipes were included in the produce bag that were easy to cook, requiring less than 30 minutes preparation time (many times involving the microwave), costing less than five dollars in ingredients, and needing less than five ingredients (besides salt and pepper).

Figure 1. Overview of Measurement Procedures for Fresh Produce, Fresh Start

Week(s)	0	1-4	5	5-8	9-12	13-16	16
	-Height & weight -24-hour food recall -Food security -Study questionnaire -Decline questionnaire	-Baseline measures at week 1	-Height & weight -24-hour food recall	-Produce delivery -Weekly checklist	-Produce delivery -Weekly checklist	-Intervention completion at week 16	-Height & weight -24-hour food recall -Study questionnaire

The researchers hypothesized that the free fruit and vegetable delivery program would increase home availability of local fruits and vegetables, knowledge about benefits of fruits and vegetables and the local community food system, decrease perceived barriers and benefits for fruit and vegetable consumption, and change food preparation skills. In turn, these mediators would encourage individual and interpersonal (within families) level behavior change through increased fruit and vegetable intake and participation in a community-based food system. An overarching goal was to create organizational support for generalizable farm-to-school-to-home fruit and vegetable delivery program that would increase local fruit and vegetable access for Head Start families within their food environment. Approval was obtained from Virginia Tech’s Institutional Review Board (IRB) for all components of the study with the informed consent of participants.

Participants

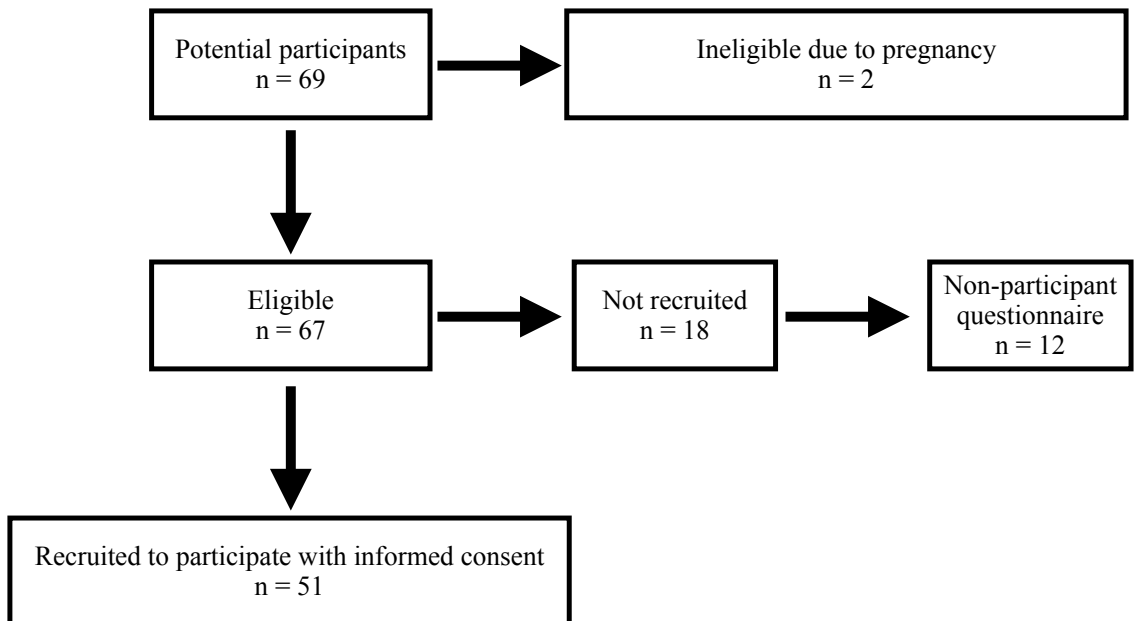
According to the most recent Head Start annual report (2009-2010), Head Start of the New River Valley served 411 children and their families (New River Valley Community Action, 2009). Of those families, two Head Start sites in Montgomery County served 112 total children during the regular school year and summer months. Head Start of the NRV served 73% white, 11% bi- or multi- racial, 10% black/African American, 4% unspecified, 2% Asian, and .002% American Indian or Alaska Native during the 2008-2009 school year. Five children were of Hispanic/Latino origin. Demographic information for the 2009-2010 school year was not available.

Recruitment

Participants were recruited from Christiansburg Head Start (Fall 2009) and Blacksburg Head Start (Fall 2010). Christiansburg and Blacksburg Head Start each enroll 38 children into their program during the fall for the school year. All parents with a child aged 3 to 5 who attended the Christiansburg Head Start in Fall 2009 or Blacksburg Head Start in Fall 2010 were eligible to participate. Exclusion criteria included: being pregnant; having a chronic disease; or previous participation in the program during the previous season (Christiansburg).

Parents received flyers from Head Start teachers detailing the free and local fruit and vegetable delivery program during their first required home visit. At orientation, which is required and occurred the week before preschool began, one Head Start parent in each household was invited to enroll in the program by signing an informed consent form and completing pre-questionnaire instruments (see Figure 2). Parents were informed of pre, baseline, delivery, and one-month post program measurements. In order to detect participant and non-participant differences, those parents who declined were asked to complete a questionnaire similar to the participant questionnaire.

Figure 2. Flowchart of Fresh Produce, Fresh Start Participants



Intervention

Overview.

Good Food Good People (local produce farmers, vendors, and CSA operators), partnered with Head Start and the research team to offer wholesale prices (paid for by the research team's funding) for all fruits and vegetables and direct produce delivery to Head Start. The research team and students recruited participants for the project and bagged food. Bus drivers agreed to assist with the loading and unloading of produce bags. To remind parents that they were receiving *local* food, the area farmers market logo and the Good Food Good People logo was placed on the outside of the bag. Reminding parents of the produce's origin served as a method to increase parent's knowledge about the availability and location of community-based food system foods. The bags were bussed home, where children would present produce to caregiver. Recipes were included and created by nutrition students and Good Food Good People. Each produce bag included a worksheet entitled 'In This Bag' detailing what fruit and vegetables were in the bag, and the amount needed to consume a single serving.

Procedures.

Two pre-tests were administered four weeks previous to the intervention and at baseline to strengthen internal validity. A post-questionnaire (one-month post produce delivery period) was included to determine the study's effectiveness and feasibility for adoption of the program at other Head Start site or other limited resource pre-schools. (See Table 1 for comprehensive research design, which was replicated during both deliveries. The receipt collection referred to in Table 1 is reported elsewhere.)

To reduce attrition and increase retention, participants provided contact information for the research staff to send reminders and words of encouragement in the form of cards, emails, and telephone calls. At the end of each delivery week, the parent completed a short checklist detailing individual produce consumption and sent food receipts to the pre-school. In addition, a qualitative evaluation through interviews or written questions with the Head Start director, fruit and vegetable vendors, and Head Start teachers helped to gather information regarding project operations (i.e. challenges, benefits, etc.).

Sample	Study design	Intervention	Targeted Outcomes	Measures
<p>Participants -51 Head Start parents/guardians</p> <p>Inclusion criteria -Parent or guardian of child that is 3-5 and attends Head Start Christiansburg or Blacksburg</p> <p>Exclusion criteria -Pregnant, chronic disease, previous participation in study (cohort 2)</p> <p>Declined questionnaire Those parents who declined (n=12) were asked to complete a short questionnaire</p>	<p>One group pre-test post-test design using a double pre-test: Double pre-test administered at 4 weeks pre-intervention and at baseline assessing fruit and vegetable intake though 24-hour food recall, food security assessment, BMI, food receipts*, and short questionnaire about dietary habits and quality</p> <p>Assessments of primary outcomes Intervention period (8 weeks) compared to pre- (4 weeks prior), baseline, and post- (4 weeks post) data</p> <p>Post-tests 24 hour recall, BMI report, food security questionnaire, FPFS questionnaire, receipt collection*, and program evaluation</p>	<p>Intervention period: 16 weeks</p> <p>1. Initiation of study: participant introduction to delivery program, description of study process, informed consent, and pre measurements.</p> <p>2. Parent collects receipts* for 4 weeks to assess baseline diet.</p> <p>3. Fruit and vegetable delivery from week 5-12, for 8 weeks. Receipts * and weekly consumption checklists are collected. Bags include simple recipes.</p> <p>4. Receipts* are collected for post information from weeks 13-16. Post measurements are collected.</p> <p>5. Program evaluation throughout and following the intervention to assess study</p>	<p>Primary outcomes:</p> <p>1. Increase fruit and vegetable intake; 2. Improve self-efficacy about fruits and vegetables; 3. Increase dietary quality; and 4. Weight loss</p> <p>Secondary outcome:</p> <p>5. Design a generalizable fruit and vegetable delivery program at Head Start—discovered through a mixed model evaluation of process evaluation and survey measurements.</p>	<p>1. Fruit & vegetable intake: -24-hour recalls, weekly checklist, targeted questionnaire questions, receipts*</p> <p>2. Self-efficacy: -Targeted questionnaire questions</p> <p>3. Dietary quality: -Questionnaire, 24-hour recall, Receipts*</p> <p>4. Decreased weight: -BMI measurements</p> <p>5. Change in purchasing patterns -Receipts*</p> <p>6. Decrease amount of money spent on food. -Receipts*</p>

*Food receipt data reported elsewhere

Measures

Design of measurement was particularly challenging given the high-risk, transient, and difficult to contact nature of this population. There are few entirely appropriate evaluation instruments that are appropriate for low-income and limited resource individuals (Contento, Randell, & Basch, 2002). As education and literacy levels may be low, it is important to use quick, straightforward, easily accessible, change sensitive, and audience-diverse tools (McClelland et al., 2001). Adaptations to observation instruments that minimize participant burden will be noted with measurement description. Measurements collected were as follows: questionnaire, height and weight (to compute Body Mass Index), food security questionnaire, 24-hour recall, process evaluations, and food receipts. All measurement results except for food

receipts will be reported in this manuscript. The free fruits and vegetables administered to the families were considered compensation for study measurements.

Fresh Produce, Fresh Start Study Questionnaire

The researchers developed pre- and post- questionnaires as no other instruments had been developed and/or tested to examine research questions related to free fruit and vegetable delivery programs. Questionnaires were adapted from Rose et al. 100-mile diet study (2008) and Virginia Cooperative Extension's Suppers Made Simple curriculum (Virginia Cooperative Extension, 2007). The pre questionnaire included 27 items that collected information about: demographics (i.e. race, income, household size, etc); personal food practice questions (i.e. grocery shopping patterns, food preparation self-efficacy and patterns) perceived barriers and benefits of fruit and vegetable consumption; and participation in a community food system (i.e. frequency of shopping at the farmers market). Grocery shopping patterns will be reported in the following manuscript as it relates closely to questions regarding food receipts. Demographic information was collected. The post questionnaire asked 22 questions total questions, with 11 of the same questions from the pre questionnaire and 11 new questions which evaluated the fruit and vegetable delivery program (i.e. interest in being involved in the future, proposed models for program sustainability).

The main components of this questionnaire addressed potential barriers to and benefits associated with fruit and vegetable consumption. The questions addressing barriers and benefits were structured to reflect the socio-ecological model. As noted previously, the socio-ecological model is a framework that has been used to explain the interplay among individual, interpersonal, organizational, and societal factors, and the impact these factors have on the impact and efficacy of nutrition education (Stokols, 1992). Questions regarding barriers and benefits to fruit and vegetable consumption at the individual-level, community-level, and societal-level were both open- and closed-ended. It is important to note that with the exception of four questions on both questionnaires—about personal attitudes towards fruits and vegetables and process evaluations—all were closed-ended. The entire questionnaire was tested for content validity with health educators and revised accordingly. The questionnaire took approximately 10 minutes to complete.

Reach

Aligning with the RE-AIM framework, researchers calculated the reach of Fresh Produce, Fresh Start (Glasgow, Vogt, & Boles, 1999). Reach examines the number of participants, the participation rate of potentially eligible individuals, and the representativeness of the study sample to the general target population.

Weight Status

Height (in inches) was measured at Head Start orientation (along with informed consent and other pre-test materials) without shoes using a transportable stadiometer. Weight (in pounds) was calculated at pre-test using a digital scale. At baseline and post, collection of weight data occurred in the form of self-report as participants reported personal transportation, work schedules, and child care as major limitations to attending scheduled weigh-ins. All individuals pre-height and weight measurement were compared to self reported numbers for significant differences. Changes in height and body mass were calculated using BMI formula.

Food Security Assessment

To assess participant's food security and hunger status, the ERS/USDS 10-item U.S. Food Security Module was administered at pre- and post- (United States Department of Agriculture, 2006). Numerous validity and reliability studies have successfully utilized this food security questionnaire in measuring household food security (Bhattacharya, Currie, & Haider, 2004; Stuff et al., 2004). In particular, one study validates the questionnaire's use in rural households (Frongillo Jr, Rauschenbach, Olson, Kendall, & Colmenares, 1997). To minimize respondent burden, the 10-item questionnaire was administered instead of the 18-item questionnaire.

Food security status was categorized to ERS/USDA labels (United States Department of Agriculture, 2006). That is, high food security (raw score = 0) denotes a family had no issues obtaining food in the past year, with no adverse or negative responses. Marginal food security (raw score = 1-2) denotes a family that had problems and anxiety about obtaining food. Low food security (raw score = 3-5) denotes diminished quality and variety of food, but not quantity in the past year. Lastly, very low food security (raw score = 6-10) denotes diminished quality, variety, and quantity of foods for a family within the past 12 months.

Dietary Quality

Participants completed 24-hour recalls, which logs all of the food and beverages consumed in the previous 24-hours, using a detailed portion guideline. Researchers prompted

participants to include all foods including beverages and snacks (often under-reported). If questions arose regarding recall items, researchers contacted the participant to clarify information reported. Numerous validity, reliability, and behavior change studies have utilized 24-hour recalls (Carter, Sharbaugh, & Stapell, 1981; Thomson et al., 2003). Dietary recalls were used to assess changes in total calories (kcal/day), total fat (percentage of total kcal), saturated fat (percentage of total kcal), sugar, fiber, and fruit and vegetable intake as a result of the fruit and vegetable delivery program.

Fruit and Vegetable Report

A weekly fruit and vegetable report was created based upon produce included in bags. The report was sent home inside produce bags for completion and return by the next delivery. A detailed list of fruits and vegetables varieties and number of servings were included with the report on a pamphlet titled 'In This Bag.' Participants were asked to match number of servings on 'In This Bag' with number of checks on the fruit and vegetable report. Instructions were included with the report. The checklist assessed the type and quantity of produce eaten during the intervention by the participant or others and if the produce was thrown away or not eaten. This allowed researchers to discover participant likes and dislikes of vegetables to tailor participant needs each week.

Time and Cost Effectiveness

Time and cost are both important factors to report for interventions that aim to be adopted and implemented into other settings (Klesges, Estabrooks, Dzewaltowski, Bull, & Glasgow, 2005). Time for all stakeholders to partake in the program was tallied each week by researchers. Information to calculate the cost of cohort one, two, the entire program, the program per person, and the program per effect (fruit and vegetable serving) was collected by researchers throughout the study period. Only direct costs of Fresh Produce, Fresh Start were computed, as indirect costs (such as transportation and utility costs (of Head Start and at Virginia Tech)), were built into ongoing and existing infrastructures and systems. The direct costs (i.e. supplies specific to the program) would be additional costs incurred by organizations interested in pursuing this type of intervention.

Program Evaluation

Written questionnaires and one-on-one interviews were conducted with all stakeholders (i.e. participants, teachers, bus drivers, students, administration, and farmers) at the completion

of the study to better understand the strengths and weaknesses of the program (Creswell, 2009). A focus group was designed for participants during each study period. In both cases, no participants were available to attend because of lack of personal transportation, work schedules, and child care. Instead, questionnaires gathered qualitative data to enhance the external validity of the program, making it translatable other locations. Questions in the written questionnaires and one-on-one interviews were open-ended and examined strengths and weaknesses and likes and dislikes of the program.

Completion Rate

Because consistent data collection was challenging, the number of measurements completed per participant were split into quartiles and analyzed. A qualitative analysis was one way to assess demographic and outcome differences between those who completed observations across measurements and those who did not complete all observations across measurements.

Analysis

Information from the 24-hour recall was entered into the Nutritionist Pro Diet Analysis Module (First Data Bank, 2006). This software contains up-to-date food and nutrient data for over 35,000 foods and ingredients, including brand name, fast foods, ethnic foods, and enteral products. For each individual, a nutrition summary was generated that includes information on all macro- and micro- nutrients. The diets were also compared to MyPyramid guidelines for fruit and vegetable servings (United States Department of Agriculture, 2011). Paired sample t-tests were used to test the effect of the intervention on dietary intake for total calories (kcal/day), total fat (percentage of total kcal), saturated fat (percentage of total kcal), sugar, fiber, and fruit and vegetable intake. All dietary data were maintained in analyses regardless of completeness of data, given the food security status of this population. For example, two participants reported that they did not consume any food within the last 24 hours; still, the participant's data were included, as not to make assumptions about consumption within the past day.

All other data, which were normally distributed, were entered into Microsoft Excel (Microsoft Corporation, 2008), and then converted into SPSS statistical software, version 18.0 (SPSS Inc., 2009). Paired t-tests were used to assess changes in questionnaire responses, food security status, and height and weight status ($p < .05$). In order to calculate BMI, height and weight data were converted to the metric scale and weight (kg) was divided by height (m^2).

Since participants consistently did not complete all measurements, two forms of analyses will be reported on for each protocol: 1) baseline measurement descriptive statistics for entire population ($N = 51$); and 2) completed pre- and post- data across measurements. Kruskal Wallis Tests for interval and ordinal and Fisher's Exact Test for categorical data were conducted to detect differences in socio-demographic and selected health behavior data between non-participants and participants and between Blacksburg and Christiansburg participants ($p < .05$). Depending upon sample size, normality, and number of variables, Pearson Chi-Square tests of independence (X^2) and Fisher's Exact Tests for categorical data and independent t-tests, Kruskal Wallis Tests or unpaired t-test for interval or ordinal data were used to analyze differences between those who completed observations across measurements and those who did not complete all observations across measurements based upon the following distinct levels distinguished by quartiles: $\geq 15\%$ and $< 30\%$; $\geq 30\%$ and $< 60\%$; $\geq 60\%$ and $< 90\%$; $\geq 90\%$ and $\leq 100\%$. As only three participants returned some baseline data, all measurements were evaluated from pre to post. There were no significant ($p < .05$) differences between those participants ($n = 3$) that returned incomplete baseline data and participants ($n = 48$) who returned no baseline data, based upon non-parametric analysis.

Cost effectiveness was calculated for the monetary cost of cohort one, two, the entire program, the program per person, and the program per effect (increase in fruit and vegetable servings). Basically, a cost effectiveness analysis (CEA) calculates the cost of achieving some measureable effect (Klesges et al., 2005; Serrano et al., 2011). The key formula in a CEA is called the (incremental) cost effectiveness ratio (CER). The CER is simply

$$CER(p) = \frac{C(p)}{E(p)}$$

where p denotes the program, C(p) is the cost of the program, and E(p) is the effect (impacts) of the program.

Program evaluations were assessed using Patton's inductive grounded theory approach (Patton, 2002). Qualitative data was categorized using codes where themes emerged. Codes were organized into similar categories and condensed into overarching themes. A second researcher evaluated and verified all program evaluation data.

Results

Participants

See Table 2 for specific participant demographics. Overall, 31 adults in Christiansburg and 36 adults in Blacksburg were eligible to participate in Fresh Produce, Fresh Start. All participants provided informed consent. In Christiansburg, 21 adults completed all pre-questionnaire protocol. In Blacksburg, 30 completed all pre-questionnaire protocol. In total, 76% ($n = 51$) of eligible participants ($N = 67$) enrolled in Fresh Produce, Fresh Start. Three participants did not complete data beyond the pre-questionnaire consenting protocol (see completion rate section). One participant left the Head Start program, whereas the two other participants did not complete protocol, but were still enrolled in Head Start. For the total participant pool, race was reported as 54.9% white, 27.5% black or African American, and 17.6% Asian. In total, 100% were Non-Hispanic/Latino. Age ranged from 20 years old to 62 years old ($M = 32.5$, $SD = 8.6$); 90% were female; and 47% were single. Income levels varied with 33.3% earning less than \$10,000 per year, 52.9% earning \$10,000 to \$24,999, 7.8% earning \$25,000 to \$49,999, and 5.9% earning other. A high percentage of participants smoked, with 40.4% reporting smoking. Household sizes ranged from 2 to 11 individuals ($M = 4.2$, $SD = 1.8$). The number of children in a household ranged from 1 to 9 ($M = 2.4$, $SD = 1.8$). Participants owned an average of 1.5 cars ($SD = .2$). In all, 22 participants (43%) were enrolled in either the Supplemental Nutrition Assistance Program (SNAP) ($n = 12$) or Special Supplemental Nutrition Program for Women, Infants and Children (WIC) ($n = 10$).

There were significant ($p < .05$) differences between Blacksburg and Christiansburg participants based upon race, smoking, education, meal preparation responsibility, typical meals, food security, and total food assistance between Blacksburg and Christiansburg. Significant ($p < .05$) differences were found for participants in Christiansburg, who were more likely to be white, smoke, have a high school degree or lower, have greater responsibility for meal preparation, consume a mixture of fresh and ready made products, have very low to low food security status, and participate in some kind of food assistance ($p < .05$). Blacksburg participants were more likely to be racially diverse, with 36.7% ($n = 11$) white, 33.3% ($n = 10$) Black or African American, and 30% ($n = 9$) Asian ($p < .05$). In addition, participants in Blacksburg were more likely to have some college education or higher and prepare food made with fresh ingredients (p

< .05). Lastly, there were no significant ($p < .05$) differences based upon completion rate of study instruments.

Reach

See Table 2 for description of total study participants and decliners. There were significant ($p < .05$) differences between age, race, number of children attending Head Start, and participation in SNAP. Specifically, those who chose to participate were significantly more likely to be racially diverse (54.9% white, 7.5% black or African American, and 17.6% Asian) and older ($M = 32.5$ $SD = 8.6$) than those who did not provide informed consent (83.3% white, 0% Asian, and 16.7% black or African American; $M = 27.1$ $SD = 4.3$). When compared with those who participated ($M = 1.1$, $SD = .4$), those who did not participate ($M = 1.4$, $SD = .5$) were significantly ($p < .05$) more likely to have more than one child attending Head Start. Overall, those who declined had lower ($p < .05$) perceived health status (50% decliners perceived their health as fair; 66.7% participants perceived their health as fair) and were slightly younger in age ($M_{decline} = 27.1$, $SD_{decline} = .5$; $M_{participants} = 32.5$, $SD_{participants} = 8.6$). Over decliners were more likely to be enrolled in SNAP ($n = 11$; 91.7%) than participants

From 32 eligible participants eligible at the Christiansburg Head Start site and 37 eligible participants at the Blacksburg site, two (one at each site) participants were excluded from the study due to pregnancy status. Of eligible participants ($N = 67$), 76% provided informed consent from both Christiansburg ($n = 21$) and Blacksburg ($n = 30$). Out of 18 eligible participants who did not agree to participate, 12 (66.7%) completed the non-participant questionnaire in Christiansburg ($n = 11$) and Blacksburg ($n = 1$).

Fresh Produce, Fresh Start Questionnaire

In total, 88.5% ($n = 46$) of participants had primary household responsibility for meal preparation. Homemade meals were typically a mixture of fresh and ready-made products ($n = 23$), made with fresh ingredients ($n = 20$), and ready-made products ($n = 8$). Only five participants shopped at the local farmers market once in the previous month. Reasons for not attending the farmers market were that participants were unaware that there was a market, unsure of the location, uncertain about acceptable payment methods, and/or lacked time or transportation. Participants perceived the top benefits to enrolling in the study as: eating better (82%); feeling better (47%); saving money (51%); and being a role model (41%). Participants ate an average of 1.73 ($SD = 1.42$) meals away from home and 16.27 ($SD = 4.85$) meals at home.

Variable of Interest	Descriptor	Participants (n = 51)	Decliners (n = 12)
Age (μ in years)		32.5 \pm 8.6 ¹	27.1 \pm 4.3 ¹
Race/ethnicity (%)	White	54.9 ¹	83.3 ¹
	Asian	17.6 ¹	0 ¹
	Black or African American	27.5 ¹	16.7 ¹
	Non-Hispanic/Latino	100.0	100.0
Marital status (%)	Single	47	50.0
	Married	53	50.0
Household size (μ)		4.2 \pm 1.8	5.1 \pm 1.8
Total number of children (μ)		2.4 \pm 1.8 ¹	3.6 \pm 2.0 ¹
Number children enrolled in Head Start (μ)		1.1 \pm .4 ¹	1.4 \pm .5 ¹
Smoking habits (%)	Yes	41.2	75.0
Education (%)	Some high school	15.7	0
	High school graduate/GED	29.4	66.7
	Some college	25.5	25.0
	College degree (BS/BA)	15.9	8.3
	Graduate degree (MS, PhD)	13.7	0
Income level (%)	Less than \$10,000	33.3	16.7
	\$10,000 to \$24,999	52.9	50.0
	\$25,000 to \$49,999	7.8	25.0
	Other	5.9	8.3
WIC enrollment (%)	Enrolled	19.6	25.0
SNAP enrollment (%)	Enrolled	23.5 ¹	91.7 ¹
Farmers market attendance (%)	No	90.2	83.3
Perceived benefits of FV (μ)	1 very low, 10 very aware	8.1 \pm 2.0	8.3 \pm 1.9
Perceived confidence in eating 5c. FV/day	1 not confident, 10 very confident	7.1 \pm 2.4	7.0 \pm 2.4
Food preparation skills (%)	Not at all confident	2.0	8.3
	Not very confident	3.9	8.3
	Somewhat confident	43.1	33.3
	Very confident	51.0	50.0
Food security (%)	Very low	37.3	25.0
	Low	19.6	50.0
	Marginal	19.6	16.7
	High	23.5	8.3
Number of cars (μ)		1.5 \pm .2	1.5 \pm .5
Meal preparation responsibility (%)	Not responsible	9.8	16.7
	Responsible	90.2	83.3
Typical meals (%)	Made with fresh ingredients	39.2	8.3
	Ready-made products	15.7	0
	A mix of fresh and ready	45.1	91.7
Perceived health status (%)	Excellent	15.7 ¹	0 ¹
	Good	66.7 ¹	41.7 ¹
	Fair	17.6 ¹	50.0 ¹
	Poor	0 ¹	8.3 ¹

*Superscripts denote significant ($p < .05$) difference based upon Kruskal-Wallis test for interval or ordinal data and Fisher's Exact test for categorical data.

On a scale of 1 (low) to 10 (high), perceived benefits of fruit and vegetable consumption were high ($M = 7.86$; $SD = 1.98$) and perceived confidence in eating five or more servings of

fruits and vegetables per day was also high ($M = 7.10$; $SD = 2.41$). A majority of participants (64.7%) perceived their health as good, from a scale of poor, fair, good, excellent.

Based upon participants who completed both pre and post ($n = 24$) questionnaires, there were significant ($p < .05$) changes found in food purchased away home weekly ($M_{pre} = 1.33$, $SD = .963$; $M_{post} = .75$, $SD = 1.03$) and in food consumed at home weekly ($M_{pre} = 17.17$, $SD = 4.30$; $M_{post} = 18.63$, $SD = 3.98$). In addition, participant awareness (on a scale of 1 (low) to 10 (high)), of the benefits of eating fruits and vegetables significantly ($p < .05$) increased ($M_{pre} = 8.08$, $SD = 1.64$; $M_{post} = 9.21$, $SD = 1.14$). Changes ($p < .05$) in food preparation and cooking skills on a scale of 1 (not at all confident) to 4 (very confident) were also found ($M_{pre} = 3.33$, $SD = .565$; $M_{post} = 3.83$, $SD = .381$). No significant ($p < .05$) changes were found in perceived health status or confidence in eating five or more servings of fruits and vegetables per day.

Weight Status

At pre, body mass index (BMI) classifications were as follows: 3.9% ($n = 2$) underweight; 31.4% ($n = 16$) normal; 21.6% ($n = 11$) overweight; 25.5% ($n = 13$) obese I; 11.8% ($n = 6$) obese II; and 5.9% ($n = 3$) obese III. Overall, 43.1% ($n = 22$) of participants were obese, 64.7% ($n = 33$) were overweight or obese, and mean BMI for the entire group was classified as overweight at 29.3. Although mean weight decreased ($M_{pre} = 28.33$, $SD = 8.35$; $M_{post} = 28.18$, $SD = 8.28$) based upon participants who completed both pre and post ($n = 29$), there were no significant ($p < .05$) changes found in BMI status.

Food Security Status

Before the intervention, almost half (46.3%) were considered to have low to very low food security status: 37.3% ($n = 19$) very low; 19.6% ($n = 10$) low; 19.6% ($n = 10$) marginal; 23.5% ($n = 12$) high. Based upon those who completed pre and post ($n = 25$), participant's food security status changed slightly. At pre, 60% of matched participants were considered to have low to very low food security status: 40% ($n = 10$) very low; 20% ($n = 5$) low; 20% ($n = 5$) marginal; and 20% ($n = 5$) high. At post, matched participants reported 36% ($n = 9$) very low; 32% ($n = 9$) low; 8% ($n = 2$) marginal; and 24% ($n = 6$) high. Although levels did change slightly, no significant ($p < .05$) differences were found pre to post.

Dietary Quality

Table 3 displays mean nutrient intakes based upon reports from 24-hour recalls. Overall, participants reported a low daily caloric (kcal/day) intake, with a range of 1487 kcal/day to 1620

kcal/day. Percent of mean caloric intake for micronutrients remained constant throughout observations and ranged as follows: mean protein intake ranged from approximately 18% to 20% of total caloric intake; mean carbohydrate intake remained at approximately 52% of total caloric intake; mean total fat intake ranged from approximately 30% to 33% of total caloric intake; mean total saturated fat intake ranged from approximately 9% to 12% of total caloric intake.

	Total Pre (n=51)	Matched Pre (n=29)	Matched Post (n=29)
Total calories (kcal)	1539.9 ± 607.6	1487.1 ± 627.8	1620.2 ± 566.9
Total fat (g)	54.8 ± 27.7	55.2 ± 27.6	54.0 ± 24.9
Saturated fat (g)	18.5 ± 11.5	19.2 ± 11.8	17.6 ± 8.6
Sugar (g)	84.7 ± 65.5	77.3 ± 53.3	83.1 ± 49.6
Fiber (g)	12.3 ± 7.1	12.3 ± 7.7	17.9 ± 8.0†
Fruit and vegetable servings**	2.1 ± 1.6	1.9 ± 1.5	4.4 ± 2.7†

*Based on paired and unpaired t-test

**Based upon MyPyramid recommendations for serving sizes

†Significantly different than pre values, based on paired t-test ($p < .05$)

Recommendations for fiber ($M_{pre} = 12.3$ g, $SD_{pre} = 7.1$ g; $M_{matchedpre} = 12.3$ mg, $SD_{matchedpre} = 7.7$ mg; $M_{matchedpost} = 17.9$ mg, $SD_{matchedpost} = 8.0$), fruit ($M_{pre} = .72$, $SD_{pre} = 1.1$; $M_{matchedpre} = .58$, $SD_{matchedpre} = 1.01$; $M_{matchedpost} = 1.4$, $SD_{matchedpost} = 1.4$), vegetable ($M_{pre} = 1.4$, $SD_{pre} = 1.3$; $M_{matchedpre} = 1.3$, $SD_{matchedpre} = 1.4$; $M_{matchedpost} = 3.0$, $SD_{matchedpost} = 2.5$), or fruit and vegetable servings combined ($M_{pre} = 2.1$, $SD_{pre} = 1.6$; $M_{matchedpre} = 1.9$, $SD_{matchedpre} = 1.5$; $M_{matchedpost} = 4.4$, $SD_{matchedpost} = 2.7$) according to MyPyramid were not met across observations. Between matched pre and post participants ($n = 29$), significant increases ($p < .05$) were found in intake of fiber and fruit and vegetable servings. In particular, compared to matched pre and post values, participants increased their fruit and vegetable servings by 2.5 ($SD = 1.2$) servings per day.

Fruit and Vegetable Checklist

The free delivery bag was intended to offer 21 servings of produce. On average, participants were given eight servings of fruit per week and thirteen servings of vegetables per week in their produce delivery bag, depending upon seasonality and cost. In total, 31 participants (61%) returned fruit and vegetable checklists at least one out of eight measurement times. Overall, the return rate was as follows: 39.2% ($n = 20$) returned none; 25.5% ($n = 13$) returned one; 3.9% ($n = 2$) returned two; 9.8% ($n = 5$) returned three; 2.0% ($n = 1$) returned five; 3.9% ($n = 2$) returned six; 9.8% ($n = 5$) returned seven; 5.9% ($n = 3$) returned all. The fruit and vegetable

checklist results showed that study participants consumed an average of 6.1 vegetable servings and 3.6 fruit servings from the produce bag per week. Study participants also shared the produce bag with others—reporting an average of 6.5 servings vegetables and 3.2 servings fruits consumed by ‘someone other than you’ per week. An average of .13 fruits and 1.88 vegetables were thrown away per week. Participants commented that produce was only discarded if it was too bruised or rotted too quickly, but did not report throwing away because of distaste. For example, one stated, “Some of the apples were bad, so we had to throw them away.” Another wrote, “We could not eat the carrots before they went bad.” And another commented, “We ate it all. We are going through a hard time and this is all we have to eat.”

Time Effectiveness

There were several different time costs noted by participants, Head Start employees, farmers, and researchers. Participants required time to learn new recipes, prepare fruits and vegetables, and complete study protocol. Head Start employee’s time was spent distributing produce bags onto school buses, transporting produce and children to their respective homes, and ensuring the collection of study protocol. Good Food Good People spent time receiving orders, packing wholesale produce, creating recipes, and adding a stop to their delivery route. Researchers developed, distributed, collected, and entered study protocol, purchased and maintained supplies, managed recipe creation, and packed produce bags. Outside of data collection and entry, the delivery program took approximately four hours per week for researchers, Good Food Good People, and Head Start staff to conduct. Weekly time to participate in the intervention varied from participant to participant, depending on cooking skills and recipes. Study protocol was estimated to take an average of 20 minutes per person per week to complete.

Cost Effectiveness

Fresh Produce, Fresh Start also required monetary support and was funded through two seed money grants. Direct costs were accrued from supplies to conduct the program, including produce bags, plastic bags to store fragile produce, office supplies, and weekly produce costs for each site. Leftover supplies from the Christiansburg site were used at the Blacksburg site. In total, 16 weeks of produce delivery cost \$3,716.64. For Christiansburg ($n = 21$), the entire program cost \$85.89 and \$0.51 per serving of fruit or vegetable. For Blacksburg ($n = 30$), the entire program cost \$63.77 and \$0.38 per serving of fruit or vegetable. The cost of the program

(\$3,716.64) was \$128.16 per effect (2.5 servings/day) per participants that completed pre and post dietary recall ($n = 29$).

Process Evaluation and Qualitative Feedback

Overall, 24 participants completed program evaluations. The most common responses for questions about enrolling in Fresh Produce, Fresh Start was to eat healthier meals and to save money on food. Several themes emerged about the overall program from the perspective of the participant, including being able to try ‘new’ foods, having fresh foods at home, saving money on groceries, and trying new recipes. For example, one participant stated:

“I know that my family needs to eat more vegetables. My family and I found that having a good recipe to follow we really enjoyed several vegetables that we never really enjoyed before. Due to the prices of fresh fruits and vegetables we can’t afford to buy as much as we should be eating. We didn’t know how good squash was until we tried the recipes. We will be including squash often at dinner now. I thank you for the fresh fruit and vegetables you gave to my family and I each week. Some weeks this was all we had. The program made me think about a healthier diet for myself and my family.”

This statement was confirmed several times by other participants. All participants commented that their child enjoyed bringing the produce delivery bags home for their family and therefore were highly motivated to be involved in consumption:

“My grandson was so excited each week about bringing fresh fruits and vegetables home to his family. We talked with him about each fruit and vegetable. He also enjoyed eating the fresh produce. He wanted to try each fruit and vegetable. He said he was helping to feed his family healthy foods.”

Others commented that they appreciated the local produce supplied and Fresh Produce, Fresh Start encourages them to shop at the farmers market, “I can get some fresh foods at farmers markets. Now I know the best is farmer’s markets.” Yet some did not understand the seasonality or place-based nature of local foods as evidenced by the following comment, “I got to try new things and recipes. I got to feed my family the most healthy things. My child loved it and always looked forward to getting more. It was all the same things though. No onions, peppers, celery, bananas, or oranges.” One unexpected outcome was that several individuals from other countries liked trying American produce:

“I want to join this again because I lost weight and feel healthier than before. I come from other country. I had no idea about cooking with American vegetables, so I had not purchased any unfamiliar vegetables. However, after this program, I try to purchase American vegetables such as swiss chard and kale and pumpkins. It makes me eat more vegetables. My son really likes this program because he likes apples.”

Participants also shared their thoughts about continuing the program. For example when asked what was least liked about the program several participants commented to this effect, “I like least that the program is over.” In terms of long-term continuation and expansion, another participant commented,

“I think this program is good for the family, it changed some food idea for my family. I think it must change the other family's food table. If more family can get that, this program can make the more benefit. This is good for all people. I think this can make new idea for the healthy foods.”

Only one participant commented that they would not join the program again due to the stress of preparing so much produce weekly. But, there were several ideas for sustaining the program. Some participants said that they would pay a very minimal fee (\$5 to \$10 per week), while others could not afford to pay at all. Those who could not pay offered to help pack produce bags weekly, contact other parents to get involved, create new recipes, or start a garden.

Good Food Good People expressed interest in the produce delivery program beyond monetary reasons. They commented that Fresh Produce, Fresh Start was important to “introduce Head Start parents and children to new foods, fresher and tastier versions of foods they already know, and provide nutrition information and recipes to encourage a healthier diet.” In several instances, Good Food Good People desired “more exposure to the staff or folks receiving the products” and more child and parent involvement in packing bags and direct nutrition education (like cooking classes). In terms of continuing the program, Good Food Good People’s delivery driver stated, “Great pilot program... would like to see it in the kindergartens, Head Starts, preschools and daycares in the area.” The owners had excitement and creative ideas when asked about expansion of the program:

“Yes, absolutely! More food to more good folks! ... There are lots of #2 quality products available free or at discount that could be used to can, freeze, or make large batches of prepared foods. Is there a kitchen facility and staff (parents and kids?) available to utilize

these items for the group? Could be a great learning experience in food preparation as well as providing low cost sustenance if someone was able to utilize these items for quickly as they become available. This could include Head Start families so they had a stake and involvement in helping to feed themselves.”

Head Start employees were similarly invested in Fresh Produce Fresh Start as exemplified by the following statement, “Children got a variety of fruits and vegetables. They were introduced to foods they may normally have never had” and “Gave parents access to foods they might not typically buy or have an awareness of. Gave recipes and preparation techniques to families.” Head Start employees had concerns about lack of participation in research protocol and indicated by stating that weaknesses were, “Getting parent involvement for the weighing times. Also parents were not prompt in sending in receipts. Not sure of the follow up with individuals as they are sometimes hard to get in contact with,” “Not making the parents get weighed. Several parents wanted to do the program but did not want to have their weight done,” and “To improve the program, if the research data is no longer needed—eliminate that data gathering component.” Suggestions for continuation and sustainability of the program included creating a mini farmers market for families, starting an on-site garden, involving parents and children in packing of produce, signing up families for volunteer hours at orientation, and holding a workshop that involves nutrition education.

The resultant grounded theory from Fresh Produce, Fresh Start reveals that the desire to try healthy and new foods and save money on foods influences study enrollment, the child’s role in produce delivery is a key factor in parent interest in the program, education is necessary for participant’s to comprehend the intricacies of community-based food systems (e.g. farmers market location and seasonality of foods), and the research component is a major barrier to participation in the program.

Completion Rate

All participants completed at least 15% of measurements, which were those given at pre. Those who completed only pre-study protocol ($n = 3$), did not complete any observations beyond the pre-questionnaire consent period. There were no significant ($p < .05$) differences found between completion rates ($\geq 15\%$ and $< 30\%$; $\geq 30\%$ and $< 60\%$; $\geq 60\%$ and $< 90\%$; $\geq 90\%$ and $\leq 100\%$) based on every variable of interest listed in Table 2 or study outcomes.

Discussion

Overall, Fresh Produce, Fresh Start proved to be a practicable model to increase local fresh fruit and vegetable consumption among Head Start families. There were several documented changes made to the participant's food environment on all levels of the socioecological model. Individual dietary quality increased through changes in knowledge, attitudes and skills regarding fruits and vegetables. On the interpersonal level, there was an increase in home availability of fruits and vegetables and family acceptance of those foods. Organizational support was provided by Head Start and Good Food Good People with interest in continuing and expanding the program. Lastly, changes in access to a community-based food system as a result of the delivery program were noted by participants.

In addition, there were several promising quantitative and qualitative outcomes. Notably, participants that completed both pre and post 24-hour recall measurements significantly increased their fruit and vegetable consumption by 2.5 servings. This is particularly significant given the results from Pomerleau, Lock, Knai, & McKee's (2005) review of 44 health behavior interventions, finding a range increase of 0.1 to 1.4 servings of fruits and vegetables per day. Consistent with increases in fruit and vegetable intake, fiber significantly increased in Fresh Produce, Fresh Start participants. Although BMI scores did not significantly decrease, an additional 2.5 servings of fruits and vegetables in a diet long-term may positively impact weight and/or chronic disease status (Hung et al., 2004; Ness & Powles, 1997; Serdula et al., 1996, 2004). It is documented that BMI is not a sensitive tool for adiposity, which is more directly associated with chronic disease (Pietrobelli et al., 1998). The fruit and vegetable checklists and process evaluation again confirmed the significant increase in fruit and vegetable consumption. Even with new foods introduced to the families, indicated by the process evaluation, very few families reported not eating the foods or wasting the food.

Participant interest in the farmers market pre- and post- study was consistent with research that characterizes farmers market shoppers (Byker, Rose, & Serrano, 2010; Rose et al., 2008; Webber & Dollahite, 2008; Webber, Sobal, & Dollahite, 2010). Participants were not likely to shop at the local farmers market pre program, mainly because of time, cost, and location. Post study, many participants commented that they were more likely to shop at the farmers market after this study due to the 'fresh' produce that they received, but time, cost, and location were still identified as limitations. This finding provides further support for the need to

design creative programs that overcome barriers to include limited resource individuals in a community-based food system.

In terms of reach, a high proportion (76%) of Head Start parents who provided informed consent to participate in the program, denoting the attractiveness of a free and local fruit and vegetable delivery program such as Fresh Produce, Fresh Start to a limited resource population. But, in terms of representativeness, those who declined to participate in this study were significantly more likely to be white, have more total children, have more children attending Head Start, participate in SNAP, and have a lower perceived health status. Possibly SNAP provided decliners enough food assistance, although their food security status was not significantly different from participants. This finding is supported by research indicating that even with enrollment in SNAP, food security status may not necessarily be improved (Nord & Golla, 2010). Another explanation may be found from decliners lower perceived health status, feasibly explained by the Theory of Reasoned Action's 'attitude toward behavior' construct, which would indicate weak beliefs about or ambivalence towards health may translate into decreased behaviors that improve health (i.e. consuming fruit and vegetable consumption) (Montano, Kasprzyk, Glanz, Rimer, & Viswanath, 2008). In any case, both participants (75.5%) and decliners (91.7%) reported much higher levels of food insecurity than the national rates (14.7%) seen in the general United States population (Economic Research Service, United States Department of Agriculture, 2011).

Although not significant, food security status decreased slightly for participants that completed both pre- (76%) and post- (80%) food security questionnaires. No significant increases or decreases in food security status may be explained by responses on study questionnaires demonstrating that participants positively increased both their perceptions about the benefits of eating fruits and vegetables and food preparation skills, yet their confidence to eat five or more fruits and vegetables per day did not significantly change. Given that post questionnaires were distributed and collected four weeks after the delivery program occurred, it is likely that participants experienced many of the barriers to obtaining fruits and vegetables that were present before the intervention, possibly feeling slightly more food insecure. Even with decreased confidence and food security status, dietary recall results establish that participants were able to overcome barriers and increase intake.

Limitations

Limitations to this study include threats to external and internal validity. The greatest threats to external validity include significant differences between the two study cohorts and differences between decliners and participants. Nevertheless, differences between the two cohorts created a more diverse population, possibly enhancing generalizability of study findings. Further research should examine strategies to recruit for study participants with demographics similar to decliners as the resultant grounded theory showed that study recruitment depended upon interest in trying new foods, healthy foods, and saving money. In addition, no significant differences (socio-demographic or otherwise) were found between participants based upon level of research tools completed. A small sample size also hampers the study's generalizability.

The greatest threats to internal validity include the lack of control group, attrition rates and unknown role of social desirability. The researchers decided to forgo a control group for two reasons: 1) the extremely challenging nature of data collection with a high-risk population; and 2) our community partner, Head Start, felt more comfortable implementing research at one site at a time. A double-pretest post-test was designed to account for a lack of control group, but no participants completed all baseline measures, causing analysis to occur as a pre-test post-test design. There were issues with attrition for certain measures, but not for overall study protocol. Although only three participants did not complete any protocol past pre, there were several issues with missing data across study results. Several participants were present throughout the study, but were selective about measures completed. Statistical tests were run to find differences between completion rate of measures, outcomes, and sociodemographics, but no significant differences were found. The incomplete nature of data sets does pose a threat to internal validity, but this is not surprising considering the resultant grounded theory stating that research protocol decreased the likelihood for adoptability of participants and the Head Start sites. Study findings are just a beginning to an examination of the effectiveness of a fruit and vegetable delivery programs for limited resource preschool families and simplified research methods should be employed to decrease threats to external and internal validity. Lastly, the role that social desirability for self-reported study protocol is not known. In health behavior interventions, there is always potential that participants will overreport positive behavior and underreport negative behavior.

Although cost-effectiveness was calculated, extracting meaning from the final amounts is challenging. While it is recognized that ‘cost’ is a critical element of interventions and research, little has been published on what is ‘cost-effective,’ although numerous cost-benefit analyses have been conducted (Glasgow et al., 1999; Klesges et al., 2005; Serrano et al., 2011). While \$128.16 seems reasonable, it is still not possible to compare and calculate whether this intervention is ‘cost-effective’ or not.

In terms of BMI self-reported measurements, the researchers were aware that individuals who self report tend to over-report height and under-report weight (Danubio, Miranda, Vinciguerra, Vecchi, & Rufo, 2008; Gorber, Tremblay, Moher, & Gorber, 2007; Nord et al., 2007). Additionally, the researchers were aware that self-reported food records are frequently under-estimated. Although there are several methods to enhance validity, such as using Goldberg’s method for calculating estimated energy expenditure (EER) (Black, 2000; Goldberg et al., 1991, 1991), researchers decided to include all data as reported given the high risk nature and food security status of this population. Low-caloric intake reported on 24-hour recalls is likely to be a result of food insecurity. No nutrients reported may be due to food insecurity or incomplete data.

External funding is one limitation of continuing Fresh Produce, Fresh Start as a community-based food system program. In order for a delivery program to be sustainable, it is necessary that all parties involved both contribute and benefit. For example, the researchers felt that it was important to pay full prices to the farmers involved in the delivery program, even with offers for discounted prices or second rate items. A program such as Fresh Produce, Fresh Start ultimately necessitates that entities such as the local community, pre-school, or families commit to absorbing costs (monetary or time) at some level in order to sustain support for programs that aim to involve limited resource individuals in a community-based food system.

Conclusions

Fresh Produce, Fresh Start has potential to increase fruit and vegetable consumption for limited resource, preschool families. Further research should examine the feasibility and impacts of a fruit and vegetable delivery on a larger scale at several sites (possibly using a time series approach to allow for comparison groups), with different populations, and longitudinally. Future studies should further test the mediators and moderators that predict participation in and resulting changes in produce consumption from a free and local fruit and vegetable delivery program.

From a practical standpoint, creative approaches to sustain programs like Fresh Produce, Fresh Start through organizations such as Head Start, need to be considered by all stakeholders. With the implementation and evaluation of programs such as Fresh Produce, Fresh Start scientific evidence can be added to the literature about the feasibility and effectiveness of diet-related programs that promote a community-based food system.

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CHAPTER 4

Fresh Produce, Fresh Start: A Free, Fruit and Vegetable Delivery Program Results in Changes in Purchasing Patterns

Introduction

There are a number of national food assistance programs for limited resource populations in the United States that address hunger and food insecurity through the provision of supplemental food. The largest programs include Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps), Supplemental Nutrition Program for Women, Infants, and Children (WIC), and the USDA School Breakfast and Lunch programs. The farm bill, revisited by Congress every five years, is responsible for the allocation of funds to US food assistance programs. The 2008 farm bill appropriated about \$300 billion dollars for food nutrition related programs (Weber, 2008).

Given the amount of resources put into assisting the 17.4 million food insecure people in the United States, 55% of whom participate in national food assistance programs, it is very important to consider the nutritional implications of those programs. (Economic Research Service, United States Department of Agriculture, 2011; Nord, Andrews, & Carlson, 2009). While these programs have documented successes in reducing food insecurity (Fox, Hamilton, & Lin, 2004) and increases in academic achievement (Gordon, Devaney, & Burghardt, 1995; Meyers, 1989; Murphy et al., 1998), several studies have shown that they may result in higher weight status of participants (Gibson, 2006; Gleason & Dodd, 2009; Kimbro & Rigby, 2010; Meyerhoefer & Pylypchuk, 2006; Zagorsky & P. K. Smith, 2009). To date, the researchers are not aware of any studies that examine the effect of ‘free’ food from federal nutrition programs on overall purchasing patterns, including the displacement and replacement of foods.

Recently, there has been an increasing emphasis on expanding federal nutrition assistance programs to promote locally-grown produce, including Supplemental Nutrition Assistance Program (SNAP), the acceptance of SNAP benefits through Electronic Benefit Transfer EBT at farmers markets, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), WIC Farmers Market Nutrition Program (WIC FMNP), and Senior Farmers Market Nutrition Program (SFMNP). In addition, the USDA’s Community Food Project Grant program funds community level food system projects such as community gardens, healthy food store initiatives, and nutrition education programs that aim improve the food and home environment

(United States Department of Agriculture, 2009). Whereas federal nutrition assistance programs traditionally focus on providing enough food for families, these community-based food programs focus on increasing access and availability of locally grown, fresh foods.

Although there is no conclusive evidence of how the establishment of EBT machines at farmers market impact nutritional intake, WIC FMNP and SFMNP have demonstrated improvements in fruit and vegetable intake (Johnson, Beaudoin, Smith, Beresford, & LoGerfo, 2004; Kropf & Holben, 2006; L'Italien, Dharod, Sady, & Gallagher, 2006). For example, Herman and colleagues analyzed the long-term effectiveness of providing vouchers for fresh produce purchase to low-income women enrolled in the WIC program (Herman, Harrison, & Jenks, 2006). A total of 602 participants enrolled at one of two intervention sites or the single control site. The two intervention sites received \$10 worth of vouchers weekly for either supermarket or farmers market produce purchases. The control site received \$13 per month to purchase disposable diapers. Over the study period, average energy intake decreased and fruit and vegetable intake increased for the two intervention sites. Six months post study, an increase in fruit and vegetable intake was sustained by 1.4 servings per day for farmers markets and .8 servings per day for supermarkets. Still, similar to the original federal programs, no data were reported on other changes that may have taken place in food purchasing. In addition, few studies have even documented the dietary quality of community-based programs like food pantry foods (Bernier, Paynter, & Anderson, 2009; Duffy, Zizza, Jacoby, & Tayie, 2009), yet alone the effect on overall purchasing patterns. One specific question that stands to be answered is, does the purchase of energy dense foods increase given the availability of extra money for food when a nutrition assistance program is in place? Or, do nutrition assistance programs impact what an individual buys long-term? For example, do fruit and vegetable purchases increase after a free fruit and vegetable delivery program? The goal of this study was to examine how a free and local fruit and vegetable delivery program changes grocery purchasing patterns.

Methods

Fresh Produce, Fresh Start was a free and local fruit and vegetable delivery program created for Head Start families with the design efforts of Head Start representatives, local farmers, and researchers. Specifically, this study seeks to answer the question: Does a free and local fruit and vegetable delivery program to Head Start families' food environment change overall purchasing patterns? (The dietary outcomes of this study are reported in chapter 3.)

Research Design

Fresh Produce, Fresh Start used a mixed methods approach to assess both feasibility and effectiveness. This component of the study focuses specifically on changes in food purchasing patterns with a one group pre-test post-test design using a double pre-test implemented twice to two different groups. The two cohorts were conducted identically.

The free and local fruit and vegetable delivery program was targeted towards Head Start families. The intervention components measured one Head Start parent or head of household. As it is usual for parents to purchase and provide meals for their children (Savage, Fisher, & Birch, 2007), this study hoped to see positive changes in food purchasing patterns as a result of Fresh Produce, Fresh Start. An assumption of this study was that changes in food purchasing patterns would impact home food availability and possibly change consumption patterns. Approval was obtained from Virginia Tech's Institutional Review Board (IRB) for all components of this study with informed consent obtained from all participants.

Study Procedures

Participants were recruited from two Head Start sites in Montgomery County during fall of 2009 and 2010. One parent from each family was eligible if their child attended Head Start. Ineligibility criteria included pregnancy, chronic disease, or previous participation in the fall 2009 intervention. Parents signed up for Fresh Produce, Fresh Start at preschool orientation by providing informed consent and completing pre-study measurement tools. Individuals who declined to participate were asked to complete a non-participant questionnaire in order to detect differences in study participants and overall Head Start population.

As an intervention, Fresh Produce, Fresh Start lasted 16 weeks. At pre, participants completed study protocol and were trained to collect food receipts for four weeks. Receipts were collected by participants and sent to researchers periodically throughout the study. Baseline measures were collected at the end of four weeks and the free fruit and vegetable delivery program lasted for the duration of weeks five through 12. The delivery program portion of the study was split into two observation (called 'delivery 1' and 'delivery 2' in this paper) periods to compare receipt data across identical amounts of time (four weeks each for pre, delivery 1, delivery 2, and post). At the completion of 12 weeks, participants were asked to continue collecting food receipts for four more weeks. During week 16, participants were asked to complete post-study protocol and return all food receipts.

Measures

Development of the intervention was based upon known factors about working with limited resource populations. It is documented that few appropriate evaluation instruments exist that are apt for low-income and limited resource individuals (Contento, Randell, & Basch, 2002). For reasons such as less education and lower literacy levels, it is important to use quick, straightforward, easily accessible, change sensitive, and audience-divers tools (McClelland et al., 2001).

Fresh Produce, Fresh Start Study Questionnaire

Participants completed a short questionnaire that asked questions about socio-demographic and diet preferences and patterns. This study will report questions about demographics and grocery store shopping patterns. These specific survey questions were adapted from Rose et al. 100-mile diet study (2008) and Virginia Cooperative Extension's Suppers Made Simple curriculum (Virginia Cooperative Extension, 2007).

Food Security Questionnaire

To assess participant's food security and hunger status, the ERS/USDS 10-item U.S. Food Security Module was administered at pre and post (United States Department of Agriculture, 2006). Validity and reliability studies have successfully utilized this food security questionnaire in measuring household food security (Bhattacharya, Currie, & Haider, 2004; Frongillo Jr, Rauschenbach, Olson, Kendall, & Colmenares, 1997; Stuff et al., 2004). The screeners are designed to categorize individuals with high (raw score = 0), marginal (raw score = 1), low (raw score = 2-5), or very low (raw score = 6-9) food security (Bickel, Nord, Price, Hamilton, & Cook, 2000).

Receipts

Participants were requested to collect and/or document food receipts for 16 weeks for all food-related purchases, including grocery stores, restaurants, convenience stores, and (by documenting the product, brand, and cost on a notecard) vending machines. Researchers chose to use the collection of food receipts as the main instrument to assess purchasing patterns. In general, receipts are easily accessible, audience-diverse, and do not require a high level of literacy and can detect differences in purchasing patterns. Several studies have used receipt collection to analyze food purchasing patterns, including food category purchases separated by household education and race/ethnicity (Cullen et al., 2007) and assessment of an online nutrition

and physical activity intervention administered to church populations (R. A. Winett, E. S. Anderson, Wojcik, S. G. Winett, & Bowden, 2007).

For receipts, methodology reported by Rankin and colleagues (1998) was adapted and utilized to monitor food purchasing patterns and their relationship to family characteristics. French et al. also recently developed a method for annotated receipt collection (French, Shimotsu, Wall, & Gerlach, 2008; French, Wall, & Mitchell, 2010; French, Wall, Mitchell, Shimotsu, & Welsh, 2009). The researchers did not use the latter method for collection of receipts because it was published after development of the program, but was referred to in the analysis of data. Receipts were collected from participants with information about item, date purchased, quantity purchased, price paid, and food store for 16 weeks. The purpose of this study was to analyze changes in types of food purchased and expenditures by category, not specific nutrient breakdown. Whereas Rankin developed a nutrient database to compare kilocalorie breakdown, the focus here is on the quantity and price purchased in each food category (1998). Because of the departure from Rankin's methodology, the researchers referenced French et al. methodology for annotation and evaluation of receipts, discussed in the analysis below (2009).

Analysis

Receipts, survey data, food security questionnaire responses, and completion rates were entered into Microsoft Excel (Microsoft Corporation, 2008), then converted to SPSS statistical software, version 18.0 (First Data Bank, 2006). Descriptive statistics were used for socio-demographic data and receipt data. Paired t-tests were used to assess changes in questionnaire responses and food security status, as data was normally distributed. Changes in food purchasing patterns were analyzed in several ways and is discussed below.

As complete data collection for all measurements was challenging with a high-risk population, several extra steps in the analysis phase were taken to ensure a comprehensive understanding of the study results. First, depending upon sample size, normality, and number of variables, Pearson Chi-Square tests of independence (X^2) and Fisher's Exact Tests for categorical data and independent t-tests, Kruskal Wallis Tests, or unpaired t-tests for interval or ordinal data were used to assess socio-demographic differences among completion of receipt measurements at distinct levels distinguished by quartiles: $\geq 0\%$ and $< 25\%$; $\geq 25\%$ and $< 75\%$; $\geq 75\%$ and $< 100\%$; and $\leq 100\%$. In addition, participants that returned at least one receipt across all four measurement periods (pre, delivery 1, delivery 2, and post) were classified as "matched."

Participants that returned at least one receipt during one to three measurement periods were classified as “unmatched.” Results below are reported in two formats: 1) matched ($n = 22$) and 2) match combined with unmatched ($n = 41$). In addition, two forms of analyses were reported on for food security measurements: 1) baseline measurement descriptive statistics for entire population ($N = 51$); and 2) completed pre and post data across the food security measurement tool ($n = 25$).

For receipts, each food item was categorized into one of 22 food purchasing groups and its respective number was entered accordingly into the spreadsheet:

1. Add-on and cooking fats (oil, margarine, butter, mayo, PB, sauce, meat sauce, gravy, salad dressing)
2. Add on cooking nonfat/low fat (ketchup, bbq sauce, mustard, syrup, honey)
3. Baking needs (flour, sugars, baking powder, baking soda, vanilla)
4. Sugar sweetened beverages
5. 100% fruit juices
6. Other beverages (alcohol, coffee, tea)
7. Milk alternatives (baby formula, lactaid, soy milk)
8. Breads
9. Cereals and cereal bars
10. Dairy (milks, cream, sour cream, frozen dairy, yogurt, cheese)
11. Entrees/meals (frozen, canned, deli, restaurant)
12. Meat, fish, and poultry
13. Pasta, rice, and grains
14. Fresh produce (fruits and vegetables)
15. Canned produce
16. Frozen produce
17. French fries
18. Instant mashed potatoes
19. Beans/nuts
20. Sweets/deserts/pastries (snack cakes and pies, doughnuts, candy bars)
21. Snacks (chips, crackers)
22. Other foods (seasonings, broth, gelatin)

All items were analyzed by the number of appearances on a food receipt and not by weight because of differences in reporting methods of quantity. All food categories were used to analyze overall food purchasing patterns of each individual and then all participants.

To gain a full understanding of the receipt data, the results are split into two analyses—one regarding food expenditures (money) and the other regarding number of items purchased within a food category for matched alone and matched and unmatched participants combined. Three analyses were completed for the expenditure and item analysis: 1) total amount; 2) mean amount

per participant; and 3) mean percentages. Total amounts and means for participants were characterized in respect to the four observation periods using descriptive statistics. A Wilcoxon Rank Sum Test was used to detect significant increases or decreases in the mean amounts for participants by food category between observations. Then, food category percentages were calculated by dividing amount reported within a particular food category by total reported amounts per participant. Then a mean was calculated for the percentages of all participants combined. Wilcoxon Rank-Sum Test was used to test significant differences in the mean percentages per food category between study observation periods.

Results

Fresh Produce, Fresh Start was designed to be a one-group double pre-test post-test intervention. Frequently, data was challenging to collect from participants. Participants were difficult to reach as a result of frequent life changes—for example, changes in living situations and telephone numbers. This difficulty was evidenced by receipt data collection. Receipt data was collected at pre and baseline, only three participants returned incomplete survey baseline data. Survey instruments were, therefore, evaluated from pre to post. There were no significant ($p < .05$) differences between those participants ($n = 3$) that returned incomplete baseline data and participants ($n = 48$) who returned no baseline data.

Participant Description

Overall, 32 adults in Christiansburg and 37 adults in Blacksburg were eligible to participate in Fresh Produce, Fresh Start. In Christiansburg, 21 adults provided informed consent and completed all pre-survey protocol. In Blacksburg, 30 adults provided informed consent and completed all pre-survey protocol. In total, 51 of 67 (76%) eligible participants enrolled in Fresh Produce, Fresh Start. Three participants did not complete data past the pre-survey and informed consent protocol. Overall, participant racial break down was 54.9% white, 27.5% black or African American, and 17.6% Asian. Age ranged from 20 years old to 62 years old ($M = 32.5$, $SD = 8.6$); 90% were female; and 47% were single head of household. Income levels varied with 33.3% earning less than \$10,000 per year, 52.9% earning \$10,000 to \$24,999, 7.8% earning \$25,000 to \$49,999, and 5.9% earning other. A high percentage of participants smoked, with 40.4% reporting smoking. Household sizes ranged from 2 to 11 individuals ($M = 4.2$, $SD = 1.8$). The number of children in a household ranged from 1 to 9 ($M = 2.4$, $SD = 1.8$). Participants owned an average of 1.5 cars ($SD = .2$). In all, 22 participants (43%) were enrolled in either the

Supplemental Nutrition Assistance Program (SNAP) ($n = 12$) or Special Supplemental Nutrition Program for Women, Infants and Children (WIC) ($n = 10$).

There were significant ($p < .05$) differences between Blacksburg and Christiansburg participants based upon race, smoking, education, food security, or total food assistance. Participants in Christiansburg were more likely to be white, smoke, graduates with a high school degree or lower, have very low to low food security status, and participate in some kind of food assistance (food bank, WIC, SNAP, etc). Blacksburg participants were more likely to be ethnically diverse, with 36.7% ($n = 11$) white, 33.3% ($n = 10$) black or African American, and 30% ($n = 9$) Asian. In addition, participants in Blacksburg were more likely to have some college education or higher.

Food Security Status

At pre, food security status spanned categorization levels, with classifications as follows: 23.5% ($n = 12$) high; 19.6% ($n = 10$) marginal; 19.6% ($n = 10$) low; and 37.3% ($n = 19$) very low. Based upon those who completed pre and post ($n = 25$), participant's food security status changed slightly. At pre, matched participants were 20% ($n = 5$) high; 20% ($n = 5$) marginal; 20% ($n = 5$) low; and 40% ($n = 10$) very low. At post, matched participants reported 24% ($n = 6$) high; 8% ($n = 2$) marginal; 32% ($n = 9$) low; and 36% ($n = 9$) very low. Although levels did change slightly, no significant ($p < .05$) differences were found pre to post.

Completion Rate

There were no significant ($p < .05$) differences found between completion rate of receipt data for age, race, ethnicity, marital status, household size, number of children, number of Head Start children, education, income level, occupation, number of cars, perceived benefits of fruits and vegetables, perceived confidence to eat five or more servings of fruits and vegetables per day, perceived health, access to transportation, meal preparation habits, typical meals types, farmers market attendance, or food security status. Significant ($p < .05$) differences were found in reported smoking status. Specifically, those who completed 100% ($n = 22$) of receipt measurements were significantly ($p < .05$) more likely to smoke.

Receipt Data

For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. "Matched" data reported below reflects participants that returned receipts during all four measurement periods. The term

“unmatched” implies that the group of participants returned at least one receipt during one to three measurement periods. Regarding unmatched participants, the assumption made by researchers is that each family most likely needed to purchase at least one food item during a four-week period. Because this is a blatant assumption, the researchers decided to include analysis on matched and unmatched data combined.

Expenditures.

Total and Mean Food Expenditures—Matched Participants.

Reporting total food expenditures demonstrates any changes in amounts of food purchased by category over time. For the matched ($n = 22$) group, total expenditures on all food items for the entire study was \$28,959.17. Over the 16-week study, each family reported spending a minimum of \$337.24 and a maximum of \$3,365.76 ($M = \$1,316.33$, $SD = \$808.25$). Per each person in a household ($n = 82$, $\text{min} = 2$, $\text{max} = 8$, $M = 3.73$), families reported spending a minimum of \$67.45 and a maximum of \$927.30 ($M = \$372.75$, $SD = \$217.19$).

Table 1 displays mean food expenditures by category for matched participants during each respective study period using the Wilcoxon Rank-Sum Test. There were several incremental decreases in expenditures reported within food categories from pre to delivery 2 and post. Significant ($p < .05$) examples include add-on and cooking fats and canned produce. Interestingly, there was a slight increase in expenditures reported within many of the food categories from pre to delivery 1, possibly due to extra money available for food because of the produce delivery program. Significant ($p < .05$) instances include cereal and cereal bars, fresh produce, and sweets, desserts, and pastries. From pre to post, there were significant ($p < .05$) decreases in the reported amount of money spent on snacks. There were several significant ($p < .05$) differences found in reported mean total fresh produce expenditures during the study period, but not from pre to post. Of note, expenditures reported decreased over the study period, possibly attributed to the produce delivery program’s food displacing necessary food expenditures or missing data.

Total and Mean Food Expenditures—Matched and Unmatched Participants.

For the combined matched and unmatched ($n = 41$) group, total expenditures on all food items for the 16-week study period was \$39,196.67 (pre = \$12,981.89; delivery 1 = \$13,557.81; delivery 2 = \$6,263.78; post = \$6,393.62). Each family reported spending a minimum of \$8.48 to a maximum of \$3,541.51 ($M = \$972.77$, $SD = \$814.16$) during the study period. Per each person

in a household ($n = 171$, $\min = 2$, $\max = 11$, $M = 4.17$), families reported spending a minimum of \$2.12 to a maximum of \$924.28 ($M = \$254.36$, $SD = \$221.75$).

Food Category	Matched Participants ($n = 22$)			
	Pre (\$)	Delivery 1 (\$)	Delivery 2 (\$)	Post (\$)
Add-on and cooking fats	12.55 ± 10.76 ^{1,2}	10.91 ± 13.15	5.77 ± 5.68 ¹	8.01 ± 7.00 ²
Add-on and cooking non or low fat	4.64 ± 6.13	6.80 ± 9.86	3.80 ± 6.34	4.48 ± 8.70
Baking needs	4.70 ± 6.55	3.40 ± 3.90	2.84 ± 4.98	2.72 ± 4.88
Sugar-sweetened beverages	18.73 ± 22.78	24.62 ± 35.98 ¹	10.98 ± 13.87 ¹	12.36 ± 17.95
100% fruit juice	5.96 ± 6.55	10.95 ± 13.57 ^{1,2}	4.63 ± 5.96 ¹	4.66 ± 5.97 ²
Other beverages	13.27 ± 22.92	17.18 ± 40.76	8.99 ± 15.05	13.40 ± 22.86
Milk alternatives	3.45 ± 12.66	5.17 ± 12.05	2.62 ± 4.80	3.77 ± 11.57
Breads	17.54 ± 17.17 ¹	22.37 ± 20.93 ²	11.43 ± 12.21 ¹	13.66 ± 16.55 ²
Cereals and cereal bars	9.42 ± 8.58 ¹	15.12 ± 19.61 ^{2,3}	4.35 ± 8.21 ²	6.67 ± 10.38 ^{1,3}
Dairy	32.51 ± 27.76	47.19 ± 47.82 ¹	25.94 ± 29.89 ¹	30.62 ± 40.18
Entrees and meals	45.59 ± 55.95	64.39 ± 69.69 ^{1,2}	31.08 ± 33.86 ¹	29.68 ± 40.07 ²
Meat, fish, poultry	72.32 ± 84.67 ¹	95.98 ± 93.54 ^{1,2,3}	35.14 ± 47.31 ^{1,2}	48.92 ± 43.07 ³
Pasta, rice, grains	12.30 ± 13.56 ¹	16.48 ± 17.00	7.10 ± 10.40 ¹	8.66 ± 12.80
Fresh produce	37.30 ± 30.34 ^{1,2}	57.24 ± 57.51 ^{1,3}	26.07 ± 29.47 ^{2,3,4}	42.88 ± 33.55 ⁴
Canned produce	8.04 ± 6.82 ¹	10.44 ± 12.66 ²	5.06 ± 7.21 ^{1,2}	7.65 ± 10.13
Frozen produce	1.13 ± 2.25	2.41 ± 5.30	1.08 ± 2.42	1.54 ± 2.64
French fries	1.96 ± 2.71 ^{1,2}	2.52 ± 5.17	0.67 ± 1.07 ¹	0.49 ± 1.11 ²
Instant mashed potatoes	.89 ± 2.10	.60 ± 1.62	0.09 ± 0.43	0.06 ± 0.26
Beans and nuts	4.71 ± 4.48	8.20 ± 13.89	5.89 ± 7.65	7.38 ± 12.65
Sweets, desserts, pastries	14.65 ± 19.73 ¹	28.95 ± 32.43 ^{1,2}	17.29 ± 18.73	14.04 ± 14.90 ²
Snacks	15.18 ± 15.76 ^{1,2}	21.20 ± 29.80 ^{3,4}	6.93 ± 8.11 ^{1,3}	5.33 ± 6.26 ^{2,4}
Other foods	3.19 ± 5.38 ¹	8.19 ± 11.01 ¹	7.40 ± 20.72	2.95 ± 7.15

* All data reported as mean ± SD

* Similar superscripts across rows denote significant ($p < .05$) changes within a food category based on Wilcoxon Rank-Sum Test.

* For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

Using the Wilcoxon Rank-Sum Test for unmatched and matched participants combined, there were significant ($p < 0.05$) decreases in numerous food categories: add-on and cooking fats pre to delivery 2, delivery 1 to delivery 2, and pre to post; baking needs pre to delivery 1; sugar-sweetened beverages pre to delivery 2 and delivery 1 to delivery 2; breads pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; cereals pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; dairy delivery 1 to delivery 2; entrées and meals delivery 1 to delivery 2 and delivery 1 to post; meat pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; pasta pre to delivery 2 and delivery 1 to delivery 2; fresh produce pre to delivery 2, delivery 1 to

delivery 2, and delivery 2 to post; snacks pre to delivery 2, delivery 1 to delivery 2, delivery 1 to post, and pre to post; and sweets, desserts, and pastries pre to delivery 2. These significant differences could be attributed to the produce delivery program or a general decrease in food receipts reported.

Food Category Expenditure Mean Percentages—Matched Participants.

Food category expenditures demonstrate the mean percentage of money spent on a particular food category as compared to overall expenditures on all food categories. Table 2 displays percentages of total expenditures by category for matched participants during the study period.

Food Category	Matched Participants (n = 22)			
	Pre (\$)	Delivery 1 (\$)	Delivery 2 (\$)	Post (\$)
Add-on and cooking fats	.039 ± .033 ¹	.020 ± .029 ^{1,2}	.024 ± .022	.044 ± .050 ²
Add-on and cooking non-fat or low-fat	.011 ± .015	.011 ± .014	.011 ± .019	.016 ± .026
Baking needs	.010 ± .013	.007 ± .011	.012 ± .016	.009 ± .015
Sugar-sweetened beverages	.056 ± .053	.042 ± .047	.059 ± .035	.051 ± .034
100% fruit juice	.019 ± .019	.036 ± .049	.022 ± .026	.018 ± .030
Other beverages	.027 ± .033	.022 ± .041	.033 ± .048	.033 ± .041
Milk alternatives	.014 ± .045	.017 ± .048	.019 ± .052	.016 ± .036
Breads	.059 ± .035	.051 ± .034	.068 ± .092	.055 ± .054
Cereals and cereal bars	.031 ± .028 ¹	.032 ± .033	.021 ± .039 ¹	.023 ± .031
Dairy	.103 ± .058	.098 ± .072	.130 ± .119	.117 ± .095
Entrees and meals	.108 ± .108 ¹	.118 ± .100 ²	.101 ± .083	.073 ± .076 ^{1,2}
Meat, fish, poultry	.205 ± .091 ¹	.212 ± .182	.131 ± .081 ¹	.181 ± .107
Pasta, rice, grains	.045 ± .064	.030 ± .030	.031 ± .060	.032 ± .044
Fresh produce	.119 ± .077 ¹	.132 ± .117 ²	.125 ± .132 ³	.194 ± .100 ^{1,2,3}
Canned produce	.025 ± .019	.020 ± .022	.026 ± .044	.030 ± .040
Frozen produce	.004 ± .007	.006 ± .012	.004 ± .010	.007 ± .014
French fries	.025 ± .019	.020 ± .022	.026 ± .044	.030 ± .040
Instant mashed potatoes	.002 ± .006	.001 ± .004	.000 ± .001	.001 ± .002
Beans and nuts	.016 ± .018	.020 ± .032	.028 ± .046	.024 ± .037
Sweets, desserts, pastries	.040 ± .045	.050 ± .041	.066 ± .058	.051 ± .049
Snacks	.051 ± .050 ^{1,2}	.051 ± .054 ³	.049 ± .102 ¹	.020 ± .021 ^{1,3}
Other foods	.006 ± .008	.017 ± .024	.038 ± .120	.009 ± .016

* All data reported as mean ± SD

*Similar superscripts across rows denote significant ($p < .05$) changes within a food category based on Wilcoxon Rank-Sum Test.

* For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

For the matched group ($n = 22$), there were significant ($p < 0.05$) decreases in expenditure percentages across food categories, including cereal and cereal bars and snacks. Significant ($p < 0.05$) increases occurred in the percentage of fresh produce purchased from delivery 1 to delivery 2, delivery 2 to post.

Mean Food Category Expenditure Percentages—Matched and Unmatched

Participants.

For the combined matched and unmatched group ($n = 44$), significant ($p < 0.05$) decreases occurred in percentage of food expenditures for: add-on and cooking fat pre to delivery 2; cereal pre to delivery 2; entrées and meals pre to post and delivery 1 to post; snacks pre to delivery 1, delivery 1 to post and pre to post; canned produce pre to delivery 2; instant mashed potatoes pre to post. There was a significant ($p < 0.05$) increase in the proportion purchases of fresh produce from delivery 1 to post, delivery 2 to post, and pre to post.

Itemized Food Category Purchases.

Total and Mean Item Amounts—Matched Participants.

The mean number of items demonstrates changes in each food category between observation periods. For the matched ($n = 22$) group, the total number of food items purchased for the entire study was 11,696. Over the 16-week study, each family reported purchasing a minimum of 95 items and a maximum of 1,274 items ($M = 531.64$, $SD = 311.65$). Per each person in a household, families purchased a minimum of 26 items and a maximum of 389.67 items ($M = 154.09$, $SD = 94.64$).

Table 3 displays significant differences in mean number of items purchased for matched participants separated by observation periods during Fresh Produce, Fresh Start. Generally, the mean number of items reported decreased over the study period, barring several increases during delivery 1. There were significant ($p < .05$) decreases in several categories over portions of the study period, sugar-sweetened beverages and snacks. During delivery 1, several items reported significantly ($p < .05$) increased, including meat, fish, and poultry and sweets, desserts, and pastries. This initial increase may be due to the extra money available in participants' budget because of produce provided during the delivery program. From delivery 1 to post, there were significant ($p < .05$) decreases in categories such as meat, fish, and poultry, sugar-sweetened beverages, and sweets, desserts, and pastries categories, suggesting that reported purchases

eventually stabilized. The number of fresh produce items purchases did increase from pre to post, but not significantly.

Table 3. Mean Item Amounts Per Food Category Based on Matched Food Receipts from Fresh Produce, Fresh Start

Food Category	Matched Participants (n=22)			
	Pre (\$)	Delivery 1 (\$)	Delivery 2 (\$)	Post (\$)
Add-on and cooking fats	6.05 ± 5.98 ¹	4.82 ± 6.04	2.14 ± 2.23 ¹	3.36 ± 3.03
Add-on and cooking non-fat or low-fat	2.00 ± 2.85	3.64 ± 5.15	1.82 ± 3.02	1.68 ± 1.94
Baking needs	1.95 ± 2.85	3.27 ± 6.16	1.05 ± 1.43	1.09 ± 1.79
Sugar-sweetened beverages	12.23 ± 15.33 ^{1,2}	14.45 ± 19.62 ^{3,4}	5.41 ± 6.74 ^{1,3}	4.41 ± 6.01 ^{2,4}
100% fruit juice	2.41 ± 2.84	4.36 ± 4.48 ^{1,2}	1.59 ± 1.84 ¹	2.18 ± 2.68 ²
Other beverages	4.00 ± 10.24	4.27 ± 11.34	1.73 ± 2.27	2.45 ± 2.94
Milk alternatives	.82 ± 2.86 ¹	1.82 ± 4.66 ¹	1.00 ± 1.60	1.41 ± 4.31
Breads	8.55 ± 7.66 ¹	10.64 ± 9.74 ²	4.95 ± 5.07 ^{1,2}	6.95 ± 8.28
Cereals and cereal bars	3.86 ± 3.55 ¹	5.45 ± 6.82 ²	1.68 ± 3.23 ^{1,2}	2.95 ± 4.13
Dairy	14.77 ± 12.45	20.36 ± 24.91	11.09 ± 12.08	14.18 ± 16.80
Entrees and meals	14.64 ± 17.42	21.27 ± 25.68 ^{1,2}	8.00 ± 9.02 ¹	9.18 ± 12.15 ²
Meat, fish, poultry	20.14 ± 26.16 ^{1,2}	30.64 ± 28.23 ^{1,3,4}	10.32 ± 13.26 ^{2,3}	12.50 ± 11.62 ⁴
Pasta, rice, grains	3.68 ± 4.35 ^{1,2}	7.09 ± 7.35 ^{1,3}	1.73 ± 2.25 ²	2.64 ± 3.08 ³
Fresh produce	18.86 ± 15.84 ¹	25.64 ± 25.03 ²	12.45 ± 12.98 ^{1,2,3}	21.00 ± 19.94 ³
Canned produce	5.41 ± 6.17	7.73 ± 9.65 ¹	3.50 ± 4.83 ¹	4.50 ± 5.95
Frozen produce	0.73 ± 1.52	1.27 ± 2.73	0.55 ± 1.26	0.73 ± 1.32
French fries	0.91 ± 1.11 ¹	1.45 ± 3.61	0.41 ± 0.73	0.23 ± 0.53 ¹
Instant mashed potatoes	.50 ± 1.26	.36 ± 1.00	.09 ± .43	.05 ± .21
Beans and nuts	3.27 ± 3.98	5.36 ± 10.39	3.36 ± 4.60	3.18 ± 4.99
Sweets, desserts, pastries	7.36 ± 11.08 ¹	14.18 ± 16.19 ^{1,2,3}	6.68 ± 6.78 ²	6.14 ± 6.07 ³
Snacks	6.50 ± 6.12 ^{1,2}	7.82 ± 8.99 ^{3,4}	3.23 ± 3.53 ^{1,3}	2.32 ± 2.51 ^{2,4}
Other foods	2.59 ± 4.92	3.91 ± 4.04	2.14 ± 4.04	2.59 ± 4.22

* All data reported as mean ± SD

*Significant ($p < .05$) changes within a food category noted by matching superscripts across rows, based on Wilcoxon Rank-Sum Test.

*For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

Mean Item Amounts—Matched and Unmatched Participants.

For the combined matched and unmatched ($n = 41$) group, there was a total of 15,520 (pre = 5,085; delivery1 = 5,601; delivery 2 = 2,299; post = 2,535) items purchased and reported through food receipts. Each family reported purchasing a minimum of two items and a maximum of 1,274 items ($M = 378.54$, $SD = 309.65$) during the study period. Per each person in a household, families reported purchasing a minimum of .5 items and a maximum of 389.67 items ($M = 101.71$, $SD = 92.73$). There were significant ($p < .05$) decreases in the number of items reported for matched and unmatched combined in the following food categories: add-on and cooking fats pre to delivery 2 and delivery 1 to delivery 2; sugar-sweetened beverages pre to

delivery 2, delivery 1 to delivery 2, delivery 1 to post, and pre to post; breads pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; cereals and cereal bars pre to delivery 2, delivery 1 to delivery 2, delivery 1 to post; dairy delivery 1 to delivery 2; entrees and meals pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; meat, fish, and poultry pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; pasta pre to delivery 2, delivery 1 to delivery 2, and delivery 1 to post; fresh produce pre to delivery 2 and delivery 1 to delivery 2; canned produce pre to delivery 2, delivery 1 to delivery 2, delivery 1 to post; French fries pre to delivery 2 and pre to post; instant mashed potatoes pre to post; sweets, desserts, and pastries delivery 1 to delivery 2 and delivery 1 to post; 100% fruit juices delivery 1 to post; and snacks pre to delivery 2, delivery 1 to delivery 2 and delivery 1 to post. There was a significant ($p < .05$) increase in fresh produce items reported from delivery 2 to post.

Mean Item Amount Percentages—Matched Participants.

Whereas the mean item amount above details the average amount of items purchased within a category, item amount percentages accounts for reported item purchases within a category relative to total reported item purchases. Table 4 exhibits percentages of total items listed on food receipts by category for matched participants during the study period. During the delivery 1 portion of the program, several increases were noted, including spending shifted to a great portion of sweets, desserts, and pastries with extra money available because of produce delivery program. Although this is not a positive outcome, participants did decrease the amount of sweet, desserts, and pastry purchases post study. In addition, the proportion of money spent on fresh produce did significantly ($p < 0.05$) increase at post, potentially due to the effects of Fresh Produce, Fresh Start.

Mean Item Amount Percentages—Matched and Unmatched Participants.

For matched and unmatched participants ($n = 44$), there were significant ($p < .05$) decreases in the percentages of items reported for: add-on and cooking fats pre to delivery 1 and pre to delivery 2; sugar-sweetened beverages pre to post; cereal and cereal bars pre to delivery 2; snacks pre to delivery 2 and pre to post; canned produce pre to delivery 2; French fries pre to delivery 1 and pre to post; instant mashed potatoes pre to post; and sweets, desserts, and pastries pre to post. There were significant ($p < .05$) increases in several food categories, including: add-on and cooking fats delivery 2 to post; dairy delivery 1 to post; and fresh produce delivery 1 to post, delivery 2 to post, and pre to post.

Food Category	Matched Participants (n = 22)			
	Pre (\$)	Delivery 1 (\$)	Delivery 2 (\$)	Post (\$)
Add-on and cooking fats	.042 ± .028 ¹	.020 ± .023 ^{1,2}	.025 ± .025 ³	.054 ± .060 ^{2,3}
Add-on and cooking non-fat or low-fat	.015 ± .021	.014 ± .017	.010 ± .017	.021 ± .032
Baking needs	.016 ± .022	.015 ± .023	.013 ± .017	.010 ± .016
Sugar-sweetened beverages	.086 ± .110 ¹	.059 ± .070 ¹	.080 ± .103	.050 ± .058
100% fruit juice	.025 ± .021	.033 ± .036	.021 ± .025	.022 ± .030
Other beverages	.019 ± .024	.014 ± .028	.023 ± .037	.025 ± .032
Milk alternatives	.012 ± .027	.013 ± .037	.018 ± .035	.020 ± .044
Breads	.073 ± .039	.071 ± .091	.075 ± .104	.075 ± .077
Cereals and cereal bars	.035 ± .033 ¹	.036 ± .052 ^{1,2}	.016 ± .027 ²	.028 ± .034
Dairy	.118 ± .080	.100 ± .079 ¹	.132 ± .138	.156 ± .130 ¹
Entrees and meals	.071 ± .049	.095 ± .085	.074 ± .071	.069 ± .080
Meat, fish, poultry	.126 ± .059	.160 ± .140	.101 ± .057	.137 ± .102
Pasta, rice, grains	.037 ± .046	.031 ± .028	.021 ± .025	.031 ± .037
Fresh produce	.162 ± .119 ¹	.154 ± .129 ²	.149 ± .155 ³	.223 ± .162 ^{1,2,3}
Canned produce	.039 ± .031	.039 ± .048	.033 ± .047	.047 ± .057
Frozen produce	.010 ± .019	.007 ± .015	.005 ± .012	.009 ± .017
French fries	.013 ± .021	.006 ± .013	.004 ± .008	.003 ± .007
Instant mashed potatoes	.007 ± .018	.002 ± .004	.001 ± .003	.001 ± .003
Beans and nuts	.031 ± .034	.025 ± .038	.032 ± .047	.034 ± .053
Sweets, desserts, pastries	.040 ± .041 ¹	.058 ± .042 ¹	.072 ± .075	.021 ± .032
Snacks	.060 ± .053 ¹	.044 ± .037	.058 ± .106	.030 ± .036 ¹
Other foods	.017 ± .021	.018 ± .022	.019 ± .023	.022 ± .036

* All data reported as mean ± SD

*Significant (p<0.05) changes within a food category noted by matching superscripts across rows, based on Wilcoxon Rank-Sum Test.

*For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

Discussion

Several changes in food purchasing patterns were noted as a result of the fresh produce delivery program. First, fresh produce consumption significantly increased in both percentage of food expenditure and percentage of items purchased. For several food categories, there was a decrease in number of items reported from pre to the second month of the intervention and to the follow-up, and an increase in items reported from pre to the first month of the intervention. The spike in items reported during the first portion of the intervention may be due to an initial increase in amount of money available for food because of the produce program. Decreases in reporting across some categories as the intervention progressed may have been due to less need for food because of the delivery program, missing data, or less money available to purchase food because of financial difficulties external to the intervention.

When comparing decreases in reporting to USDA's Thrifty Food, some of the minimum food expenditures purchased per family member are below feasible intake based upon the USDA's Thrifty Meal Plan for Low-Cost Meals (Carlson, Lino, & Fungwe, 2007). For example, one can compare the mean number of individuals living in matched participant household ($n = 4$) and the mean amount of money ($n = \$1,316.33$) spent over the 16-week study period to the Thrifty Plan. During the intervention periods in fall 2009 and 2010, the amount of money reported on receipts is slightly below the amount of money needed to feed a family of four.

Even with decreases in reporting, certain trends can be observed when examining the percent of money spent or percent of total food purchases obtained by food categories. For example, participants spent the largest proportion of their food money on meat, fresh produce, and dairy. The very same trend can be seen for mean percentages of items purchased. This is not surprising considering that fresh foods are usually the most expensive and least shelf-stable when compared to processed foods. In fact, the USDA Economic Research Service (2002) reports that behind processed foods combined, meats, produce, and dairy comprise the highest proportions of supermarket purchases.

Directly following the meats, produce, and dairy food categories, entrees and meals (including pre packaged, frozen, and restaurant meals) comprise of a large portion of participant purchases and number of food items. Since this includes restaurant meals, this is consistent with data that reports increasing amounts of food purchased away from home and the relative relief in time costs as compared to monetary costs for limited resource individuals (Davis & You, 2010).

Shelf-stable goods accounted for the least proportion of money and were purchased most infrequently. Specifically, these foods were from the following food categories: add on cook fats and non/low fats, baking needs, canned and frozen produce, beans, and instant mashed potatoes. All of these products are relatively inexpensive to non-processed, can be stored in bulk at home, and some require cooking skills and time to prepare. In addition to those shelf-stable foods, when the sweets, snacks, and sugar-sweetened beverages category is combined, this 'junk food' category includes a large portion of participant purchases, but still not as great as meats, produce, or dairy. Without knowing the specific quantities of each food item purchased, it is impossible to know whether these relatively less expensive foods comprise a greater amount of intake (USDA Economic Research Service, n.d.).

From a dietary perspective, meat, produce, and dairy are all items that exist on MyPlate. Further analysis needs to take place to understand the value of these food items in contributing to a participant's overall intake. For example, food receipt information could be corroborated with dietary recall data. Furthermore, quantities of meat, produce, and dairy and their dietary profile (i.e. low fat or high fat) needs to be understood before making conclusions about the participant's actual intake. But, a general increase in the proportion of number and expenditures of fresh produce items is promising, as there is no doubt about their positive contribution to an individual's diet. That is, fruits and vegetables are consistently correlated with decreased risks for overweight, obesity, chronic diseases, and some cancers and better long term health (Bazzano et al., 2002; Guo, Warden, Paeratakul, & Bray, 2004; Smith-Warner et al., 2001).

Participants enrolled Fresh Produce, Fresh Start were mainly female, and a large portion were single heads of households. Compounded with being a limited resource audience, the fruit and vegetable delivery program was one way to overcome significant personal barriers to accessing and affording healthy foods within their food environment (Attree, 2005; Chang, Nitzke, Guilford, Adair, & Hazard, 2008). It is interesting to note that participants who completed 100% of receipt data were more likely to smoke than participants were not. This is an unexpected finding as smoking is not a particularly health promoting behavior.

Limitations

The research design, specifically the small sample size and no control group, of this study limits the generalizability to other populations. As access to food stores and what can be purchased within an individual's food environment differs, larger studies in multiple locations need to take place before data is generalized.

The analysis of receipts was conducted by calculating the number of times that an item appeared on a receipt and the cost of those items, not in terms of quantity or weight purchased. This presents a possible limitation, as specific amounts of food purchased were not considered in the analysis. For example, the researchers did not know if a bag of potato chips purchased was regular or super-size. Still, the analyses were able to detect general trends and differences in variety and type of food purchased by item type and expenditures.

As with dietary assessments, like 24-hour recalls, it is difficult to discern whether participants disclose – or in this case, return – all relevant data (Black & Cole, 2001; Jeor, Guthrie, & Jones, 1983; Trulson, 1955). In addition, participants were classified as “matched” or

“unmatched” according to the completeness of their data. The assumption was made that each family had to purchase at least one food item during a four week period. Given the food insecure nature of this population, the researchers did not make any assumptions beyond one item about the amount of food items purchased or food expenditures. To account for this, matched and unmatched data was reported to account for any false assumptions. But, as home food inventories were not conducted, no data were available on the amount of food families stored in their homes, amount of food wasted, and quantity consumed during the study period. In addition receipt data is not validated to other indices like dietary recalls or home food inventories.

Future Research

Future studies should consider validating food receipts with assessments of the home food environment. One feasible way to accomplish this would be to compare food receipts to refrigerator, shelving, and pantry checklists, similar to home food inventory studies (Patterson, Kristal, Shannon, Hunt, & White, 1997; Sharkey, Dean, St John, & Huber, 2010). Researchers should also consider working with local grocery stores to release electronic food records to obtain county level data, making it feasible to examine relative representativeness of population sample receipt data. Given the positive increases of fruits and vegetables during the study period, Fresh Produce, Fresh Start could potentially be tested as a local fruit and vegetable delivery program in other Head Starts and other settings. Further, receipts appear to be a simple, feasible method for collecting data about food purchasing trends.

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CHAPTER 5

Impacts of Heifer Alternative Spring Break on the Sustainable Dietary Practices of College Students

Introduction

There is a nascent trend for college and university campuses to “go green” around the United States. Examples of “going green” include purchasing fuel-efficient campus vehicles, reducing waste, and starting recycling campaigns and composting programs (Weisbord, Dautremont-Smith, & Orłowski, 2011). The Sustainable Endowments Institute, a non-profit focused on advancing sustainability on campuses, tracks progress and grades “green” universities across the nation (2011). The Association for the Advancement of Sustainability in Higher Education (AASHE) tracks the same data, in addition to conducting conferences that directly relate to sustainable practices in higher education (2011). In more recent years, college campuses have begun supporting food system efforts that promote local communities and sustainability (Barlett, 2011). Many campus-dining services feature local and organic food programs as a way to support sustainability (Real Food Challenge, 2011). Several majors and minors at the undergraduate and graduate level are emerging that concentrate on sustainable food system practices, including agriculture, nutrition, economics, and population health (Sustainable Agriculture Education Association, 2011). Beyond the classroom, students are beginning to participate in community-based efforts that focus on sustainable food systems, also called ‘civic agriculture’ (Lyson, 2004). Some examples include contributing to student farms and community gardens, volunteering or interning as farm workers, supporting farmers markets and community nutrition projects, solving food access issues, creating edible landscaping and cultural food narratives, and helping with refugee resettlement as it relates to food and agriculture. A sustainable food system education is appropriate and necessary for the contemporary higher education environment as the tenants of sustainability—individual and environmental health, economic profitability, and social justice—are important issues for all students to consider and are themes that appear across curriculums (Clugston & Calder, 2007; Wright, 2006).

The U.S. Census Bureau estimates American higher education institution enrollment to be approximately 21 million students (U.S. Census Bureau, 2008). Accounting for roughly 6% of the country’s population, there are immense opportunities to initiate educational discussions regarding consumption habits and connections with sustainable food systems and the local

community at the college and university level. Little research has been completed about the perceptions or effects of sustainable food system education on the collegiate diet (Wilkins, Bowdish, & Sobal, 2000). Studies completed about the college student's diet focus on a change in general consumption practices as a result of new independence in choice about what to eat (Poddar et al., 2009; Racette, Deusinger, Strube, Highstein, & Deusinger, 2008; Rose, Hosig, Davy, Serrano, & Davis, 2007; Wengreen & Moncur, 2009). These studies show that many times fruit and vegetable consumption is low, poor food choices may be prevalent, and vulnerability for weight gain and/or eating disorders is high (United States Department of Health and Human Services, 1997). This paper focuses on one example of sustainable food system education at the university level and reports the dietary implications of that program.

Background

In partnership with Heifer International, Virginia Tech coordinates two Alternative Spring Break (ASB) trips to the non-profit's Learning Center at Heifer Ranch and Heifer Honduras project sites. Since the partnerships formation, three ASB'S have been conducted at Heifer Ranch in Perryville, Arkansas (spring 2008, 2010, and 2011) and one at Heifer Honduras project sites in central and western Honduras (spring 2011). This study focuses only on the 2010 and 2011 ASB trips. The first two (2008, 2010) Ranch trips were funded through a college seed grant, while both 2011 trips were funded through a USDA Higher Education Challenge grant. The USDA Higher Education Challenge grant funded the creation of Virginia Tech's Civic Agriculture and Food Systems (CAFS) minor that is designed based upon the Heifer Model for sustainable community development through agriculture.

The mission of Heifer is to "work with communities to end hunger and poverty and care for the earth" (Aaker, 1996, p. 123). More than a hunger relief organization, Heifer International focuses on developing self-reliant communities worldwide by improving nutrition and producing income in a sustainable manner (Aaker, 1996, p. 126). With gifts of livestock, seeds, education, and training, Heifer gives a single family the tools to succeed whom then "pass the gift" to other families in the same community (Aaker, 1996, p. 124). One study demonstrates that the presumably simple gift of goats helps develop sustainable communities in 55 countries, because this gift provides food, income, and security (De Vries, 2008). "PASSING GIFTS" is Heifer's cornerstone acronym, which guides projects, practices, and communities (Aaker, 1996, p. 124).

The acronym stands for:

Passing the Gift
Accountability
Sharing and caring
Sustainability and self-reliance
Improved animal management
Nutrition and income
Gender and family focus
Genuine need and justice
Improving the environment
Full participation
Training and education
Spirituality

Utilizing the experiential learning model, students visit the Learning Center at Heifer Ranch and/or Heifer Honduras project sites to “experience some of the challenges of global hunger and poverty—and come away with a re-energized determination to be a part of the solution.” A major solution to the aforementioned challenges is habitual modification to practice sustainability daily, particularly in regard to consumption (Dierolf, Kern, Ogborn, Protti, & Schwartz, 2002). The ASBs teach participants about the organization’s mission, provide students with the opportunity to engage in experiential learning activities about sustainable, individual approaches to ending global poverty and hunger, and how to involve the mission in their daily life through sustainable practices. Kolb and Kolb (2008, p. 2) succinctly describe the important steps in experiential learning that can be applied to sustainable food system education as “a recursive cycle of experiencing, reflecting, thinking, and acting, they can increase their learning power.”

Methods

With livestock, various produce production gardens, and country-specific cooking and energy producing equipment, Heifer Ranch aims to provide a model simulation of the work completed through Heifer in various countries around the world (Heifer International, n.d.). The Heifer Honduras study tour places students directly into the environment where Heifer projects occur (Heifer International, n.d.). These programs provide different levels of immersion, but both aim to educate students about Heifer’s work and mission and how to incorporate them into their daily life through sustainable practices that will help to solve global poverty and hunger. Specifically, through the ASB experiences college students learn that they are part of a socio-ecological matrix in which their personal actions impact living systems on a global, national,

regional, and local level. This study examined the impacts that the Heifer ASB programs had on Virginia Tech college student's perceptions and behaviors regarding sustainable food systems before and after the content and experience of the course.

Research Design

To measure the effectiveness of Heifer's ASB programs on student perceptions and practices about sustainable, community-based food systems, participants provided informed consent and completed a series of surveys, dietary recalls, and a journal. The research questions, measurement, and analysis were generated with the socio-ecological model as a guide (Sallis & Owen, 2008). In addition to examining individual behavior choice, the socioecological model recognizes the interactions with and influences of how layers in the food environment (i.e. individual, interpersonal, organizational, and societal factors) impact food choice (Stokols, 1996).

Using a participatory approach, researchers and Heifer International worked in conjunction to modify ASB curriculum to be appropriate for college-aged students and develop measurement instruments that would answer questions that were useful to both the research team and Heifer staff (Israel, Eng, Schulz, & Parker, 2005). The design was quasi-experimental, using a one-group pre-test, post-test, and follow-up, with no control group. This research primarily seeks to detect changes in and impacts of attitudes, motivation, and behavior towards sustainable, community-based food systems and Heifer's mission. The secondary aim was to detect areas to improve the Heifer ASB program to accommodate college age participants and better address sustainable food systems. Virginia Tech's Institutional Review Board (IRB) approved this study with informed consent provided by all participants. This material is based upon work supported by the USDA HEC under Award No. 2009-38411-19770.

Setting

To prepare for spring break trips, course meetings were held throughout the semester at Virginia Tech (located in Blacksburg, Virginia). Virginia Tech is home to over 30,000 undergraduate and graduate students across nine colleges and a graduate program. The courses were housed within the College of Agriculture, whose mission is to "to provide a multi-disciplinary approach to learning, discovery, and citizen engagement in the fields of science and the business of living systems that makes a positive difference on society" (College of Agriculture and Life Sciences, Virginia Tech, n.d.). The weeklong Ranch ASBs were located in

Perryville, Arkansas, at Heifer's Ranch. The weeklong Honduras study tour was located at Heifer project sites in the central and western portion of Honduras.

Recruitment

The subject pool included all Virginia Tech students (approximately 30,000): 70% white; 7% Asian; 4% black or African American; .6% two or more races; .3% American Indian or Alaska Native; and 7% not reported. For ethnicity, 3% were Hispanics of any race. For gender, 57% were male and 43% were female (Virginia Tech, n.d.). See Table 1.

Virginia Tech's College of Agriculture offered three Heifer ASB courses during spring 2010 and spring 2011. Due to changes in funding, the recruitment of students for the Heifer trips occurred in different ways for each trip. Being unable to attend the ASB was the only exclusion criteria that existed for enrollment in the course and study. For the first Heifer Ranch trip in 2010, student recruitment initially occurred through advertisements to the entire Virginia Tech student body (e.g. flyers, word of mouth, student registration page (called HokieSpa)). Students voluntarily registered for ALS 2984: Engaged Learning Environment I. The course was limited to 25 students, with preference given to underclassmen (i.e. 1st and 2nd year). At the onset of the 2011 school year, an official partnership between Heifer International and Virginia Tech's new Civic Agriculture and Food Systems (CAFS) minor was formed through a USDA Higher Education Challenge grant. Given this partnership, a large part of recruitment for students to enroll occurred through the minor classes, as well as flyers, word of mouth, and HokieSpa for the second Heifer Ranch trip in 2011, with the same course title as Heifer Ranch 2010. This course was limited to 25 students, with preference given to underclassmen. Study exclusion criteria included previous attendance to Heifer Ranch. For Heifer Honduras in 2011, students who previously attended Heifer Ranch in 2010 were first recruited to attend Heifer Honduras Study Tour, course titled ALS 3954: Heifer Honduras Study Abroad. Remaining spaces for the study tour were opened to CAFS minor students. This course was limited to 10 students.

Study Procedures

After enrollment into the ALS courses, students were introduced to the study through an in class announcement. Study protocol (i.e. journals, surveys, and dietary recalls) was a part of the course grade and students provided informed consent if they wanted their information to be included in the study. All students were given a code number and the Heifer ASB baseline survey, regardless if they signed consent or not. After baseline survey completion, students were

given a pre-trip journal prompt and 3-day food record to be completed prior to departure for the Heifer Ranch or Heifer Honduras. During the intensive one-week intervention period, students travelled to Heifer Ranch in Arkansas and/or Heifer Honduras, where they learned about the organization's mission, the challenges of hunger and poverty, and how to build sustainable lifestyles and communities. While at the Heifer Ranch or in Heifer Honduras, students were given journal prompts to reflect upon their experience with a sustainable food system. After the intervention, students were asked to complete a post survey about their respective Heifer ASB and a final journal prompt. One month post ASB, students completed a 3-day dietary recall. One year post Heifer Ranch 2010 and 3 months post Heifer Ranch and Honduras 2011, students were prompted to complete a follow-up survey, 24-hour dietary recall, and participate in a focus group discussion to detect intervention maintenance.

Overview of Alternative Spring Breaks

The Ranch included experiential learning activities that modeled sustainable agriculture that occurs around the world. Experiential learning activities included animal management, farm maintenance, building Ranch structures, and crop planting and harvesting. Beyond activities, students attended classroom sessions to learn about global hunger and Heifer's mission and proposed solutions. During the classroom sessions, student groups identified issues in their local community, worked within Heifer's model to propose solutions, and planned implementation steps.

The Honduras study tour included classroom learning, service-learning projects, and site tours at current Heifer project sites in Honduras. Classroom learning prepared students for the status of hunger, political climate, and culture of Honduras. Service learning involved building structures side by side with a group of peasant farming families who were beginning a sustainable community. Students independently brainstormed issues in their local community that had potential to be solved using Heifer's model.

Measures

Dietary Recalls

Participants completed modified 3-day dietary recalls baseline and post ASB, which aimed at documenting all of the food and beverages consumed during a 3-day consecutive time period, using a detailed portion guideline. As a follow up measure, 24-hour recalls were collected. Both recalls were modified to include a section for documenting the source of food

(i.e. dining hall, grocery store) and method of growing (i.e. organic or local). The purpose of the dietary recalls was to measure changes in local or organic food consumption, signifying dietary engagement in a sustainable community-based food system. Researchers used Rose et al. method of cataloging sustainable food consumption, where participants record whether the food grown or processed locally and/or organically next to each food item identified on a recall (Rose et al., 2008). Participants were prompted to include all foods, with emphasis on including, often under-reported, beverages and snacks. If questions arose about the recall, researchers contacted the participant to clarify information reported. Numerous validity, reliability, and behavior change studies have utilized 3-day and 24-hour dietary recalls (Carter, Sharbaugh, & Stapell, 1981; Posner et al., 1992; Thomson et al., 2003).

Heifer Alternative Spring Break Questionnaire

Questions were developed in partnership with Heifer International Education Programs staff as no other reliable or validated instrument has been developed to assess questions about the impacts of the ASB intensive intervention on attitudes, motivation, and behavior of a sustainable food system at baseline, post, and follow-up (i.e. attitudes towards local or organic foods). Diet-related questions were developed based upon Rose et al. 100-mile diet study (2008) and Virginia Cooperative Extension's *Suppers Made Simple* curriculum (2007). Demographic information was collected.

The main components of the questionnaire addressed participation in and attitudes towards a sustainable community food system. The questions were structured to reflect the socio-ecological model. Questions about sustainable food systems were closed-ended and asked the participant to rank the importance of sustainable food system components (i.e. organics or composting), with 1 being very important and 5 being not important. The questions were tested for content validity with health educators and revised accordingly. The questionnaire took approximately 10 minutes to complete.

Journal Entries

In order to assess individual attitude, motivation, and behavior change about sustainable food systems throughout the course and as a result of the ASB, students responded to journal prompts during Heifer Ranch and Heifer Honduras. Students transcribed journal entries into e-portfolios for personal record and research use. Questions were developed in partnership with Heifer International Education Programs staff and were guided by the Social Cognitive Theory—

where individual behavior, the social and physical environment, and personal factors interact to determine the health behaviors that college students make pre and post program (McAlister, Perry, & Parcel, 2008). Questions focused on the individual's knowledge of Heifer International, expectations about and experiences at the ASB program, cultural values, attitudes towards sustainable agriculture and community development, and individual behavioral practices regarding what was learned at the ASB.

Focus Group Discussions

In order to assess group attitudes and behavior change about sustainable food systems throughout the course and as a result of the ASB, students were asked to participate in follow-up focus group discussions. The focus group discussions served to track progress on and barriers to planned projects within their local community (See Overview of Alternative Spring Breaks) as well as adherence to practices that support a sustainable food system. Questions were developed in partnership with Heifer International Education Programs staff. The Social Cognitive Theory was used as a guide to design and interpret focus group questions in order to determine and interpret the interactions between individual behavior, the social and physical environment, and personal factors in regards to sustainable, community-based food system practices that college students participate in pre and post program (McAlister et al., 2008). Questions were semi-structured and focused on motivation for participation in the ASB, impacts on personal food behaviors and the program in general, barriers to long-term behavior maintenance, perceptions about the effect that personal behaviors have on the surrounding environment, suggestions for ASB program and course improvement at Virginia Tech, and progress about community projects planned at the Ranch and in Honduras. A trained moderator and note taker conducted two focus groups for one hour each. Participants were randomly divided into two groups to obtain an optimal number of participants in each group (Krueger & Casey, 2009). All focus groups were audio-recorded using Olympus WS-110 digital voice recorders.

Analysis

All quantitative dietary and survey data was entered into Microsoft Excel (Microsoft Corporation, 2008), and then converted into SPSS statistical software, version 11.0 (SPSS Inc., 2009). All data were analyzed as three independent groups (Ranch 2010, Ranch 2011, and Honduras 2011) and as one total group. Descriptive statistics and frequencies were computed using questions on qualitative surveys regarding demographics of participants, overall dietary

quality, and attitudes towards sustainable food systems (i.e. local, organic). Wilcoxon Signed-Rank Test was used to calculate changes in ordinal or interval questionnaire data regarding attitudes towards sustainable food systems at baseline, post, and follow up. Kruskal-Wallis Test or Pearson's chi square test of independence (X^2) was used to detect differences between groups regarding ordinal or interval questionnaire data.

Information from all dietary records was entered into the Nutritionist Pro Diet Analysis Module (First Data Bank, 2006). Nutritionist Pro contains up-to-date food and nutrient data for over 35,000 foods and ingredients, including brand name, fast foods, ethnic foods, and enteral products. This paper reports changes in the percentage of total, local, and organic average kilocalories per day consumed from baseline to post intervention. Total kilocalories were obtained from each individual's nutrient summary generated by Nutritionist Pro. Dietary recalls were used to identify local or organic foods as indicated by each participant. For 3-day dietary recalls, averages were computed for all three days. Average daily kilocalories of food consumed locally and organically from recall information was divided by average kilocalories per day from Nutritionist Pro. Paired t-tests were used to test the effect of the intervention on dietary intake for total kilocalories of total, local, organic, the sum of local and organic foods, and changes in dietary quality. To assess changes in dietary quality due to increased local and organic food consumption, individuals that increased local and organic food intake were separated from individuals that decreased local and organic food intake. Paired t-tests were used to analyze the effect that increases or decreases in local and organic food consumption had on macro- and micro- nutrient and consumption and fruit and vegetable intake.

Journal entries and focus groups were transcribed and coded for major and minor themes following a ground theory approach using the constant comparative method described by Patton (Patton, 2002). Questions and responses specifically garnering insight about food system attitudes, motivation, and behaviors and evaluation of the Heifer ASB trip will be reported in this analysis. Codes were categorized into themes. A second researcher listened to recordings (for focus group discussions) and verified transcripts, codes, and themes (for journals and focus group discussions). Participant responses were then retrieved from transcripts to support themes.

Two separate analyses were conducted for questionnaires and dietary recalls—one analysis for participants that completed pre to post data and an additional analysis for participants that completed pre to post to follow up data. From pre to post, 39 individuals (Heifer

Ranch 2010 $n = 19$; Heifer Ranch 2011 $n = 12$; Heifer Honduras 2011 $n = 8$) completed measurements. Baseline to post results are reported for the groups independently and combined below. From pre to post to follow-up, 22 participants (Ranch 2010 $n = 14$; Ranch 2011 $n = 4$; Honduras 2011 $n = 4$) completed measurement data. Because of these low numbers, follow-up data from all three groups was combined into one group and analyzed accordingly.

Results

Participants

There were no significant differences ($p < .05$) found between participants present at follow-up and baseline to post based upon demographics, frequency of campus dining, or enrollment in CAFS minor using Kruskal-Wallis Test. There were no significant ($p < .05$) differences in the amount of local and organic kilocalories or micro- and macro- nutrients consumed at baseline or post using an independent t-test.

Demographics	Ranch 2010	Ranch 2011	Honduras 2011	Pre-Post	Follow-Up	VT
Enrollment (n)	20	12	8	39	22	28,687
Gender (%)						
Male	21	17	13	18	18	58
Female	79	83	87	82	82	42
Race (%)						
White	90	83	87	87	91	77
Asian	5	8	13	8	0	7
Other	5	8	0	5	9	NA
College Level (%)						
Freshman	40	42	0	32	18	18
Sophomore	15	8	25	15	23	NA
Junior	15	33	13	21	18	NA
Senior	20	17	50	26	36	NA
5 th Year Senior	0	0	13	3	0	NA
Masters	0	0	0	0	0	NA
PhD	10	0	0	3	5	NA
Age ($M \pm SD$)	21 \pm 4	21 \pm 3	21 \pm 1	21 \pm 3	20 \pm 5	NA
CAFS minor (%)						
Enrolled	21	67	75	54	50	.11
Not enrolled	79	33	25	46	50	99.9

Baseline to Post Data.

Overall, 43 participants were eligible to participate in Heifer ASBs. In the end, 39 participants provided informed consent and completed all pre-survey protocol (Heifer Ranch 2010 $n = 19$; Heifer Ranch 2011 $n = 12$; Heifer Honduras 2011 $n = 8$). One participant did not

complete post or follow-up data. Another participant only completed the post survey, and not the post dietary recall. (No significant ($p < .05$) differences were found between these participant's pre-data completed and the larger group.) Four participants out of 39 (10%) participants attended both Heifer Ranch 2010 and Heifer Honduras, meaning that 36 individuals were involved in all three studies, but data was collected twice for four participants. The four individual's data is reported twice as ASB groups are analyzed independently as three groups and as a total group.

For the entire baseline to post participant pool ($n = 39$), the majority was female, white, and had a mean age of 21. Most participants were undergraduates, with only two graduate student enrolled in Heifer Ranch 2010 at baseline. See Table 1 for demographic description of independent groups, combined groups, and Virginia Tech demographics (white, Asian, and other categories are only reported in the race row as no other races attended the ASB program). A large number of participants ($n = 22$) represented the College of Agriculture and Life Sciences, while the other half represented six out of nine Virginia Tech Colleges. Several students ($n = 21$) were currently enrolled in the CAFS minor, which focuses specifically on sustainable food systems. A majority of participants rated their health as good to excellent at baseline.

Baseline to Post to Follow-Up Data.

For the follow-up participant pool ($n = 22$), the majority was female, white, and had a mean age of 20. See Table 1. Most participants were undergraduates, with one graduate student completing follow-up data. Many participants ($n = 13$) represented the College of Agriculture and Life Sciences, while the others represented five out of nine Virginia Tech Colleges. Ten participants were enrolled in the CAFS minor. A majority of participants rated their health as good to excellent at baseline.

Heifer Alternative Spring Break Questionnaire

Baseline to Post Data.

Heifer Ranch 2010 ($n = 19$), Heifer Ranch 2011 ($n = 12$), and Heifer Honduras ($n = 8$) differed in baseline to post changes regarding rank order questions tested: 1) the importance of climate change, composting, biodiversity, natural resource use, over consumption, pollution, recycling, and waste; 2) interest in foods that are organic, fair trade, local, cheap, humanely treats animals, protects the earth, or healthier. Specifically, Heifer Ranch 2010 significantly increased the importance they placed on the following issues: composting ($z = 1.67, p < .05$); natural resource use ($z = -2.12, p < .05$); recycling ($z = -2.07, p < .05$); and food that protects the earth (z

= -2.24, $p < .05$). No significant ($p < .05$) differences were detected for Heifer Ranch 2011. For Heifer Honduras, significant increases were noted for recycling ($z = -2.00, p < .05$) and waste ($z = -2.00, p < .05$). There were no significant ($p < .05$) differences for any groups when asked how many miles food should be grown within to be labeled ‘local’ or the perceived percentage of sustainably produced food consumed. When combined, there was a significant increase in the importance places of fair trade food from pre to post ($z = -2.35, p < .05$). There were no significant ($p < .05$) differences noted between ranks of each group regarding the sustainable food systems survey using the Kruskal-Wallis test.

Baseline to Post to Follow-Up Data.

From baseline to post to follow-up, 22 participants completed follow-up survey data (Ranch 2010 $n = 14$; Ranch 2011 $n = 4$; Honduras 2011 $n = 4$). As a group, significant increases occurred in the importance participants place on the following components: overconsumption from baseline to post ($z = -2.24, p < .05$); waste from baseline to post ($z = -2.97, p < .05$), baseline to follow-up ($z = -2.00, p < .05$), and post to follow-up ($z = -2.12, p < .05$); and local foods from baseline to post ($z = -4.16, p < .05$) and baseline to follow-up ($z = -4.18, p < .05$). In addition significant decreases were found about the importance of food ‘being cheap’ from baseline to post ($z = -2.44, p < .05$) and pre to follow-up ($z = -2.51, p < .05$). There were no significant ($p < .05$) differences found between the ranks of each group regarding the sustainable food systems survey using the Kruskal-Wallis test.

Dietary Quality

Baseline to Post Data.

Thirty-eight participants (Ranch 2010 $n = 18$; Ranch 2011 $n = 12$; Honduras 2011 $n = 8$) completed 3-day dietary recalls from baseline to post. See Table 2. There were no significant ($p < .05$) differences found in percentage of local or organic kilocalories consumed by participants or total kilocalories reported when analyzing the three ASB groups independently from baseline to post, based upon a paired t-test. Significant ($p < .05$) differences were found when all three groups were combined for local and organic foods. For participants that consumed less than 50% of their calories from local or organic foods at baseline ($n = 19$), however, significant increases ($p < .05$) occurred in the percentage of local ($M_{pre} = .01, SD_{pre} = .02$; $M_{post} = .06, SD_{post} = .09$) or organic ($M_{pre} = .04, SD_{pre} = .05$; $M_{post} = .15, SD_{post} = .16$) foods consumed from baseline to post in local and organic food consumption separated and combined, based upon a paired t-test. For

participants ($n = 19$), that consumed greater than 50% of their calories from local ($M_{pre} = .20$ $SD_{pre} = .18$; $M_{post} = .19$ $SD_{post} = .15$) or organic ($M_{pre} = .26$ $SD_{pre} = .17$; $M_{post} = .28$ $SD_{post} = .19$) foods at baseline, no significant ($p < .05$) increases or decreases were found at post.

Table 2. Mean Percentage of Local and Organic Kilocalories out of Total Kilocalories Consumed from Pre to Post Three Heifer Alternative Spring Break Trips*

	Calories** Pre	Calories Post	Local Pre	Local Post	Organic Pre	Organic Post	Sum*** Pre	Sum Post
Ranch 2010	1865.8 ± 719.49	1719.8 ± 739.2	.14 ± .21	.13 ± .17	.13 ± .18	.19 ± .20	.27 ± .35	.33 ± .29
Ranch 2011	1807.4 ± 353.6	1681.3 ± 532.3	.07 ± .09	.13 ± .12	.14 ± .16	.17 ± .12	.21 ± .24	.30 ± .17
Honduras 2011	1468.0 ± 240.5	1257.7 ± 256.9	.08 ± .09	.10 ± .10	.21 ± .15	.33 ± .20	.28 ± .23	.43 ± .26
Combined	1763.6 ± 557.3	1610.4 ± 627.3	.11 ± .16	.13 ± .14	.15 ± .17 ¹	.22 ± .18 ¹	.28 ± .23 ²	.43 ± .26 ²

*All data reported as mean ± SD

*Similar superscripts across rows denote significant ($p < .05$) changes within a food category based on paired and unpaired t-test.

**Measured in kilocalories (kcal)

***Local and organic combined

When examining whether an increase in the percentage of local and organic food consumption impacts dietary quality, there were no significant ($p < .05$) differences in micro- or macro- nutrients or fruit and vegetable consumption. Based upon Pearson's chi square test of independence (X^2), no significant ($p < .05$) differences were found based upon if a student consumed greater than 50% of food from dining halls on campus or not. Using an independent t-test, there were no significant ($p < .05$) differences found in dietary intake from baseline to post based upon those who attended Heifer Ranch and Heifer Honduras ($n = 4$) and those that only attended one Alternative Spring Break ($n = 34$).

Baseline to Post to Follow-Up Data.

A separate analysis was completed for follow-up data. At follow-up, participants were prompted to complete a 24-hour recalls instead of a 3-day recall to reduce respondent burden, but still, measurement completion rates were low (Ranch 2010 $n = 14$; Ranch 2011 $n = 4$; Honduras 2011 $n = 4$). Because of these low numbers, follow-up data from all three groups was combined into one group and analyzed using a paired t-test in respect to matched baseline and post 3-day dietary recalls. There were no significant ($p < .05$) differences found in participants present at follow-up based upon demographics, frequency of campus dining, or enrollment in CAFS using

Pearson's chi-square analysis, or amount of local and organic kilocalories consumed at baseline or post using an independent t-test.

For these 22 participants, there were significant ($p < .05$) differences in the percentage of local foods consumed from pre ($M = .13$, $SD = .19$) to and post ($M = .13$, $SD = .15$) to follow-up ($M = .26$, $SD = .22$). Like the baseline to post only group, significant increases ($p < .05$) were also noted in the percentage of organic foods consumed from pre ($M = .14$, $SD = .15$) to post ($M = .24$, $SD = .19$) and the sum percentage of local and organic foods combined from pre ($M = .27$, $SD = .29$) to post ($M = .37$, $SD = .26$). No significant ($p < .05$) differences were found with the total number of calories reported throughout the three observation periods ($M_{pre} = 1772.3$ $SD_{pre} = 544.2$; $M_{post} = 1610.4$ $SD_{post} = 627.5$; $M_{FU} = 1731.2$ $SD_{FU} = 460.8$). For participants that consumed less than 50% of their calories from local or organic foods at baseline ($n = 11$), significant increases ($p < .05$) occurred in the percentage of local from baseline to follow-up ($M_{pre} = .01$ $SD_{pre} = .02$; $M_{FU} = .2$ $SD_{FU} = .19$) and post to follow-up ($M_{post} = .04$ $SD_{post} = .07$; $M_{FU} = .2$ $SD_{FU} = .19$), and in organic foods from pre to post ($M_{pre} = .04$ $SD_{pre} = .04$; $M_{post} = .17$ $SD_{post} = .15$) and pre to follow-up ($M_{pre} = .04$ $SD_{pre} = .04$; $M_{FU} = .25$ $SD_{FU} = .23$) and the sum of local and organic foods across all observation periods ($M_{pre} = .05$ $SD_{pre} = .06$; $M_{post} = .21$ $SD_{post} = .13$; $M_{FU} = .46$ $SD_{FU} = .31$). For participants ($n = 19$), that consumed greater than 50% of their calories from local ($M_{pre} = .24$ $SD_{pre} = .21$; $M_{post} = .21$ $SD_{post} = .17$; $M_{FU} = .31$ $SD_{FU} = .24$) or organic ($M_{pre} = .24$ $SD_{pre} = .15$; $M_{post} = .31$ $SD_{post} = .21$; $M_{FU} = .51$ $SD_{FU} = .27$) foods at baseline, no significant ($p < .05$) increases or decreases were found at post or follow-up. No significant ($p < .05$) differences in micro- or macro- nutrients or fruit and vegetable consumption across observations as a result of increased or decreased local and organic food consumption.

Journal Entries

Participants enrolled in the Heifer ASB programs were prompted to respond to journal questions throughout the course and trip as a way to promote personal reflection and collect individual level qualitative data regarding the experience. With the exception of the two graduate students enrolled, all study participants ($n = 37$) completed journal entries. Themes are reported by the researcher and separated into subthemes. Quotes will be reported that represent one or more sub-themes, but not every sub-theme will be represented.

Information known about Heifer International previous to trip attendance.

The three ASB groups knew very different information about Heifer International before attendance. In general, Heifer Ranch 2010 knew very little about Heifer International, barring surface level information gathered from their website and through family donations to the non-profit. Several of Heifer Ranch 2011 participants knew extensively about the organization and Ranch experiences through peers, the CAFS minor, and church programs. Heifer Honduras participants were very aware of Heifer International due to previous ASB experience at the Ranch or enrollment in the Heifer minor.

Defining sustainable agriculture.

Participants defined sustainable agriculture in different ways, depending on previous knowledge and previous experiences, especially in regards to coursework. One participant that was fairly new to the concept reported,

“My newfound definition of sustainable agriculture is a farming practice that aims to establish a successful system that benefits the entire community. It is also meant to enhance the environmental quality and availability of the natural resources for which the agricultural economy depends on. Instead of focusing on the individual and maximum profit, sustainable agriculture instead focuses on the quality versus the quantity” [Heifer Ranch 2010].

Across groups, sub-themes that emerged regarding sustainable agriculture included community development, environmental consciousness, social justice (e.g. solving hunger), and defining it as a small, but emerging grassroots movement.

Levels of Immersion.

In general, participants at Heifer Ranch wished for a deeper level of immersion in activities. For example, while at Heifer Ranch, participants spend the night in Heifer Ranch’s construction of model houses from countries where their non-profit work exists around the world. For example, participants stay in a Zambian hut, a concrete Guatemalan house, or slums mirrored from urban shacks existing in cities from less-developed countries around the world. Heifer Honduras is a completely different level of immersion, experiencing the real life of a less developed country. Participants in the Global Village reported learning a great deal about community development from specific scenarios they were given to solve, but wished that there were a deeper level of immersion and simulation. Participants in Honduras reported feelings of surprise, guilt about their own ‘excessive’ lifestyle, and a desire to change the situation of poverty and hunger after being deeply immersed in the Honduran culture.

“The most challenging thing about today was guilt. I’m having a really hard time not feeling bad about the fact that I was born into a situation where I am so privileged while the majority of others in the world live in poverty or in repressive societies. Walking downtown today I felt as if I was flaunting how well off I was to the poor Hondurans in the city by playing tourist and taking pictures of 12 year old kids who beg and live on the street” [Heifer Honduras 2011].

Passing the Gift.

When asked how each participant planned to pass the gift of knowledge about community development learned at the Heifer ASB, themes emerged about supporting community-food systems, sharing information about Heifer International, and integrating sustainable agriculture learning in coursework.

“Since Spring Break I have been much more conscious of decisions I make and actions I take. I ride my bike more often instead of driving my car while encouraging my roommates to use alternative forms of transportation. I have also begun to buy more groceries more frequently from Eats, a local grocery store, looking first for fair trade products, then organic and as close to this area as possible ... I have been volunteering more in my service frat and have been spreading messages and opportunities for members of my frat to be conscious of the food decisions that they make” [Heifer Ranch 2010].

The resultant grounded theory from journal entries reveal that participant’s enter Heifer ASB with various levels of knowledge about Heifer International and sustainable food systems, both of which may influence behavioral changes made. In addition, participant’s desired a deeper level of immersion, especially at Heifer Ranch, which may also influence short- and long- term changes made in regards to sustainable food systems. Lastly, students desired to “pass the gift” through community-food system changes, which provides further support about the effects of Heifer ASB on sustainable food systems.

Focus Groups

Two focus groups were conducted with all three Heifer ASB programs. Participants included 52% ($n = 10$) from Ranch 2010, 67% ($n = 8$) from Ranch 2011, and 88% ($n = 7$) from Honduras. Overall, 64% ($n = 25$) from all three trips participated. Themes were reported by the researcher and separated into sub-themes. Quotes will be reported that represent one or more sub-themes, but not every sub-theme will be represented.

Motivation to participate in Heifer Alternative Spring Break program.

Students were motivated to participate in Heifer's ASB programs for four distinct reasons: 1) To see Heifer's model in action; 2) Interest in sustainable food systems 3) Recruitment through word of mouth; and 4) CAFS minor.

"I am really interested in food and food systems and Heifer's work ... Their model is really integrated with the Civic Ag minor ... I had only heard of Heifer on the capacity of buy your mom a package of bees rather than, I don't know, a tea kettle ... and I really wanted to see that on a larger scale" [Heifer Ranch 2011].

Effects of Heifer Alternative Spring Break program on individual behaviors.

Students identified the impacts that Heifer ASB had on individual behaviors as: 1) Change in professional goals to include community development through food; 2) Involvement in community development related to food; 3) Greater consciousness about food choices; and 4) Confirmation of previously existing sustainable food practices.

"I think that trip really made me personally, and I know from talking to others that they feel the same way, it just makes you a lot more conscious about where you're getting your food from because you see how much labor goes into producing a bushel of coffee ... the choices I make as a consumer now, to have an understanding of the purchasing power of my dollar, and how that can effect other people's livelihoods" [Heifer Ranch 2010 and Honduras 2011].

Perceptions of effects of individual behavior on the environment.

Participants described the following individual behaviors as influencing the physical and social environment around them: 1) Composting; 2) Gardening; 3) Consuming less food and material goods to reduce waste; and 4) Influencing peers with personal behaviors.

"I just built a compost area at my house ... I just love seeing that sitting in my kitchen knowing that it's going to go out to my kitchen, and eventually in my garden ... [my roommates] understand the value of it ... I mean they see it on your face that you love it so much and they think well it has a to be a good thing so they might do it themselves in the future" [Heifer Honduras 2011].

Barriers to behavior change.

Although students were very interested in sustainable, community-based food systems, they also identified barriers to maintaining behavior change: 1) Finances; 2) Campus dining plan; 3) Changing routine; and 4) Convenience.

"When we spent a week on the Ranch that was it. That is what we did everyday for a week. We went out and were weeding gardens, fixing beds, and spreading compost and building things. It was great and then we come back and, as we said, we all have our routines. I wish I could spend more time in my garden. I am a full time student, I have a

family; I don't have the time that we had when we were there. So life gets in the way" [Heifer Ranch 2010].

Progress and maintenance of planned community projects.

As mentioned previously, students brainstormed community-based projects while at Heifer Ranch and were asked to identify projects individually at Heifer Honduras. Although not required, students chose to focus on using the Heifer model to focus on solving community-based food system issues. Project examples included: incorporating sustainable food system content into coursework; increasing the amount of local and organic food in dining halls; installing demonstration sustainable gardens on campus; and, starting a resident hall composting program. The first two projects were ultimately implemented at Virginia Tech through the CAFS minor and a more sustainably focused dining program, but not entirely as a result of the direct work of Heifer student groups. The second two projects are currently being planned with highly motivated student groups.

"The projects haven't happened and they're kind of far from it, but I think that they will. I feel that they will just because I mean when I'm trying to do it and it's not going the way I want I think oh God I just don't want to do this anymore. But then, in the back of my head I think you know what you just have to. So I think the fundamental Heifer model speaks to something innate within people, that speaks to their fundamental understanding of getting a project accomplished" [Heifer Ranch 2011, demonstration garden group participant].

Recommendations for Heifer Alternative Spring Break programs.

On the whole Heifer Ranch and Honduras participants felt satisfied with their experience. A few recommendations for further integrating the ASB curriculums were given: 1) prepare a pre trip curriculum for universities to better prepare students for experiences; 2) more experiential learning; 3) connecting the Heifer Ranch and Honduras trips into a stepwise experience; and 4) facilitate deeper level learning.

"It sounds like the Honduras people saw a lot more specific sustainable solutions to end global hunger and poverty and environmental degradation, whereas the Ranch was more like the theory behind it, passing the gift and grassroots [change] and it was more broad and abstract. Even some like minor details like the ... animals that stay in the pens and the manure drops down [at the Ranch]. Like smaller, detailed components and methods, and then like the methods were like briefly touched on but you could have gone deeper" [Heifer Ranch 2010].

The resultant grounded theory from focus group discussions reveals that peer influence, the CAFS minor, and interest in Heifer and sustainable food systems influenced Heifer ASB enrollment. In general, short- and long- term changes in regards to food system participation

occurred and student's perceived their own actions as influencing the social and physical environment around them as a result of Heifer ASB, but overall there were several barriers to maintaining behavior changes and modifications made were potentially influenced by a desire for a deeper level of immersion.

Discussion

Significant increases in the percentage of local foods consumed were reported from individuals that completed follow-up dietary recalls, but there were no significant differences found in individuals that completed pre- to post- surveys only. Survey data indicated that those participants who completed follow-up data placed increased importance on local foods, waste management, and overconsumption and decreased importance on the price of food as the study progressed. Perhaps these interests account for the difference of change in percentage of organic food consumption for baseline to post and the follow-up group, especially as the perception of high prices for organic and local foods proliferates (Pirog & McCann, 2009).

For participant data from pre to post, the intervention is correlated with increases in local and organic food consumption for individuals that consumed less than 50% of their calories from local and organic foods at baseline. Although increases in local and organic foods were observed, there was no change in dietary quality. This is contrary to findings in the 100-mile diet study (which studied the impacts of a one-month local foods diet on participants dietary outcomes), where participants increased their local food intake to 81% of kilocalories (Rose et al., 2008). In Rose et al. study (2008), fruit and vegetable intake increased by 1.4 servings and other significant macro- and micro- nutrient outcomes were found. Perhaps the percentage (30% to 40%) of local and organic foods found in participant's diets is not a large enough intervention effect to change dietary outcomes. Another explanation is that many organic foods can be purchased at the grocery store and are not necessarily healthy foods (i.e. organic ice cream, organic cheese puffs). Possibly focusing on a local foods diet only increases dietary quality because it necessitates increased fruit and vegetable consumption. Lastly, Rose's (2008) study lasted for one month, while this intervention lasted one week. Even though the intervention was intensive, the effect may not be as strong as with interventions occurring for longer periods of time.

Focus groups and journal entries facilitated reflective thinking within individuals and as a group, and also facilitated researchers in gathering introspective thoughts about the Heifer

experience and impacts (Krueger & Casey 2000). Several themes emerged about a sustainable, community-based food system that indicated participants changed their attitudes and behaviors. Barriers to change acknowledged by study participants are similar to those identified in literature about food choice, namely convenience and finances (Glanz, Basil, Maibach, Goldber, & Snyder, 1998). As an example of the usefulness of focus group and journal entry information, several students identified being restricted to campus dining halls as a barrier for change. The dietary recall analysis indicated that in reality there were no significant differences in percentage of local and organic foods. Participants also indicated different levels of knowledge about sustainable food systems and Heifer's model at pre due to coursework, peers, or life experiences, but this level of knowledge did not translate into significant differences in dietary practices from pre to post to follow-up. Perhaps this can be explained by the "attitude-behavior intention" disconnect described by Vermeir and Verbeke (2006). They explain that even with a positive attitude towards sustainable food systems, purchasing behaviors are not always consistent with an individual's belief system.

The entirety of all results show that behavioral and attitude changes were made in regards to community-food system participation, but changes in local and organic food consumption was contingent on a low level of intake before the Heifer ASB. These results can be corroborated with participant's desire for a deeper level of immersion on the trips. To find significant dietary changes in all participants, Heifer should consider more graduated and less elementary programming for participants. In addition, participants identified long-term changes (i.e. switching career paths) that could be measured through longitudinal studies to document the greater impacts that Heifer ASB has beyond dietary changes.

Limitations

The research design of this study included no control group, possibly inhibiting conclusions about causality and generalizability. Researchers used several dynamic qualitative and quantitative measures to account for potential validity biases arising from the research design. Participants likely to enroll in the ASB programs have similar demographics to findings reported with individuals who participate in community-based food systems in the general population (i.e. female, white, and highly educated), thus inhibiting the generalizability of the study to more diverse populations. In addition, participants were more like to be undergraduate (95%) than graduate students, confining generalizability to an undergraduate population.

Participants arrived at the Heifer ASB with various levels of knowledge and behaviors regarding sustainable community food systems and the Heifer model, especially in regards to Heifer Ranch. This inhibited deeper level learning about sustainable food systems and Heifer International when desired, possibly changing the intervention effect.

Conclusions

As the first report about the dietary impacts of Heifer's ASB programs, potential changes in attitudes and behaviors regarding sustainable, community-based food systems were found. Further studies should test the impacts of the ASB with more diverse college groups from different universities and possibly as a longitudinal study. In fact, Heifer International's College and University Advisory Council is currently investigating approaches to facilitate ASB experiences for a broader scope of college-aged students and methods to further measure the impacts of these programs.

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CHAPTER 6

Conclusions

Alarmingly high and still-increasing rates of overweight, obesity, and chronic disease have given rise to a public health crisis. That these issues are directly related to dietary quality has prompted public health advocates to scour the food environment for simple, cost-effective strategies to positively affect public health outcomes. In such pursuits, modifying the structure and scale of the food system has been proposed as one viable method for improving the food environment. With clear theoretical health benefits, many researchers are promoting community-based food systems as an emerging area with promise for creating healthier food environments. Generally, community-based systems aim for a socio-ecological restructuring of the food environment via the promotion of sustainability, relational proximity, self-reliance, and individual as well as community food security. Even with well-defined objectives, there is little scientific evidence that demonstrates the dietary impacts and public health outcomes resulting from a community-based food systems approach. This dissertation sought to enrich the evidence-base by conducting two primary research projects. Each was focused on providing support for community-based food systems with partnerships formed with two organizations—first a federally-funded low-income pre-school program, Head Start, and second, a non-profit, Heifer International.

By implementing a local fruit and vegetable delivery program, Fresh Produce, Fresh Start at Head Start demonstrated several positive dietary outcomes for participants. As reported, large and significant increases (2.5 servings) were seen in the fruit and vegetable intake of study participants. Even with significant increases seen from pre- to post intervention, participant's confidence to eat five or more servings of fruits and vegetables per day did not substantially increase. Although Fresh Produce, Fresh Start aimed to decrease several well-documented barriers (i.e. issues of access, availability, and affordability) to maintaining healthy levels of fruit and vegetable consumption (especially for limited resource individuals), obstacles persisted when the delivery program was not in place (i.e. after the intervention). This finding therefore suggests that programs aiming to integrate limited resource individuals into a community-based food system may in fact improve dietary intake. However, more attention must focus on long-term sustainability changes to the food environment in order to encourage maintenance of intervention outcomes.

In addition, data from receipts about purchasing patterns further verified the findings about fruit and vegetable results reported from dietary recalls. Food receipts are one method to study home availability of foods, which are ultimately impacted by the ability of an individual to access, available and affordable healthy foods within a particular food environment. The free and local fruit and vegetable delivery positively changed both access and availability to fresh produce in the home for the eight weeks that the intervention was in existence. With significant increases in the proportion of produce purchased found (both in the number of items and food expenditures), food receipt data indicated that participants sought to maintain increases in fruit and vegetable intake after the intervention. Participants and community partners expressed positive feedback about the continuation of Fresh Produce, Fresh Start beyond the intervention period, attesting to the benefit that the program provided.

Lastly, a partnership between Heifer International and Virginia Tech aimed to promote sustainable, community-based food system consumption in college students through an intensive Alternative Spring Break program. While there were significant changes in the percentage of local and organic foods consumed, there were no positive or negative impacts from such alternative dietary patterns. With that said, changes were seen in participants' beliefs, attitudes, and behaviors regarding support for community-based food systems. However, such ideological changes did not necessarily translate into healthier dietary practices. Although other studies have seen positive dietary impacts resulting from the consumption of local foods, this study did not. Researchers should examine if there is a proportion of community-based food system foods from the total diet that likely promotes healthier dietary outcomes.

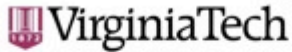
Additional research should explore the impacts that consuming food from a community-based food system has on public health outcomes, particularly given recent evidence of nutritional benefits of fresh produce and (limited) organically-produced food, such as grass-fed beef. While several measurement tools for examining associations between the food environment and dietary impacts already exist, few are valid or reliable. For example, food receipts are one method for capturing food purchases, but data analysis of receipts is tedious and not feasible outside of a research setting. There are very few reliable and valid questionnaires available that accurately capture changes in participant beliefs about community-based food systems.

Given significant public interest in community-based food systems, including from the White House, it is imperative that public health researchers work to advance the burgeoning field

of community-based food systems. Doing so in a timely manner will establish their relative significance within a dynamic food environment. If positive results are found, community-based food systems will be strongly positioned as one strategy for positively changing the food environment – not to mention addressing serious concerns with climate change, diminishing water and soil – thereby benefiting individual, social, community, and policy factors from a socioecological perspective.

Appendix A

Fresh Produce, Fresh Start: IRB Approval Letter



Office of Research Compliance
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Blacksburg, Virginia 24061
540/231-4991 Fax 540/231-0959
e-mail moored@vt.edu
www.irb.vt.edu

PWA00000572, expires 1/22/2010
IRB # is IRB00000567

DATE: August 4, 2009

MEMORANDUM

TO: Elena L. Serrano
Carmen Byker

FROM: David M. Moore 

Approval date: 8/4/2009
Continuing Review Due Date: 7/20/2010
Expiration Date: 8/3/2010

SUBJECT: **IRB Expedited Approval:** "Fresh Produce, Fresh Start", IRB # 09-634

This memo is regarding the above-mentioned protocol. The proposed research is eligible for expedited review according to the specifications authorized by 45 CFR 46.110 and 21 CFR 56.110. As Chair of the Virginia Tech Institutional Review Board, I have granted approval to the study for a period of 12 months, effective August 4, 2009.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.
3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtain re-approval from the IRB before the study's expiration date.
4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

Important:

If you are conducting **federally funded non-exempt research**, please send the applicable OSP/grant proposal to the IRB office, once available. OSP funds may not be released until the IRB has compared and found consistent the proposal and related IRB application.

cc: File

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Appendix B

Fresh Produce, Fresh Start: IRB Continuation Approval



VirginiaTech

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MEMORANDUM

DATE: July 8, 2010

TO: Elena L. Serrano, Carmen Byker

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires June 13, 2011)

PROTOCOL TITLE: Fresh Produce, Fresh Start

IRB NUMBER: 09-634

Effective August 4, 2010, the Virginia Tech IRB Administrator, Carmen T. Green, approved the continuation request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

PROTOCOL INFORMATION:

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 4, 5, 7**

Protocol Approval Date: **8/4/2010** (protocol's initial approval date: 8/4/2009)

Protocol Expiration Date: **8/3/2011**

Continuing Review Due Date*: **7/20/2011**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Appendix C

Fresh Produce, Fresh Start: Informed Consent

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Fresh Produce, Fresh Start

Investigator: Elena Serrano, Ph.D.

Co-PI: Carmen Byker

I. Purpose of this Research/Project

The purpose of this study is to promote local fruit and vegetable intake in mothers at Head Start and measure the impact on diet and purchasing patterns.

II. Procedures

All Head Start mothers (the participants) in Christiansburg are invited to join this study. If you are pregnant or have chronic disease(s), you cannot be in the study.

As a participant of the Fresh Produce, Fresh Start program, you will be asked to participate in a fruit and vegetable delivery program. The timeline is as follows:

-Family night: All Head Start mothers will be given an announcement about the study and consent form. If interested in participating (shown by signing consent form), all eligible Head Start mothers will be given a letter with their assigned code number and questionnaires. All questionnaires, surveys and study documents will be given a one week deadline to return back to researchers. Mothers will be given directions at a short meeting that night on completing a 24 hour food recall (intake) (10 minutes), questionnaire to assess physical activity (expenditure) (5 minutes), questionnaire to assess social desirability (5 minutes), food security questionnaire (5 minutes) and study questionnaire (5 minutes) to complete and asked to return within one week. Additionally, mothers will be asked to collect ALL food receipts for four weeks. Height and weight taken to calculate Body Mass Index (BMI).

-Weeks 1-4: Mother will collect ALL food receipts, save and send in with child weekly. Child will place receipts in 'cubby' and researcher will pick up.

-During week 4: Participate in a 24 hour food recall (10 minutes) and have height and weight taken* to calculate Body Mass Index (BMI).

-Weeks 5-12: Produce baskets will be made available to mothers. The mother's child will bring produce basket home on the Head Start bus. At each weeks end, the mother will fill out short survey (10 minutes) detailing individual produce consumption during the week and turn in with empty basket. Additionally, participants will turn in weekly food receipts.

-Week 8: Participate in a 24 hour food recall (10 minutes).

-Week 12: Participate in a 24 hour food recall (10 minutes), study questionnaire (5 minutes) and have height and weight taken* to calculate Body Mass Index (BMI).

-Weeks 13-16: Mother will collect ALL food receipts, save and send in with child weekly. Child will place receipts in 'cubby' and researcher will pick up.

-Week 16: Partipate in a 24 hour food recall (10 minutes), complete study questionnaire (5 minutes) and have height and weight taken* to calculate Body Mass Index (BMI).

*Head Start has agreed to pick up all mothers (using the Head Start van) participating in the study and bring to the preschool in Christiansburg in order to take height and weight measurements.

III. Risks

Risks are that some questions contain potentially sensitive information, which if released in conjunction with the mother may be considered negative. All efforts to ensure anonymity and confidentiality will be ensured to eliminate this risk altogether. There is a small risk that a foodborne pathogen could be transferred to the participant via the fruits and vegetables, resulting in illness. The risk is no greater than purchasing produce at the grocery store or restaurant however. All efforts will be made to choose vendors that follow safe agricultural practices that will minimize this risk. Finally, transportation to and from Head Start for BMI measurements may pose risks from road travel.

IV. Benefits

Mothers will receive free produce and information from produce baskets to encourage healthy habits and promote their overall health. Additionally, participation in this study may change eating habits for family and friends if the mother thinks increased fruit and vegetable consumption is beneficial.

V. Extent of Anonymity and Confidentiality

We will assign a user number to you, which will take the place of your name on the survey and for all analyses and reports. These responses will be kept in a secure location to ensure confidentiality.

VI. Compensation

You will receive free fruits and vegetables for 8 weeks, valued at approximately \$170.

VII. Freedom to Withdraw

You are free to withdraw from the study at any time.

VIII. Approval of Research

As required, this research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Human Nutrition, Foods, and Exercise.

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. Following are my responsibilities:

- Complete four height and weight measurements (transportation provided)
- Complete questionnaires (one week to complete after distributed, three times in total)
- Complete weekly checklists (eight in total)
- Send in ALL food receipts weekly
- Complete 24 hour food recalls (one week to complete after distributed, five in total)

- Have children pick up and drop off weekly fruit and vegetable baskets

X. Permission

I have read and understand the Informed Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Print Name

Participant Signature

Date

Should I have any pertinent questions regarding this research or its conduct, the research subjects' rights, or whom to contact in the event of a research-related injury to the subject, I may contact:

Elena Serrano, PhD

Investigator

540.231.3464/serrano@vt.edu

Telephone/e-mail

David Moore

Chair, IRB

Office of Research Compliance

Research & Graduate Studies

540.231-4991/moored@vt.edu

Telephone/e-mail



Appendix D

Fresh Produce, Fresh Start: Recruitment Material

Fresh Produce, Fresh Start



Head Start Parents: Would you like free fruits and vegetables delivered to you for 8 weeks this fall?

If yes, please consider signing up for the Fresh Start, Fresh Produce fruit and vegetable program. The program starts **August 26th**!

Research goal: to measure the effects of free fruits and vegetables on purchasing and eating patterns.

What will you have to do?

- Sign a consent form to participate
- Complete and return various questionnaires
- Collect all food receipts for 16 weeks
- Come to Head Start (transportation provided, if needed) to have height and weight measured and provide feedback in focus groups!

Please ask questions and consider joining at Head Start orientation on August 26th, 27th, or 28th!

Appendix E

Fresh Produce, Fresh Start: Pre and Baseline Questionnaire

Fresh Produce, Fresh Start

Virginia Tech is currently conducting a study at Head Start related to fruit and vegetable delivery.

If you are a mother at Head Start; do not have any major medical/health conditions; and are not pregnant; we invite you to complete the following questionnaire.

This survey contains questions about diet and food purchasing patterns. It should take approximately 10 minutes to complete. The results will help us understand the motives for consuming fruits and vegetables from a delivery program. Your participation is completely voluntary and all of your answers will be kept confidential. When you have completed the questionnaire, please send in provided envelope with your child. At the end of 16 weeks, we will administer a similar questionnaire to you.

For more questions about this study, please contact:

Carmen Byker, (757) 636-7492, byker@vt.edu

OR

Elena Serrano, (540) 231-3464, serrano@vt.edu



ID: Date:

Fresh Start, Fresh Produce Survey

The first part of the questionnaire contains **personal questions** about you.

- 1) What is your age? _____

- 2) How would you describe your race?
 - American Indian or Alaska Native
 - White
 - Black or African American
 - Asian
 - Native Hawaiian or other Pacific Islander

- 3) How would you describe your ethnicity?
 - Hispanic/Latino
 - Non Hispanic/Latino

- 4) What is your marital status? (Check the category you identify with)
 - Single (never married, divorced, separated, or widowed)
 - Married

- 5) How many people live in your household? _____

- 6) How many children (under the age of 18) live in your household? _____

- 7) How many of those children attend Head Start? _____

- 8) Do you smoke?
 - Yes
 - No

- 9) Which of the following best describes your educational level?
 - Some high school
 - High school graduate/GED
 - Some college
 - College degree (BS, BA)
 - Graduate degree (MS, PhD)
 - Professional degree (RN, MD)

- 10) What was your total annual household income for 2008?
 - Less than \$10,000
 - \$10,000 to \$24,999
 - \$25,000 to 49,999
 - Other

- 11) Overall, how would you rate your health? (Check one response.)

- Excellent Good Fair Poor

12) What is your occupation? _____

13) How many cars are in your household? _____

The following questions are related to your typical **food shopping patterns**:

14) On average, how many meals per week do you (personally) eat out at a restaurant, including fast food restaurants, take-out restaurants, and sit-down restaurants? _____

15) On average, how many meals per week do you eat at home? _____

16) Are you the person primarily responsible for meal preparation and shopping for your family?

- Yes
 No

17) Where do you or your family currently shop for groceries? (Please check all that apply)

- Supermarket (Kroger, Food Lion, Food City, etc.)
 Super-center (Wal-Mart, Target)
 Convenience store (7-11, gas station)
 Farmer's Market
 Health food store
 Roadside stand
 Other _____

18) Where do you or your family current shop for groceries the most often (pick one)?

- Supermarket (Kroger, Food Lion, Food City, etc.)
 Super-center (Wal-Mart, Target)
 Convenience store (7-11, gas station)
 Farmer's Market
 Health food store
 Roadside stand
 Other _____

19) How confident are you in your food preparation/cooking skills? (In another words, how comfortable are you preparing meals for yourself and your family?)

- Not at all confident
- Not very confident
- Somewhat confident
- Very Confident

20) My home made meals are typically (please rank)

- Made with fresh ingredients (food that is not pre-cooked such as fresh fruits and vegetables, uncooked meat and dried pasta or rice)
- Ready-made products (examples: TV dinners, soups in a can, boxed meals such as macaroni and cheese or hamburger helper, frozen pizza)
- A mixture of fresh and ready-made products

21) Do you ever shop for food at the Blacksburg Farmer’s Market?

- Yes. How many times per month do you typically shop there?

- No.
If no, why?

22) How would you rate your *awareness of the benefits of eating fruits and vegetables*, on a scale of 1 to 10 with 1 being “extremely low” and 10 being “extremely aware”? _____

23) How *confident* are you that you could *eat a 5 or more servings of fruits and vegetables per day*, on a scale of 1 to 10 with 1 being “not confident at all” and 10 being “extremely confident”? _____

24) Please rank the top 3 benefits you see to participating in this fruit and vegetable delivery program, with 1 being the #1 benefit.

- _____ I will eat better
- _____ I will feel better
- _____ I will support small, local businesses
- _____ I will eat fewer processed foods with preservatives
- _____ I will be a positive role model for others, including my family
- _____ I will help reduce the need for overland trucking and gas
- _____ I will feel better about my purchasing patterns (what I spend money on)

_____ I will save money

_____ Other:

25) Please describe the top 3 barriers to eating fruits and vegetables , with1 being the #1 barrier.

26) Why are you interested in participating in this study?

27) Please add any comments you would like to add about any of the topics addressed in this questionnaire. Feel free to use the back of the page to write more.

Thank you for your time!

Appendix F

Fresh Produce, Fresh Start: Post Questionnaire

Fresh Produce, Fresh Start

Thank you for participating in Virginia Tech's fruit and vegetable delivery program, Fresh Produce, Fresh Start.

This survey contains questions about your diet and food purchasing patterns. It should take approximately 10 minutes to complete. The results will help us understand the impact of the fruit and vegetable delivery program. Your participation is completely voluntary and all of your answers will be kept confidential. When you have completed the questionnaire, please send in provided envelope with your child.

For more questions about this study, please contact:

Carmen Byker, (757) 636-7492, byker@vt.edu

OR

Elena Serrano, (540) 231-3464, serrano@vt.edu



Fresh Start, Fresh Produce Survey

1) Please place a check beside all of the food assistance programs that you are currently participating in (please check all that apply):

- None
- SNAP (Food stamps)
- WIC
- Food bank or pantry
- Commodity Supplemental Food Program (Grocery Program)
- Other (besides Head Start program)

1a. How much do you receive in benefits per month? \$ _____

2) Overall, how would you rate your health? (Check one response.)

- Excellent Good Fair Poor

The following questions are related to your typical **food shopping patterns**:

3) On average, how many meals per week do you (personally) eat out at a restaurant, including fast food restaurants, take-out restaurants, and sit-down restaurants? _____

4) On average, how many meals per week do you eat at home? _____

5) Do you have reliable transportation to get food?

CIRCLE ONE: YES NO SOMETIMES

6) Where do you or your family currently shop for groceries? (Please check all that apply)

- Supermarket (Kroger, Food Lion, Food City, etc.)
- Super-center (Wal-Mart, Target)
- Convenience store (7-11, gas station)
- Farmer's Market
- Health food store
- Roadside stand
- Other _____

6a. How did this change during the free fruit and vegetable delivery program?

- YOU save money
- Your children eat more fruit
- Your children eat more vegetables
- Your children eat better
- Your children feel better
- Your children are healthier

12) How much do you think **all** of the fruits and vegetables that you received were worth, in a dollar amount?

Total value of free fruits and vegetables

\$ _____

13) How much did you save in grocery bills, restaurants, and other food-related expenses during the 8-week fruit and vegetable delivery program?

I saved: \$ _____

14) Which of the following will you do as a result of the free fruit and vegetable program? Check all that apply.

- Buy more fruit
- Buy more vegetables
- Set personal goals for how many fruits and vegetables I will eat each day
- Go to the farmers market
- Try new recipes
- Other (please list here):

15) On the following table, rate on a scale of 1 through 5 (1 being did not like at all, 5 being liked very much), how much you and then your family liked or disliked each fruit or vegetable.

Fruit or Vegetable	Rating-You	Rating-Your Family
Apples		
Green Bell Peppers		
Spinach		
Eggplant		
Potatoes		

Sweet Potatoes
 Tomatoes
 Carrots
 Kale
 Watermelon
 Spaghetti Squash
 Acorn Squash
 Pumpkins
 Parsley
 Delcata Squash
 Cabbage
 Turnips
 Swiss Chard

16) Did you use and like any of the recipes for the fruits and vegetables listed in the table? In the first column, circle the fruits or vegetables that you used provided recipes for. If a fruit or vegetable was circled in the first column, indicating that you did use a recipe, tell us if you liked the recipe by circling YES or NO in the second column.

Fruit or Vegetable Recipes	Did you like the recipe?	
Apples	Yes	No
Green Bell Peppers	Yes	No
Spinach	Yes	No
Eggplant	Yes	No
Potatoes	Yes	No

Sweet Potatoes	Yes	No
Tomatoes	Yes	No
Kale	Yes	No
Spaghetti Squash	Yes	No
Acorn Squash	Yes	No
Parsley	Yes	No
Delcata Squash	Yes	No
Cabbage	Yes	No
Turnips	Yes	No
Swiss Chard	Yes	No

17) Would you participate in this program again?

CIRCLE ONE: YES NO MAYBE

Please explain _____

18) What did you like most about the free fruit and vegetable delivery program? Please be as specific as possible.

19) What did your child (ren) say about the free fruit and vegetable delivery program? Please be as specific as possible.

20) What did you least like about the program? Please be as specific.

21) If we offered this program again, in what ways would you be willing to do to make sure the program continued? (Check all that apply)

- Pay a small fee for the fruits and vegetables
- Use food stamps for the fruits and vegetables
- Help pack produce bags
- Help order produce
- Help create recipes
- Encourage other parents to join the program by making phone calls
- Other ideas _____

22) I would pay \$_____ each week for about 21 pieces or servings of fruits and vegetables.

23) Please add any comments you would like to add about any of the topics addressed in this questionnaire. Feel free to use the back of the page to write more.

Thank you for your time!



Appendix G

Fresh Produce, Fresh Start: Non-Participant Survey

Fresh Produce, Fresh Start

Virginia Tech is currently conducting a study involving the delivery of fruits and vegetables to families at Head Start. We were recruiting mothers over the past week for this study. Although you did not want to participate in this study, we are hoping that you will take a few minutes to fill out a short survey.

It should take approximately 10 minutes to complete. The results will help us understand motives for not participating in a fruit and vegetable delivery program. By completing this questionnaire, you will receive a \$20 gift card to Wal-mart.

For more questions about this study, please contact:

Carmen Byker, (757) 636-7492, byker@vt.edu

OR

Elena Serrano, (540) 231-3464, serrano@vt.edu



Fresh Start, Fresh Produce Survey

The first part of the questionnaire contains **personal questions** about you.

- 1) What is your age? _____

- 2) How would you describe your race?
 - American Indian or Alaska Native
 - White
 - Black or African American
 - Asian
 - Native Hawaiian or other Pacific Islander

- 3) How would you describe your ethnicity?
 - Hispanic/Latino
 - Non Hispanic/Latino

- 4) What is your marital status? (Check the category you identify with)
 - Single (never married, divorced, separated, or widowed)
 - Married

- 5) How many people live in your household? _____

- 6) How many children (under the age of 18) live in your household? _____

- 7) How many of those children attend Head Start? _____

- 8) Do you smoke?
 - Yes
 - No

- 9) Which of the following best describes your educational level?
 - Some high school
 - High school graduate/GED
 - Some college
 - College degree (BS, BA)
 - Graduate degree (MS, PhD)
 - Professional degree (RN, MD)

- 10) What was your total annual household income for 2008?
 - Less than \$10,000
 - \$10,000 to \$24,999
 - \$25,000 to 49,999
 - Other

- 11) Which of the following programs do you participate in?
- Food Stamps
 - WIC
 - Commodity Supplemental Foods
 - Food bank
 - Other: please write here _____

- 12) Overall, how would you rate your health? (Check one response.)
- Excellent Good Fair Poor

13) What is your occupation? _____

14) How many cars are in your household? _____

The following questions are related to **reasons for not participating** in the fruit and vegetable study.

15) Please check all of the reasons for not participating in this study.

- It seemed like too much work (like paperwork)
- I don't like to eat fruits and vegetables.
- My family doesn't like to eat fruits and vegetables.
- I do not want to participate in a research study.
- I don't want "free handouts."
- I did not hear or know anything about it.
- Other: _____

The following questions are related to your typical **food shopping patterns**:

16) On average, how many meals per week do you (personally) eat out at a restaurant, including fast food restaurants, take-out restaurants, and sit-down restaurants? _____

17) On average, how many meals per week do you eat at home? _____

18) Are you the person primarily responsible for meal preparation and shopping for your family?

- Yes
- No

19) Where do you or your family currently shop for groceries? (Please check all that apply)

- Supermarket (Kroger, Food Lion, Food City, etc.)
- Super-center (Wal-Mart, Target)

- Convenience store (7-11, gas station)
- Farmer's Market
- Health food store
- Roadside stand
- Other _____

20) Where do you or your family current shop for groceries the most often (pick one)?

- Supermarket (Kroger, Food Lion, Food City, etc.)
- Super-center (Wal-Mart, Target)
- Convenience store (7-11, gas station)
- Farmer's Market
- Health food store
- Roadside stand
- Other _____

21) How confident are you in your food preparation/cooking skills? (In another words, how comfortable are you preparing meals for yourself and your family?)

- Not at all confident
- Not very confident
- Somewhat confident
- Very Confident

22) My home made meals are typically (please rank)

- Made with fresh ingredients (food that is not pre-cooked such as fresh fruits and vegetables, uncooked meat and dried pasta or rice)
- Ready-made products (examples: TV dinners, soups in a can, boxed meals such as macaroni and cheese or hamburger helper, frozen pizza)
- A mixture of fresh and ready-made products

23) Do you ever shop for food at the Blacksburg Farmer's Market?

- Yes. How many times per month do you typically shop there? _____
- No.

If no, why?

- 24) How would you rate your *awareness of the benefits of eating fruits and vegetables*, on a scale of 1 to 10 with 1 being "extremely low" and 10 being "extremely aware"? _____
- 25) How *confident* are you that you could *eat a 5 or more servings of fruits and vegetables per day*, on a scale of 1 to 10 with 1 being "not confident at all" and 10 being "extremely confident"? _____
- 26) Please add any comments you would like to add about any of the topics addressed in this questionnaire. Feel free to use the back of the page to write more.

Thank you for your time!



Appendix H

Fresh Produce, Fresh Start: Height and Weight Self Report

Please report your height and weight here. To be accurate, please use a scale to determine both. You will not be judged based upon your answer, so please be as honest as possible.

Date _____

Weight _____

Height _____

Have you gained or lost weight since you were weighed at Head Start?

Circle one:

YES, I gained weight.

NO, I did not gain weight.

If yes, how much? _____

Appendix I

Fresh Produce, Fresh Start: Brief Food Security Questionnaire

The following questions are about the food situation in your home **during the last month**. Please circle the answer that best describes you. Do not put your name on the paper, only your ID number. Your answers will remain a secret.

1. Did you **worry** that food at home would run out before your family got money to buy more?
 A LOT
 SOMETIMES
 NEVER

2. Did the food that your family bought **run out**, and you didn't have money to get more?
 A LOT
 SOMETIMES
 NEVER

3. Did your meals only include a few kinds of **cheap foods** because your family was running out of money to buy food?
 A LOT
 SOMETIMES
 NEVER

4. How often were you not able to eat a **balanced meal** because your family didn't have enough money?
 A LOT
 SOMETIMES
 NEVER

5. Did you have to **eat less** because your family didn't have enough money to buy food?
 A LOT
 SOMETIMES
 NEVER

6. Has the size of your meals **been cut** because your family didn't have enough money for food?
 A LOT
 SOMETIMES
 NEVER

7. Did you have to **skip a meal** because your family didn't have enough money for food?

- A LOT
- SOMETIMES
- NEVER

8. Were you **hungry** but didn't eat because your family didn't have enough food?

- A LOT
- SOMETIMES
- NEVER

9. Did you not eat for a **whole day** because your family didn't have enough money for food?

- A LOT
- SOMETIMES
- NEVER

10. Did you **lose weight** because there wasn't enough money for food?

- YES
- NO
- DON'T KNOW

Appendix K

Fresh Produce, Fresh Start: Weekly Checklist

Weekly Fruit & Vegetable Report

ID Number _____

This sheet will be used for you to check all the fruits and vegetables you eat from the produce basket you receive from us. *Please be as honest as possible as it will only help to better future fruit and vegetable delivery programs. You will not be judged based on your intake.*

In the column on the left, is all of the produce in this week's bag. On the check sheet below, show all of the fruits and vegetables **you personally** ate from this week's basket under the day of the week. On the right side of the check sheet, place the number of checks for servings of fruits and vegetables that other people ate (your children, husband, or anyone else) from this basket. Then indicate the number of servings of fruits and vegetables you had to throw away or that no one ate, for whatever reason (such as you didn't like the taste). Write any notes on the back of this sheet about why you had to throw away the food or anything you think we should know for next week.

Use the "In This Bag" sheet to help determine how many servings of the fruit or vegetable you ate. Some examples are:

1 entire apple = ✓
 1 entire cabbage = ✓✓✓✓
 1 single serving of cabbage = 1 cup of raw cabbage = ✓

Example below: You ate a total of 7 apple for the week: 2 on Tuesday, 1 on Wednesday, 2 on Friday, and 1 on Sunday. Your son ate 2 apples during the week. You had to throw out 1 apple because it was really bruised.

Type of Vegetable or Fruit	What YOU Ate							What someone else ate	What you had to throw away or what no one ate
	Tuesday, Date	Wednesday, Date	Thursday, Date	Friday, Date	Saturday, Date	Sunday, Date	Monday, Date		
Example: Apple	✓✓	✓		✓✓		✓		✓✓	✓

Appendix L

Fresh Produce, Fresh Start: In This Bag

Fresh Produce, Fresh Start In This Bag

This is a bag of fresh fruits and vegetables just for you! All of the fruits and vegetables came from Good Food, Good People, a local farmer and food vendor in the New River Valley. Students from Virginia Tech helped to choose produce, create recipes and assemble bags. This bag holds enough produce for 21 servings of fruits and vegetables for the entire week. Listed below is the types of fruits and vegetables you will find and a serving size guide to help you fill out your weekly checklist. Please send your checklist in with your child every Monday.

Type of Fruit or Vegetable	Number of Total Servings in this Bag	How much is one serving size?
Colored peppers	4 servings	1 cup
Butternut squash	4 servings	1 cup
Sweet potatoes	4 servings	1 cup
Mixed baby greens	4 servings	1 cup
Granny smith apples	6 servings	1 apple

ENJOY!



Appendix M

Fresh Produce, Fresh Start: Sample Recipe

Mashed Sweet Potatoes

Make sweet potatoes more than just a Thanksgiving tradition! Sweet potatoes are tasty and good for you. They contain lots of vitamins like vitamin A and C which have been shown to have great healing properties. Mashed sweet potatoes make a great side dish to any meal!



Serving size: serves 3-4 people (1 cup per person)

Estimated time of preparation and cooking: 30 minutes

Ingredients:

- 4 medium sized sweet potatoes
- 2 tbsp melted butter
- 1/3 c. milk
- 1/4 tsp. salt
- 1/2 tsp. nutmeg

Directions:

1. Bring water to a rolling boil and boil sweet potatoes for 20 to 25 minutes, until tender.
2. Drain, let cool, and peel sweet potato skin.
3. Mash well with the butter, salt, and milk, beat until light and fluffy.
4. Add nutmeg and mix well.
5. Sprinkle with nutmeg before serving. Enjoy! ☺

Nutrition Facts (per serving)

Calories: 270 kcals

Total fat: 3 g

Saturated fat: 0 g

Trans fat: 0 g

Cholesterol: 0 mg

Sodium: 300 mg

Carbohydrates: 54 g

Fiber: 6 g

Sugar: 30 g

Protein: 6 g

Appendix N

Fresh Produce, Fresh Start: Local Branding Logo

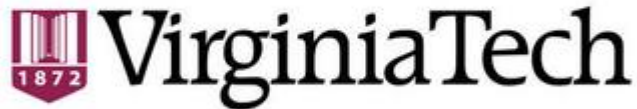
Produce in this bag was delivered by local farmers from:



who can also be found at:



Recipes and serving size information was compiled by The Berry Good Group in Community Nutrition at:



Appendix O

Fresh Produce, Fresh Start: Program Evaluation Informed Consent

**Informed Consent for Participants
in Research Projects Involving Human Subjects
Focus Group or One-on-One Evaluation**

Title of Project: Fresh Produce, Fresh Start

Investigator: Elena Serrano, Ph.D.

Co-PI: Carmen Byker

I. Purpose of this Research/Project

The purpose of this study is to promote local fruit and vegetable intake in mothers at Head Start and measure the impact on diet and purchasing patterns.

II. Procedures

As a participant of Fresh Produce, Fresh Start, you will be asked to voluntarily participate in a focus group (a group discussion) or asked questions one-on-one with the researcher for 10 to 30 minutes at the completion of the free fruit and vegetable delivery program.

III. Risks

There are no more than minimal risks associated with your participation in this project. Some of your comments may be considered sensitive in nature however will not be released to anyone outside the research group. Your responses will be kept anonymous and confidential as well.

IV. Benefits

Information from this focus group will help researchers develop and maintain an effective further fruit and vegetable delivery program at Head Start.

V. Extent of Anonymity and Confidentiality

Your responses cannot be kept anonymous and confidential during the group discussion; however, your response will not be associated with your name or a number.

VI. Compensation

No compensation will be provided.

VII. Freedom to Withdraw

You are free to withdraw from the study at any time.

VIII. Approval of Research

As required, this research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Human Nutrition, Foods, and Exercise.

IRB Approval Date

Approval Expiration Date

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. Following are my responsibilities:

- Participate in a 10 to 30 minute focus group discussion or one-on-one interview with the researcher.
- Complete a short, written questionnaire

X. Permission

I have read and understand the Informed Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Print Name

Participant Signature

Date

Should I have any pertinent questions regarding this research or its conduct, the research subjects' rights, or whom to contact in the event of a research-related injury to the subject, I may contact:

Elena Serrano, PhD
Investigator

540.231.3464/serrano@vt.edu
Telephone/e-mail

David Moore
Chair, IRB
Office of Research Compliance
Research & Graduate Studies

540.231-4991/moored@vt.edu
Telephone/e-mail



Appendix P

Fresh Produce, Fresh Start: Program Evaluation Questions

Thanks you for helping to make this program a success! Without your efforts Fresh Produce, Fresh Start at Head Start of Christiansburg would not have worked! Please take the time to complete the following program evaluation survey. Please be as thorough as possible as this will only help to better programs in the future. First complete the consent form, then the survey. Your name will not be included in any reports.

[CONSENT FORM]

Fresh Produce, Fresh Start Program Evaluation

These questions are being asked so that we can evaluate the Fresh Produce, Fresh Start program. Please be as honest as possible so that we can improve upon our program in the future. Write your answers in the space below or on another sheet of paper if more space is needed.

- 1) What is your position at Head Start? How did you play a role in Fresh Produce, Fresh Start?
- 2) What were the strengths of Fresh Produce, Fresh Start?
- 3) What were the weaknesses about the program?
- 4) In what ways would you like to see the program continue
 - a. How would you improve the program?
 - b. Would you like to see it expand?
- 5) What are some ways we could get participation from families in putting together produce bags?
- 6) Are there other food related activities that you think would be of interest to Head Start families or to Head Start? (examples: community gardening, container gardening, farmers market at Head Start)
- 7) Do you feel that there is adequate access to fruits and vegetables in Christiansburg or Blacksburg?

THANK YOU!

Appendix Q

Fresh Produce, Fresh Start: Semi-Structured Focus Group Script

Focus Group Script

Researcher: Thank you for agreeing to take part in the Fresh Produce, Fresh Start focus group. I'm Carmen Byker and will be asking questions and taking notes. We hope you enjoyed your fruit and vegetable delivery program. We have a few questions to ask in order to assess the program and possibly continue in the spring. You may withdraw at anytime, for any reason. Your opinions are very important to us, so tell me exactly what you think. Now I will start with questions.

- 1) What did you like about Fresh Produce, Fresh Start?
- 2) What did you dislike?
- 3) If we offer this program again, how would you be willing to help it continue?
- 4) Would you be willing to pay money? If so, how much?

Thank you for your participation. All of your opinions will be considered as we look to develop programs in the future.

Appendix R

Fresh Produce, Fresh Start: Receipt Reminder Example

Fresh Produce, Fresh Start Participant,
We hope that you enjoy your produce this week!
Please place your **weekly checklist** and **food receipts**
in the attached envelope. Send the envelope to Head
Start with your child on Monday. Continue collecting
receipts in the new bag provided.
Your next produce deliver will occur on Wednesday,
October 13th.

THANKS! Carmen & Elena

Appendix S

Fresh Produce, Fresh Start: Monetary Costs

Fresh Produce, Fresh Start Monetary Costs		
Item	Christiansburg (\$)	Blacksburg (\$)
Supplies	75.00	22.94
Week 1	200.75	165.35
Week 2	249.25	170.50
Week 3	245.00	191.75
Week 4	208.60	296.50
Week 5	177.00	282.00
Week 6	140.50	295.00
Week 7	282.50	231.50
Week 8	225.00	257.50
TOTAL	\$1,803.60	\$1,913.04

Appendix T

Fresh Produce, Fresh Start: Matched Total Number of Items Purchased by Food Category

Total Number of Items Purchased by Food Category Based on Matched Food Receipts from Fresh Produce, Fresh Start					
	Matched Participants (n = 22)				
Food Category	Pre (n)	Delivery 1 (n)	Delivery 2 (n)	Post (n)	Total (n)
Add-on and cooking fats	133	106	47	74	360
Add-on and cooking non fat	44	80	40	37	201
Baking needs	43	72	23	23	161
Sugar sweetened beverages	269	318	119	97	803
100% fruit juice	53	96	35	48	232
Other beverages	88	94	38	54	274
Milk alternatives	18	40	22	31	111
Breads	188	234	109	153	684
Cereal and cereal bars	85	120	37	65	307
Dairy	325	448	244	312	1329
Entrees/meals	322	468	176	202	1168
Meat, fish, poultry	443	674	227	275	1619
Pasta, rice, grains	81	156	38	58	333
Fresh produce	415	564	274	462	1715
Canned produce	119	170	77	99	465
Frozen produce	16	28	12	16	72
French fries	20	32	9	5	66
Instant mashed potatoes	11	8	2	1	22
Beans/nuts	72	118	74	70	334
Desserts/sweets	162	312	147	135	756
Snacks	143	172	71	51	437
Other food products	57	86	47	57	247
Total	3107	4396	1868	2325	11696

*For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

Appendix U

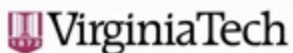
Fresh Produce, Fresh Start: Matched Total Amount of Food Purchased in Dollars

Total Amount of Food Purchased in Dollars Based on Matched Food Receipts from Fresh Produce, Fresh Start					
	Matched Participants (n = 22)				
Food Category	Pre (\$)	Delivery 1 (\$)	Delivery 2 (\$)	Post (\$)	Total (\$)
Add-on and cooking fats	276.2	240	127	176.3	819.5
Add-on and cooking non fat	102.3	149.7	83.5	98.6	434.1
Baking needs	103.4	74.8	62.4	59.9	300.4
Sugar sweetened beverages	412.1	541.6	241.6	272	1467.2
100% fruit juice	131.	240.9	101.9	102.6	576.3
Other beverages	291.9	378	197.8	294.9	1162.5
Milk alternatives	75.9	113.8	57.6	83	330.2
Breads	385.8	492.2	251.4	300.4	1429.8
Cereal and cereal bars	207.3	332.5	95.8	146.7	782.3
Dairy	715.2	1038.1	570.6	673.7	2997.7
Entrees/meals	1003.1	1416.6	683.7	653	3756.4
Meat, fish, poultry	1591.2	2111.7	773	1076.2	5552.1
Pasta, rice, grains	270.6	362.5	156.3	190.5	979.9
Fresh produce	820.5	1259.2	573.6	963.4	3616.7
Canned produce	176.8	229.7	111.3	168.4	686.1
Frozen produce	24.9	53	23.8	34	135.6
French fries	43.1	55.4	14.8	10.7	124
Instant mashed potatoes	19.5	13.1	2	1.2	35.8
Beans/nuts	103.5	180.5	129.6	162.5	576.1
Desserts/sweets	322.2	636.9	380.4	308.9	1648.3
Snacks	334	466.2	152.4	117.3	1069.8
Other food products	70.2	180.2	162.7	64.9	478
Total	7480.63	10566.42	4953.32	5958.8	28959.17

* For the entire 16-week study period, the receipt data was split into four measurement periods of four weeks each: pre; delivery 1; delivery 2; and post. Delivery 1 and delivery 2 are two four week periods when the produce delivery program was occurring.

Appendix V

Heifer Alternative Spring Break: IRB Approval Letter (Ranch)



Office of Research Compliance
Carmen T. Green, IRB Administrator
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24061
540/231-4358 Fax 540/231-0959
e-mail ctgreen@vt.edu
www.irb.vt.edu
FVA00000572 (revised 8/13/2011)
IRB # is IRB00000967

DATE: February 17, 2010

MEMORANDUM

TO: Susan Clark
Elena L. Serrano
Carmen Byker

FROM: Carmen Green 

SUBJECT: **IRB Exempt Approval:** "ALS 2984 & Heifer Alternative Spring Break", IRB # 10-123

I have reviewed your request to the IRB for exemption for the above referenced project. The research falls within the exempt status, CFR 46.101(b) category(ies) 1.

Approval is granted effective as of February 17, 2010.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in the research protocol. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.
2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

cc: File

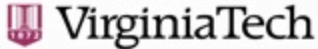
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VIRGINIA POLYTECHNIC INSTITUTE UNIVERSITY AND STATE UNIVERSITY

An equal opportunity, affirmative action institution

Appendix W

Heifer Alternative Spring Break: IRB Approval Letter (Honduras)



Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4806 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: January 24, 2011

TO: Susan Clark, Carmen Byker, Elena L. Serrano

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

PROTOCOL TITLE: ALS 3954 & Heifer Honduras Alternative Spring Break

IRB NUMBER: 11-041

Effective January 24, 2011, the Virginia Tech IRB Chair, Dr. David M. Moore, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at <http://www.irb.vt.edu/pages/responsibilities.htm> (please review before the commencement of your research).

PROTOCOL INFORMATION:

Approved as: **Expedited, under 45 CFR 46.110 category(ies) 5, 7**

Protocol Approval Date: **1/24/2011**

Protocol Expiration Date: **1/23/2012**

Continuing Review Due Date*: **1/9/2012**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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Appendix X

Heifer Alternative Spring Break: Consent Form (Ranch)

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: ALS 2984: Heifer Ranch

Investigator: Susan Clark

Co-PI: Carmen Byker and Elena Serrano

I. Purpose of this Research/Project

The purpose of this study is to measure the effectiveness of Heifer's Alternative Spring Break using pre and post surveys and qualitative data through journaling to gain insight on perceptions, attitudes and knowledge before and after the course ALS 2984: Engaged Learning Environment I, which includes a trip to Heifer Ranch's Alternative Spring Break.

II. Procedures

Pre-Survey, Post-Survey, and Follow up Survey: Students will be introduced to the study through an announcement in class. They will then be given an overview of the research project and consent form, with understanding that if they are interested they must return within one week. All students will be given a code number and the survey, whether they sign consent or not, as it is part of their class grade. Students who do consent will be included in the study. Students who do not consent will be separated. The surveys will be completed in class.

Journaling: As part of the course, students will journal one time before going to Heifer Ranch in Perryville, Arkansas about their expectations. They will journal seven times in response to questions asked by the course instructor and complete two 3 day food records in their journal, totalling nine entries. All journals will be entered into an electronic portfolio on Virginia Tech's Scholar site. Only instructors will be able to view the journal. Students who consent to being a part of the study will have their e-portfolio included in study results.

Heifer Ranch Alternative Spring Break: March 7th-12th. Students will travel to Heifer International's Ranch in Perryville, Arkansas to learn about the mission of Heifer, the challenges of hunger and poverty, and how to build sustainable lifestyles

III. Risks

Risks are that some questions contain potentially sensitive information, which if released in conjunction with the student may be considered negative. All efforts to ensure anonymity and confidentiality will be ensured to eliminate this risk altogether.

IV. Benefits

Some direct and indirect benefits will likely occur. Direct benefits to the student includes increasing reflective skills through journaling, increasing knowledge about sustainability, and increasing personal and practice-oriented skills about sustainable personal and community development. Indirect benefits include the betterment of future Heifer Ranch educational through student responses.

V. Extent of Anonymity and Confidentiality

We will assign a user number to you, which will take the place of your name on the survey and for all analyses and reports. These responses will be kept in a secure location to ensure confidentiality.

VI. Compensation

None

VII. Freedom to Withdraw

You are free to withdraw from the study at any time.

VIII. Approval of Research

As required, this research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Human Nutrition, Foods, and Exercise.

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. Following are my responsibilities:

- Complete pre and post survey
- Complete nine journal entries, including two 3-day food records

X. Permission

I have read and understand the Informed Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Print Name

Participant Signature

Date

Should I have any pertinent questions regarding this research or its conduct, the research subjects' rights, or whom to contact in the event of a research-related injury to the subject, I may contact:

Susan Clark, PhD
Investigator

540.231.8768/sfclark@vt.edu
Telephone/e-mail

David Moore
Chair, IRB
Office of Research Compliance
Research & Graduate Studies

540.231.4991/moored@vt.edu
Telephone/e-mail



Appendix Y

Heifer Alternative Spring Break: Consent Form (Honduras)

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Heifer Honduras Alternative Spring Break

Investigator: Susan Clark

Co-PI: Carmen Byker and Elena Serrano

I. Purpose of this Research/Project

The purpose of this study is to measure the effectiveness of Heifer's Alternative Spring Break using pre and post surveys and qualitative data through journaling to gain insight on perceptions, attitudes and knowledge before and after the course ALS 3954: Heifer Honduras Study Abroad, which includes a trip to Heifer Honduras Project.

II. Procedures

Pre-Survey and Post-Survey: Students will be introduced to the study through an announcement in class. They will then be given an overview of the research project and consent form, with understanding that if they are interested they must return within one week. All students will be given a code number and the survey, whether they sign consent or not, as it is part of their class grade. Students who do consent will be included in the study. Students who do not consent will be separated. The surveys will be completed in class.

Journaling: As part of the course, students will journal one time before going to Heifer Honduras about their expectations. They will journal six times in response to questions asked by the course instructor and complete two 3 day food records in their journal, totalling eight entries. All journals will be entered into an electronic portfolio on Virginia Tech's Scholar site. Only instructors will be able to view the journal. Students who consent to being a part of the study will have their e-portfolio included in study results.

Heifer Ranch Alternative Spring Break: March 5th-12th. Students will travel to Heifer Honduras to learn about the mission of Heifer, the challenges of hunger and poverty, and how to build sustainable lifestyles

III. Risks

Risks are that some questions contain potentially sensitive information, which if released in conjunction with the student may be considered negative. All efforts to ensure anonymity and confidentiality will be ensured to eliminate this risk altogether.

IV. Benefits

Some direct and indirect benefits will likely occur. Direct benefits to the student includes increasing reflective skills through journaling, increasing knowledge about sustainability, and increasing personal and practice-oriented skills about sustainable personal and community development. Indirect benefits include the betterment of future Heifer Honduras educational components through student responses.

V. Extent of Anonymity and Confidentiality

We will assign a user number to you, which will take the place of your name on the survey and for all analyses and reports. These responses will be kept in a secure location to ensure confidentiality.

VI. Compensation

None

VII. Freedom to Withdraw

You are free to withdraw from the study at any time.

VIII. Approval of Research

As required, this research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Human Nutrition, Foods, and Exercise.

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. Following are my responsibilities:

- Complete pre and post survey
- Complete nine journal entries, including two 3-day food records

X. Permission

I have read and understand the Informed Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Print Name

Participant Signature

Date

Should I have any pertinent questions regarding this research or its conduct, the research subjects' rights, or whom to contact in the event of a research-related injury to the subject, I may contact:

Susan Clark, PhD

540.231.8768/sfclark@vt.edu

Investigator

Telephone/e-mail

David Moore

540.231.4991/moored@vt.edu

Chair, IRB

Telephone/e-mail

Office of Research Compliance

Research & Graduate Studies



Appendix Z

Heifer Alternative Spring Break: Pre Questionnaire

Code Number _____

Date _____

Heifer Alternative Spring Break Pre Questionnaire

Answer questions in order and do not go back to change answers. Please complete questions to the best of your ability. Your answers are not being graded—be as honest as possible.

1. What is the best way to solve hunger issues around the world (Choose one answer)?
 - a. Food aid
 - b. Financial assistance
 - c. Community development
 - d. Increased crop yield through genetic engineering
 - e. Strategic political intervention
 - f. All of the above

2. On a scale of 1 to 5 (1 being strongly agree and 5 being strongly disagree), do you agree that these tools are effective ways to make change in the world?

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
Writing government officials					
Policy change					
Getting involved locally					
Starting a project					
Sending money to a for-profit organization					
Sending money to a non-profit organization					

3. On a scale of 1 to 5 (1 being very important and 5 being not important), rate how important the following issues are to you:

	Very Important	Important	Moderately Important	Of Little Importance	Not Important
	1	2	3	4	5
Climate change					
Composting					
Loss of biodiversity					
Natural resource use					
Over consumption					
Pollution					
Recycling					

Waste					
-------	--	--	--	--	--

4. Please write Heifer's 12 cornerstones below.

1.	7.
2.	8.
3.	9.
4.	10.
5.	11.
6.	12.

5. Heifer International's mission is:

- a. A Heifer for every home.
- b. To stop hunger through food aid, poverty relief, and community development worldwide.
- c. Sustainable earth, sustainable agriculture, sustainable communities.
- d. A cow in every community.
- e. To work with communities to end hunger and poverty and care for the earth.

6. Food that is labeled as 'local' is grown within:

- a. 50 miles
- b. 100 miles
- c. 500 miles
- d. region (regions of the United States: Northeast, Southeast, Midwest, Southwest, West)
- e. country

7. What percentage of the food that you purchase is sustainably produced (organic, local, fair trade, humane treatment of animals, protects the earth)?

- a. 0%
- b. less than 10%
- c. 10% - 25%
- d. 25% - 50%
- e. 50% - 75%
- f. more than 75%
- g. 100%

8. On a scale of 1-5 (1 being very interested and 5 being not interested), how interested are you in purchasing food that:

	Very Interested	Interested	Undecided	Somewhat Interested	Not interested
	1	2	3	4	5
Is organic					
Is fair trade					
Is local					
Is cheap					
humanely treats animals					
protects the earth					

is healthier					
--------------	--	--	--	--	--

9. On a scale of 1-5 (1 being strongly agree and 5 being strongly disagree), how strongly do you agree or disagree with the following statements:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
I am familiar with Heifer International and its mission.					
I can name at least 3 root causes of hunger and poverty. If so please list below ¹ .					
I think about where my food comes from on a regular basis.					
I can describe the importance of livestock as a resource to end hunger and poverty.					
I believe strong, supportive communities are important in order to end hunger and poverty.					
I understand the difference between conventional farming and sustainable farming.					
I feel that I am able to help end world hunger and poverty.					

¹3 root causes of hunger and poverty are:

1. _____
2. _____
3. _____

10. How many people are food insecure in the United States?

- a. About 50 million
- b. About 100 million
- c. About 1 billion
- d. About 3 billion
- e. None of the above

11. How many people are hungry in the world?

- a. About 50 million
- b. About 100 million
- c. About 1 billion
- d. About 3 billion
- e. None of the above

12. Please use the remaining space (and back of page, if needed) to reflect upon what you expect during the course and Alternative Spring Break

13. Would you recommend the course and/or Heifer Alternative Spring Break to a friend?

- Yes
- No. Please explain

14. Are you interested in adding the proposed undergraduate Civic Agriculture and Food Systems minor (in the College of Agriculture and Life Sciences) to your coursework? For your information, this minor can be completed in 3-4 semesters.

- Yes
- Maybe
- No, I am a graduate student and cannot partake in an undergraduate minor. I would be interested if it were added to the graduate curriculum.
- No
- I am already enrolled in the minor

Please explain your answer

Appendix AA

Heifer Alternative Spring Break: Post Questionnaire

Code Number _____

Date _____

Heifer Alternative Spring Break Post Questionnaire

Answer questions in order and do not go back to change answers. Please complete questions to the best of your ability. Your answers are not being graded—be as honest as possible.

1. What is your age? _____
2. What is your gender?
 - a. Male
 - b. Female
3. How would you describe your race?
 - a. American Indian or Alaska Native
 - b. White
 - c. Black or African American
 - d. Asian
 - e. Native Hawaiian or other Pacific Islander
 - f. Other _____
4. How would you describe your ethnicity?
 - a. Hispanic/Latino
 - b. Non Hispanic/Latino
 - c. Other _____
5. What is your marital status? (Check the category you identify with)
 - a. Single (never married, divorced, separated, or widowed)
 - b. Married
6. How many children (under the age of 18) live in your household? _____
7. Which of the following best describes your educational level?
 - a. Some college
 - b. College degree (BS, BA)
 - c. Graduate degree (MS, PhD)
 - d. Professional degree (RN, MD)
8. What level are you currently in school?
 - a. Freshman
 - b. Sophomore
 - c. Junior
 - d. Senior

- e. 5th year senior
- f. Graduate masters
- g. Graduate PhD

9. Overall, how would you rate your health? (Check one response.)

- Excellent Good Fair Poor

10. What is the best way to solve hunger issues around the world (Choose one answer)?

- a. Food aid
- b. Financial assistance
- c. Community development
- d. Increased crop yield through genetic engineering
- e. Strategic political intervention
- f. All of the above

11. On a scale of 1 to 5 (1 being strongly agree and 5 being strongly disagree), do you agree that these tools are effective ways to make change in the world?

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
Writing government officials					
Policy change					
Getting involved locally					
Starting a project					
Sending money to a for-profit organization					
Sending money to a non-profit organization					

12. On a scale of 1 to 5 (1 being very important and 5 being not important), rate how important the following issues are to you:

	Very Important	Important	Moderately Important	Of Little Importance	Not Important
	1	2	3	4	5
Climate change					
Composting					
Loss of biodiversity					
Natural resource use					
Over consumption					
Pollution					
Recycling					
Waste					

13. Please write Heifer's 12 cornerstones below.

1.	7.
2.	8.
3.	9.
4.	10.
5.	11.
6.	12.

14. Heifer International's mission is:

- a. A Heifer for every home.
- b. To stop hunger through food aid, poverty relief, and community development worldwide.
- c. Sustainable earth, sustainable agriculture, sustainable communities.
- d. A cow in every community.
- e. To work with communities to end hunger and poverty and care for the earth.

15. Food that is labeled as 'local' is grown within:

- a. 50 miles
- b. 100 miles
- c. 500 miles
- d. region (regions of the United States: Northeast, Southeast, Midwest, Southwest, West)
- e. country

16. What percentage of the food that you purchase is sustainably produced (organic, local, fair trade, humane treatment of animals, protects the earth)?

- a. 0%
- b. less than 10%
- c. 10% - 25%
- d. 25% - 50%
- e. 50% - 75%
- f. more than 75%
- g. 100%

17. On a scale of 1-5 (1 being very interested and 5 being not interested), how interested are you in purchasing food that:

	Very Interested	Interested	Undecided	Somewhat Interested	Not interested
	1	2	3	4	5
Is organic					
Is fair trade					
Is local					
Is cheap					
humanely treats animals					
protects the earth					
is healthier					

18. On a scale of 1-5 (1 being strongly agree and 5 being strongly disagree), how strongly do you agree or disagree with the following statements:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
I am familiar with Heifer International and its mission.					
I can name at least 3 root causes of hunger and poverty. If so please list below ¹ .					
I think about where my food comes from on a regular basis.					
I can describe the importance of livestock as a resource to end hunger and poverty.					
I believe strong, supportive communities are important in order to end hunger and poverty.					
I understand the difference between conventional farming and sustainable farming.					
I feel that I am able to help end world hunger and poverty.					

¹3 root causes of hunger and poverty are:

1. _____
2. _____
3. _____

19. How many people are food insecure in the United States?

- a. About 50 million
- b. About 100 million
- c. About 1 billion
- d. About 3 billion
- e. None of the above

20. How many people are hungry in the world?

- a. About 50 million
- b. About 100 million
- c. About 1 billion
- d. About 3 billion
- e. None of the above

21. Did you seek out sustainable food sources (local, organic) before Heifer Alternative Spring Break?

_____ Yes
 _____ No

22. Do you seek out more sustainable food sources after Heifer Alternative Spring Break?

Yes
 No

23. Did you shop at the Blacksburg Farmers Market before Heifer Alternative Spring Break?

Yes. How many times per month did you typically shop there? _____

No

If no, why?

24. Will you shop at the Blacksburg Farmers Market after Heifer Alternative Spring Break?

Yes. How many times have you shopped there since returning? _____

No

If no, why?

25. Has your attitude changed about how you select your food?

Yes

No

If yes, how? If no, please explain

26. How did this experiential learning process (hands-on, real world activities outside of the classroom) influence what you learned inside of the classroom?

27. Please detail what changes you have made in your lifestyle as a result of the Heifer Alternative Spring Break experience?

28. Please describe how your experience at the Ranch differed from and assisted in engaging at Heifer Alternative Spring Break

29. Please describe some ways that the teaching team could better prepare students for Heifer Alternative Spring Break in the future.

30. Would you recommend ALS 3954 and/or Heifer Alternative Spring Break to a friend?

- Yes
- No. Please explain

31. Are you interested in adding the proposed undergraduate Civic Agriculture and Food Systems minor (in the College of Agriculture and Life Sciences) to your coursework? For your information, this minor can be completed within 3-4 semesters.

- Yes
- Maybe
- No, I am a graduate student and cannot partake in an undergraduate minor. I would be interested if it were added to the graduate curriculum.
- No
- I am already enrolled in the minor

Please explain your answer

Appendix AB

Heifer Alternative Spring Break: Follow-Up Questionnaire

Heifer Ranch Alternative Spring Break Follow-Up Questionnaire

Answer questions in order and do not go back to change answers. Please complete questions to the best of your ability, without outside research. Be as honest as possible.

1. What is the best way to solve hunger issues around the world (Choose one answer)?
 - a. Food aid
 - b. Financial assistance
 - c. Community development
 - d. Increased crop yield through genetic engineering
 - e. Strategic political intervention
 - f. All of the above

2. On a scale of 1 to 5 (1 being strongly agree and 5 being strongly disagree), do you agree that these tools are effective ways to make change in the world?

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
Writing government officials					
Policy change					
Getting involved locally					
Starting a project					
Sending money to a for-profit organization					
Sending money to a non-profit organization					

3. On a scale of 1 to 5 (1 being very important and 5 being not important), rate how important the following issues are to you:

	Very Important	Important	Moderately Important	Of Little Importance	Not Important
	1	2	3	4	5
Climate change					
Composting					
Loss of biodiversity					
Natural resource use					
Over consumption					
Pollution					
Recycling					
Waste					

4. Without using outside resources, please write Heifer's 12 cornerstones below.

1.	7.
2.	8.
3.	9.
4.	10.
5.	11.
6.	12.

5. Heifer International's mission is:
 - a. A Heifer for every home.
 - b. To stop hunger through food aid, poverty relief, and community development worldwide.
 - c. Sustainable earth, sustainable agriculture, sustainable communities.
 - d. A cow in every community.
 - e. To work with communities to end hunger and poverty and care for the earth.

6. Food that is labeled as 'local' is grown within:
 - f. 50 miles
 - g. 100 miles
 - h. 500 miles
 - i. region (regions of the United States: Northeast, Southeast, Midwest, Southwest, West)
 - j. country

7. What percentage of the food that you purchase is sustainably produced (organic, local, fair trade, humane treatment of animals, protects the earth)?
 - k. 0%
 - l. less than 10%
 - m. 10% - 25%
 - n. 25% - 50%
 - o. 50% - 75%
 - p. more than 75%
 - q. 100%

8. On a scale of 1-5 (1 being very interested and 5 being not interested), how interested are you in purchasing food that:

	Very Interested	Interested	Undecided	Somewhat Interested	Not interested
	1	2	3	4	5
Is organic					
Is fair trade					
Is local					
Is cheap					
humanely treats animals					
protects the earth					
is healthier					

9. On a scale of 1-5 (1 being strongly agree and 5 being strongly disagree), how strongly do you agree or disagree with the following statements:

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
	1	2	3	4	5
I am familiar with Heifer International and its mission.					
I can name at least 3 root causes of hunger and poverty. If so please list below ¹ .					
I think about where my food comes from on a regular basis.					
I can describe the importance of livestock as a resource to end hunger and poverty.					
I believe strong, supportive communities are important in order to end hunger and poverty.					
I understand the difference between conventional farming and sustainable farming.					
I feel that I am able to help end world hunger and poverty.					

¹3 root causes of hunger and poverty are:

1. _____
2. _____
3. _____

10. How many people are food insecure in the United States?

- r. About 50 million
- s. About 100 million
- t. About 1 billion
- u. About 3 billion
- v. None of the above

11. How many people are hungry in the world?

- w. About 50 million
- x. About 100 million
- y. About 1 billion
- z. About 3 billion
- aa. None of the above

12. Do you seek out more sustainable food sources after Heifer Alternative Spring Break?

- ____ Yes
 ____ No

13. Do you shop at the Blacksburg Farmers Market after Heifer Alternative Spring Break?

- ____ Yes. How many times have you shopped there since returning? _____
 ____ No

If no, why?

14. Has your attitude changed about how you select your food?

 Yes

 No

If yes, how? If no, please explain

15.. Please use the remaining space to detail what changes you have made in your lifestyle as a result of the Heifer Alternative Spring Break experience?

Appendix AD

Heifer Alternative Spring Break: Semi-Structured Focus Group

Heifer Focus Group Script

Researcher: Thank you for agreeing to take part in the Heifer Alternative Spring Break focus group. I'm [researcher name] and will be asking questions and taking notes. We have a few questions to ask in order to assess the program and possibly continue in the future. This interview will be audio recorded if you agree. Your answers are confidential and a pseudonym will be used to mask any identifiers. You may withdraw at anytime, for any reason. Your opinions are very important to us, so tell me exactly what you think. Now I will start with questions.

1. What motivated you to participate in the Heifer ASB?
2. What effect did the ASB have on personal behavior or practices in relation to the local and global food system?
 - a. Are you confident that you will be able to maintain these behaviors or practices?
 - b. What are you doing differently now as a result of ASB?
 - i. Eating differently?
 - ii. Using different forms of transportation?
 - iii. Less plastic?
 - iv. Buying more local?
 - v. Trying to be more mindful of all the food you put in your mouth knowing people are starting and hungry, etc.?
3. In one sentence, how would you explain what the impact of the program was for you?
4. What do you see as barriers to maintaining these behaviors?
5. In what ways does your own behavior impact the environment around you?
6. In what ways do you see this experience forming your future?
 - a. Personally
 - b. Professionally
7. As some of you have now worked with Heifer in a variety of settings, how would you recommend Heifer's different education pieces becoming more integrated?
8. Do you see any uses for the experiences that you have had at Heifer Ranch and in Honduras having any application even after you have graduated? If so, how?
9. Do you feel that the program objectives for the ASB programs at Honduras and Heifer Ranch were met? (Researcher will pass out program objectives)
10. To what extent does your project help you understand better the admonition to "think global/act local"? How do you see you're the project you brainstormed during the Alternative Spring Break as an extension of the message and the mission of Heifer International? In what way(s) is your project a reflection of the issues related to global and community food systems?

Thank you for your participation. All of your opinions will be considered as we look to develop programs in the future.

Appendix AE

Heifer Alternative Spring Break: Focus Group Informed Consent

**Informed Consent for Participants
in Research Projects Involving Human Subjects
Focus Groups**

Title of Project: Heifer Alternative Spring Break

Investigator: Susan Clark, PhD

Co-PI: Carmen Byker, Elena Serrano, PhD

I. Purpose of this Research/Project

The purpose of this study is to measure the effectiveness of Heifer's Alternative Spring Break using pre and post surveys and qualitative data through journaling and a focus group.

II. Procedures

As a participant of Heifer Alternative Spring Break you will be asked to be a part of a focus group or a group discussion for 45 minutes. Your discussion will be audio recorded.

III. Risks

There are no more than minimal risks associated with your participation in this project.

IV. Benefits

Information from this focus group may help researchers to develop further Heifer's Alternative Spring Break program.

V. Extent of Anonymity and Confidentiality

Your responses cannot be kept anonymous and confidential during the group discussion; however, your response will not be associated with your name, it will be associated with your code number.

VI. Compensation

No compensation will be provided.

VII. Freedom to Withdraw

You are free to withdraw from the study at any time.

VIII. Approval of Research

As required, this research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, by the Department of Human Nutrition, Foods, and Exercise.

IRB Approval Date

Approval Expiration Date

IX. Subject's Responsibilities

I voluntarily agree to participate in this study. Following are my responsibilities:

- Participate in a 45 minute focus group discussion.
- Complete a short, written questionnaire on survey.vt.edu.

X. Permission

I have read and understand the Informed Consent Form and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

Print Name

Participant Signature

Date

Should I have any pertinent questions regarding this research or its conduct, the research subjects' rights, or whom to contact in the event of a research-related injury to the subject, I may contact:

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