

2013

# Promoting wellness in youth through experiential learning at summer camp

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Promoting wellness in youth through experiential learning at summer camp

by

Elizabeth Anne Mabary

A thesis submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Nutritional Sciences

Program of Study Committee:  
Ruth Litchfield, Major Professor  
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2013

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## ABSTRACT

*Background:* Overweight adolescents are more likely to be overweight or obese in adulthood and are subsequently at greater risk for chronic diseases. The development and complications of overweight and obesity as well as some chronic diseases such as heart disease, cancer, stroke, hypertension, and diabetes may be lessened by consumption of a healthier diet, specifically increasing fruit and vegetable (FV) consumption. Less than 10% of the United States population meets FV recommendations, with the lowest levels of consumption among adolescents. Interventions are needed to address and improve FV consumption.

*Methods:* The Immersion in Wellness project was funded by the Wellmark Foundation and was conducted at the Iowa 4-H Center near Madrid, Iowa during the summer of 2012 and 2013. The project goal was to immerse campers in a five day intervention focusing on nutrition, culinary and gardening topics to improve health behaviors and construct a healthy lifestyle. Intervention campers received gardening, culinary, and nutrition education over the five-day immersion experience and were provided a take-home kit in an effort to influence the home environment after leaving camp. Control campers received the traditional camp experience; no educational lessons or take home kit were provided.

*Results:* At six-month post-camp the intervention campers did not score significantly higher in FV self-efficacy, nutrition knowledge, or FV preferences compared to the control group. However, the intervention group did experience a greater increase in their most preferred home food environment ( $p < 0.05$ ) and garden vegetable

intake ( $p < 0.10$ ). There was no statistical difference between genders in the likelihood of meeting age specific FV recommendations, however age did influence whether specific FV recommendations were met.

*Conclusions:* Overall, FV consumption was low and Iowa youth are likely not meeting daily potassium, dietary fiber, and calcium requirements. As for future research, the home food environment may influence FV self-efficacy, nutrition knowledge, FV preferences as well as FV intakes. Interventions should target improving FV preferences and FV self-efficacy to positively influence FV intake.

## CHAPTER I: INTRODUCTION

### Background

The future health of Americans is concerning as more youth are becoming overweight or obese (Daniels et al., 2005; Ogden, Carroll, Kit, & Flegal, 2012; Schwimmer, Burwinkle, & Varni, 2003; Whitlock, Williams, Gold, Smith, & Shipman, 2005). Chronic diseases such as heart disease, cancer, stroke, hypertension, and diabetes can develop due to complications of overweight and obesity and may be lessened by consumption of a healthier diet, specifically increasing fruit and vegetable (FV) consumption (Bazzano, 2006; Daniels et al., 2005; Hung et al., 2004; Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009; Magarey, Daniels, Boulton, & Cockington, 2003; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). Consumption of FV is inadequate among age all groups, ethnicities, and gender throughout the United States (US) (Kimmons et al., 2009; Yeh et al., 2008). During growth and development, youth should especially meet nutrient needs through consumption of FV (Koletzko, De la Guéronnière, Toschke, & Von Kries, 2004).

Nutrition interventions can increase awareness, educate, promote and boost FV consumption among all individuals, especially youth. However, the best method to increase consumption and variety of FV consumed, as well as sustain this behavior, is controversial within the literature. Ultimately, FV consumption relies on a multitude of factors including the individual, parent, and surrounding environment.



## Goals and Objectives

**Goal 1:** Examine Immersion in Wellness influence on campers six-months following the camp experience

*Objective 1:* Collect surveys at baseline, post-camp, and six-months post-camp to determine the sustainable influence camp had on participants.

*Objective 2:* Determine the health behaviors that are most likely influenced and sustainable at six-month post-camp through experiential learning.

**Goal 2:** Examine factors influencing FV consumption among Immersion in Wellness participants.

*Objective 1:* Collect surveys at baseline, post-camp, and six-months post-camp to determine potential associations of FV consumption.

*Objective 2:* Determine potential target components to increase FV consumption for future research.

## Thesis Organization

This thesis starts with a review of literature focusing on predictors of FV consumption among youth. The second section pertains to the methodology behind the research procedures followed by two manuscripts. The final section contains overall conclusions, appendices, references, and acknowledgements.

## CHAPTER II: REVIEW OF LITERATURE

### Introduction

Progressively, more youth are overweight or obese, mounting concern for the future health of Americans (Daniels et al., 2005; Ogden, Carroll, Kit, & Flegal, 2012; Schwimmer, Burwinkle, & Varni, 2003; Whitlock, Williams, Gold, Smith, & Shipman, 2005). Ogden and colleagues (2010) using Center for Disease Control and Prevention growth charts, suggest a threefold increase in overweight and obesity among youth has occurred over a time span of twenty years. Overweight adolescents are more likely to be overweight or obese in adulthood and are subsequently at greater risk for chronic diseases (Dietz, 1998a, 1998b; Magarey, Daniels, Boulton, & Cockington, 2003). The development and complications of overweight and obesity as well as some chronic diseases such as heart disease, cancer, stroke, hypertension, and diabetes may be lessened by consumption of a healthier diet, specifically increasing FV consumption (Bazzano, 2006; Daniels et al., 2005; Hung et al., 2004; Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009; Magarey et al., 2003; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000).

Inadequate fruit and vegetable (FV) consumption among all age groups, ethnicities, and gender is of great concern throughout the United States (Kimmons et al., 2009; Yeh et al., 2008). Data collected from 14 worldwide geographical regions suggest insufficient FV intake may account for more than two and half million fatalities annually (Lock, Pomerleau, Causer, Altmann, & McKee, 2005). Less than 10% of the United States (US) population meet individual FV recommendations, with the lowest levels of consumption among adolescents (Kimmons et al., 2009; Lorson, Melgar-Quinonez, &

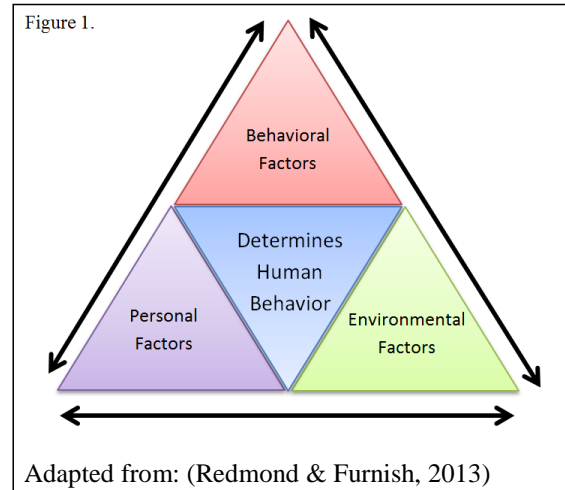
Taylor, 2009). Adolescents believe they are eating enough FV to meet current recommendations, but in reality, they are not (Sheehy & Dharod, 2008). A press release from the National Institutes of Health (2013) indicated less than 33% of adolescents aged 11 to 16 years old eat FV daily. A review of 98 papers suggests as children become older, FV consumption decreases (Rasmussen et al., 2006). As FV consumption decreases, a notable rise in the consumption of solid fats and added sugars, as well as portion size has been observed (Koletzko, de la Guéronnière, Toschke, & von Kries, 2004; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Nielsen, 2003). Failing to meet nutrient needs provided by FV during growth is especially of concern among youth (Koletzko et al., 2004).

Just 0.9% of boys and girls, age 12-18, met calorie specific FV recommendations (Kimmons et al., 2009). Consuming nutrient dense vegetables such as legumes, dark green and deep orange colors should be encouraged amongst youth (Guenther, Dodd, Reedy, & Krebs-Smith, 2006; Krebs-Smith et al., 1996). Unfortunately, starchy vegetables such as fried potatoes and processed tomato products, including pizza sauce, contribute over half of all vegetable intake among adolescents (Kimmons et al., 2009). Consuming a variety of vegetables not only provides nutrients to support normal growth and development, but also significantly reduces the risk of chronic disease (USDA and HHS, 2010).

### **Social Cognitive Theory**

Nutrition interventions can increase awareness, educate, promote and boost FV consumption among all individuals, especially youth. However, the best method to increase consumption and variety of FV consumed, as well as sustain this behavior, is

controversial within the literature. The Social Cognitive Theory (SCT) (Figure 1) is a psychological model frequently used in assessing health behaviors and outcomes (Geller & Dzewaltowski, 2010). Personal, proxy, and collective agency are proposed in this model as constructs used to make



decisions as an individual or in collaboration with others (Bandura, 2000). Actions that are completed purposely are considered an agency, these actions could be positive or negative to the individual (Bandura, 2001).

Personal agency directs and encourages individual decisions (Bandura, 1997). An individual, or agent, must be self-driven and willing to implement action to see change (Bandura, 2001). Bandura (2001) states, “Efficacy beliefs are the foundation of human agency.” Proxy agency is the act of using others to reach personal needs (Bandura, 2000). All individuals rely on this agency throughout their lives and even daily to effectively meet personal necessities and desires (Bandura, 2001); one’s perceived efficacy determines their ability and comfort of proxy agency (Bandura, 2001). Collective agency depends upon mutual desires for greater change (Bandura, 1997, 2000). This agency functions on common principles and acting collectively as a group (Bandura, 2001).

Children tend to use personal and proxy agency to meet their needs through personal decisions and parental guidance (Bandura, 2001), whereas collective agency is needed to change the environment as a whole. Multidimensional interventions that address all three agencies are necessary to change consumption behaviors significantly

and be successful in targeting a large, diverse audience with wide-reaching interventions (Patrick & Nicklas, 2005).

## **Predictors of Fruit and Vegetable Consumption**

### **Personal Agency**

#### *Self-Efficacy*

Geller and Dziewaltowski (2010) used data from the Healthy Opportunities for Physical Activity and Nutrition project to examine self-efficacy relative to FV intake. Results suggest FV consumption was related to the child's self-efficacy for consuming FV. Similar results were reported by a cross-sectional study of 422 middle school students where school lunch FV consumption correlated with FV self-efficacy (Thompson, Bachman, Baranowski, & Cullen, 2007). In a study of 145 alternative high school students, decreasing perceived health barriers was important to not only increase self-efficacy but also boost FV consumption (Bruening, Kubik, Kenyon, Davey, & Story, 2010). Web-based research on 1,606 Australian adolescents also indicated higher self-efficacy was positively correlated with FV consumption (Pearson, Ball, & Crawford, 2012). Finally, a randomized controlled trial comparing a social-cognitive intervention with a knowledge-based intervention in 114 participants found self-efficacy was more likely to promote change in FV consumption than education alone (Kreusikon, Gellert, Lippke, & Schwarzer, 2012).

Self-efficacy can be increased with interventions designed to instill specific behaviors such as asking for more FV at meals or snacks, asking parents to buy favorite FVs while shopping, or the skills to prepare FV snacks (Baranowski et al., 1993; Pearson et al., 2012; Sandeno, Wolf, Drake, & Reicks, 2000). While studies discuss the benefits of high self-efficacy for FV, perceived barriers such as cost and time to prepare FV can

negatively impact self-efficacy (Bruening et al., 2010). Self-efficacy is an important factor in FV consumption; however, food preferences likely predict FV intake as well (Reynolds, Hinton, Shewchuk, & Hickey, 1999; Van Duyn et al., 2001).

### *Preferences*

Domel et al. (1996) administered a FV self-efficacy questionnaire to 392 fourth and fifth grade students. Results suggest FV preferences may have greater influence on FV consumption than self-efficacy, although other studies indicate FV preferences do not regulate FV consumption (Domel, Baranowski, Hunter, Leonard, & Riley, 1993). Resnicow and colleagues (1997) also suggest children's intake is more likely influenced by preference than self-efficacy. In fact, FV preferences have been identified as the strongest predictor of consumption (Brug, Tak, te Velde, Bere, & de Bourdeaudhuij, 2008) and may be more beneficial than nutrition education or increased knowledge (Harvey-Berino et al., 1997). Exposing children to a variety of FV early in life increases preferences for FV that may carry into adulthood (Birch, 1999; Domel et al., 1993; Kristjansdottir et al., 2006; Larson, Laska, Story, & Neumark-Sztainer, 2012; Nicklas et al., 2001; Patrick & Nicklas, 2005; Wardle, 1995; Wolfe & Campbell, 1993). Ultimately, behavior change interventions are needed to incorporate repeated exposure of FV to young children (Harvey-Berino et al., 1997; Schindler, Corbett, & Forestell, 2013); parental based interventions have also been suggested to control the home environment. Accessibility of FVs and parental FV preferences are positively correlated with their children's FV consumption (Bere & Klepp, 2004).

### *Knowledge and Awareness*

Research by Van Duyn et al. (2001) indicated a 22% increase in adults' FV consumption with awareness of the 5 A Day for Better Health program. Evidence in the

literature suggests this is also true of children. Children with higher knowledge (Reynolds, Hinton, et al., 1999; Wardle, 1995) and awareness of FV recommendations (Bere & Klepp, 2005; Sandeno et al., 2000) have reported higher FV consumption. Research on 65 third grade students at a school implementing the CATCH nutrition curriculum and Farm to School program had increased knowledge of vitamins/minerals and awareness of farming practices. These students also reported consuming more vegetables during school meals (Moss, Smith, Null, Long Roth, & Tragoudas, 2013).

Conversely, research on 495 children (9-12 years), indicated no change in FV consumption with internet nutrition education and counseling sessions. Although the youths' awareness and knowledge of recommendations increased, self-reported FV consumption did not (Mangunkusumo, Brug, de Koning, van der Lei, & Raat, 2007). Yet, it should be noted that knowledge is a necessary pre-requisite to enhance self-efficacy (Kreasukon et al., 2012).

### *Experiential Learning*

Skill building is another essential component of self-efficacy (Baranowski et al., 1993; Pearson et al., 2012; Sandeno et al., 2000). Participating in food preparation has been shown to increase interest in health benefits of FV (Hill, Casswell, Maskill, Jones, & Wyllie, 1998) and consumption of nutrient-dense foods including FV (Larson, Story, Eisenberg, & Neumark-Sztainer, 2006). A study examining school nutrition education of 4<sup>th</sup> and 5<sup>th</sup> grade students indicate FV preparation skills play an important role in FV consumption (Baranowski et al., 1993). These findings suggest skill building interventions are an important part of youth development, building self-efficacy, and consumption of FV (Baranowski et al., 1993; Condrasky & Hegler, 2010; Dzewaltowski

et al., 2009; Gross, Pollock, & Braun, 2010; Larson, Perry, Story, & Neumark-Sztainer, 2006; Larson, Story, et al., 2006).

In a New Zealand study, teens were not aware of the health benefits of consuming FVs but became more interested when helping their parents in the kitchen (Hill et al., 1998). A cross-sectional study design of middle and high school students found that those involved with making dinner were consuming more nutrient-dense foods; young adults involved with food preparation also noted higher FV consumption (Larson, Perry, et al., 2006; Larson, Story, et al., 2006).

### **Proxy-Agency**

#### *Proxy-Efficacy*

Proxy-efficacy is the act of depending on others to reach individual needs (Bandura, 2001), such as asking parents to buy or prepare more FV for the home. Research by Geller and Dzewaltowski (2010) demonstrated both personal and proxy-agency influenced children's self-efficacy across gender, socio-economic status, and ethnicity (i.e. African American, Caucasian). Children reported more confidence asking parents to provide FV (Geller & Dzewaltowski, 2010) and were more likely to request FV with higher proxy efficacy (Geller, Dzewaltowski, Rosenkranz, & Karteroliotis, 2009).

#### *Home Food Environment*

A home food environment that supports FV consumption is necessary to influence FV intake (Neumark-Sztainer, Wall, Perry, & Story, 2003; Rabe, Ohri-Vachaspati, & Scheer, 2006). As parents provided access to more FV in the home, adolescents reported eating more produce (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005). In fact, adolescents with mothers wishing to eat healthy were more likely to consume more



FV themselves and have a healthier home food environment (Boutelle, Birkeland, Hannan, Story, & Neumark-Sztainer, 2007). While research suggests a healthy home food environment promotes greater intake of FV in youth, its multi-faceted nature creates a challenge for many households to overcome individual, environmental, and economic barriers (Glanz, Sallis, Saelens, & Frank, 2005). Changing the home food environment can be accomplished through community interventions targeting both parents and their children (Cullen et al., 2003; Heim, Bauer, Stang, & Ireland, 2011).

A review of 38 publications by Blanchette and Brug (2005) found interventions targeting availability, accessibility, and preferences of FVs as the leading predictors of FV consumption. A longitudinal study of FV consumption suggests preferences and availability were the most predictive of future consumption (Larson et al., 2012). In fact, homes with FV readily available were more successful in increasing children's FV consumption (Kratt, Reynolds, & Shewchuk, 2000). Interestingly, research examining child and parent perceptions of the home food environment suggests parents perceived a more supportive atmosphere than their children (Robinson-O'Brien, Neumark-Sztainer, Hannan, Burgess-Champoux, & Haines, 2009).

### *Parental Modeling*

Child and parental food consumption are likely correlated (Elfhag, Tholin, & Rasmussen, 2008) as meal patterns, beliefs and actions of parents are reciprocated in their children (Gross et al., 2010; Patrick & Nicklas, 2005). Parental interventions to increase FV intake may be most beneficial because they can influence the overall home food environment through accessibility and availability of FV in the home (Bere & Klepp, 2004; Blanchette & Brug, 2005; Brug et al., 2008; Cullen et al., 2003; Patrick & Nicklas, 2005). In a cross-sectional study of 1,235 eleven-year-old children, vegetable but not

fruit, consumption was influenced by home availability (Kristjansdottir et al., 2006). Parents make FV available through purchasing FV, but also make FV accessible by washing and preparing it for their children (Brug et al., 2008).

An examination of psychosocial factors influencing FV consumption among 1,739 parents indicated their child's FV consumption was positively correlated with parental intake (Reinaerts, de Nooijer, Candel, & de Vries, 2007), suggesting children follow parental guidance. Therefore, it is recommended parents not only provide FVs but positively role model FV consumption for their children rather than coercing children to consume FVs at meal time (Ball, Cohen, & Meyer, 2012; Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002; Nicklas et al., 2001; Wardle, Herrera, Cooke, & Gibson, 2003).

Family meals have also been linked greater home availability with higher FV intake (Utter, Scragg, Schaaf, & Mhurchu, 2008; Wardle, Carnell, & Cooke, 2005). FV consumption has been shown to increase by adding vegetables to mixed dishes or offering several different selections of vegetables at mealtime (Meengs, Roe, & Rolls, 2012). Collectively, the literature suggests parents act as a role model in their children's lives. A supportive home environment and leading by example appears to increase FV consumption among youth (Di Noia & Byrd-Bredbenner, 2013; Pearson, Biddle, & Gorely, 2009; Wyse, Campbell, Nathan, & Wolfenden, 2011).

#### *Household Income*

Children at greatest risk for low FV consumption come from a lower socioeconomic background, have limited grocery store accessibility and ample access to fast food restaurants (Svastisalee, Holstein, & Due, 2012). Krebs-Smith and colleagues (1996) have reported a positive correlation between income and FV intake. Although FV consumption was low among all samples, household income was clearly predictive of

whether or not children met FV recommendations (Cutler, Flood, Hannan, & Neumark-Sztainer, 2011; Krebs-Smith et al., 1996). It should be noted, children of lower socioeconomic status can increase their FV consumption by utilizing school nutrition programs (Grutzmacher & Gross, 2011; Svastisalee et al., 2012). A farmer's market intervention was successful at increasing FV consumption among low-income households through education by improving attitudes and supplying FV coupons (Anderson et al., 2001). Children attending less ethnic diverse schools with higher socioeconomic status were more likely to ask parents to provide FV at home (Geller et al., 2009). This finding was likely due to greater financial stability of parents and perceived self-efficacy for asking among children (Geller et al., 2009).

#### *Parenting Styles*

Authoritative parenting has been suggested to promote the healthiest home environment for children (Kremers, Brug, de Vries, & Engels, 2003). An examination of 231 caregivers revealed authoritative parents had more FV within the household and those children were more likely to consume FV (Patrick, Nicklas, Hughes, & Morales, 2005). In contrast, less authoritative parents had homes that fostered less desirable eating habits and less availability of FV. Regardless of parenting styles, parental control over meals within the home has been linked with higher fruit intake in adolescents (Pearson et al., 2012) and greater consumption of FVs among 2-6 year olds (Wardle et al., 2005).

#### *Early Exposure and Intervention*

Nutrition education is important in early childhood to improve knowledge and preferences (Kemirembe, Radhakrishna, Gurgevich, Yoder, & Ingram, 2011; Kunkel et al., 2013; Morris & Zidenberg-Cherr, 2002). Early interventions may be especially important because intake of sugary beverages increases (French, Lin, & Guthrie, 2003;

Rampersaud, Bailey, & Kauwell, 2003; Wang, Bleich, & Gortmaker, 2008) and FV intake decreases during adolescence (Lien, Lytle, & Klepp, 2001; Rasmussen et al., 2006; te Velde, Twisk, & Brug, 2007). Early introduction to a variety of FV appears to improve future preferences in adulthood (Domel et al., 1993; Kristjansdottir et al., 2006; Patrick & Nicklas, 2005; Wolfe & Campbell, 1993) through food exposure (Domel et al., 1993; Nicklas et al., 2001; Schindler et al., 2013). Kelder, Perry, Klepp and Lytle (1994) tracked longitudinal health behaviors of adolescents and suggested interventions prior to 6<sup>th</sup> grade were most beneficial for developing positive behavioral patterns that carry into adulthood. Training childcare providers on current nutrition and physical activity guidelines may be one way to begin implementing healthier lifestyles at a young age in the future (Van Stan, Lessard, & Dupont-Phillips, 2013).

#### *Garden*

Incorporating garden experiences into nutrition education is a relatively new strategy to develop preferences for FVs while learning in a new exciting atmosphere (Heim, Stang, & Ireland, 2009; Parmer, Salisbury-Glennon, Shannon, & Struempfer, 2009). Gardening is a novel way to expose children to different FV, be more physically active, and encourage healthy practical learning in youth (Ahmed, Oshiro, Loharuka, & Novotny, 2011; Ozer, 2007). Gardening experiences may promote increased consumption of FV through hands on involvement and increased familiarity and exposure with fresh FV (Heim et al., 2009; Morris, Neustadter, & Zidenberg-Cherr, 2001).

A pilot study for a garden-based intervention targeting 4<sup>th</sup> and 5<sup>th</sup> grade Latino students found attitudes and vegetable preferences increased with intervention (Gatto, Ventura, Cook, Gyllenhammer, & Davis, 2012). In contrast, a study by Koch, Waliczek, & Zajicek (2006) examined the impact of a garden intervention on 2<sup>nd</sup>-5<sup>th</sup> grade students

and found significant improvements in FV knowledge but little impact on preferences. Another school-based garden intervention with 6<sup>th</sup> grade students using nutrition education and active learning reported increased FV consumption during the 12 week program (McAleese & Rankin, 2007). Another 111 students participating in the “Nutrition in the Garden” program did not increase their FV intake but did improve their attitude towards FVs (Lineberger & Zajicek, 2000). The varying results suggest more research is necessary, although it is apparent that gardens have the potential to positively impact youth in some form. Varying results are likely due to a variety of variables such as; age, gender, ethnicity, length of program and previous knowledge or exposure.

Community gardens also present an opportunity to increase FV intake among urban residents and those with low access to fresh produce (Alaimo, Packnett, Miles, & Kruger, 2008; McCormack, Laska, Larson, & Story, 2010). Families enrolled in the pilot study “Growing Healthy Kids” had increased availability and consumption of FV in the home (Castro, Samuels, & Harman, 2013). Community gardens not only improve the availability of produce but also create a stronger community bond and increase awareness of important health disparities caused by inadequate FV consumption (Twiss et al., 2003).

#### *Peer-Modeling*

A study of 2,043 adolescents eating behaviors reported peers’ consumption of breakfast, whole grain, and vegetable intake behaviors were correlated but fruit intake was not (Bruening et al., 2012). It has been suggested that peers may exert more influence on each other than their parents (Lowe, Horne, Tapper, Bowdery, & Egerton, 2004). Older schoolchildren are more likely to be pressured into eating unhealthy food choices (Krølner et al., 2011). One way to possibly overcome this is to have peer taught

culinary education lessons to improve basic culinary skills (Nelson, Corbin, & Nickols-Richardson, 2013).

Research demonstrates males are more likely to not meet FV recommendations compared to females (Cartwright et al., 2003; Neumark-Sztainer, Story, Resnick, & Blum, 1996; Reynolds, Baranowski, et al., 1999). Some data suggests gender differences of FV intake exist between males and females because females have greater FV preferences (Brug et al., 2008). However, a review of 31 articles suggests that girls are more likely than boys to consume FV due to peer pressure and self-image (Krølner et al., 2011). Healthy eating is thought to be more prominent among females than males due to body image issues (McKinley et al., 2005; Neumark-Sztainer, Story, Perry, & Casey, 1999). Baseline data from 2,338 ninth grade students suggests that females have greater FV knowledge and more confidence in meeting FV recommendations compared to males (Beech, Rice, Myers, Johnson, & Nicklas, 1999).

### **Collective Agency**

#### *Environment*

Collective agency is the ability to achieve outcomes together by joining individual strengths (Bandura, 2001). It has been suggested this collaboration is needed because behavior-based interventions alone are not reliable in sustaining recommended levels of FV intake (Thomson & Ravia, 2011). However, a review of behavioral interventions suggests that individual, population and macro-level interventions all have the ability to improve intake, decreasing the risk of chronic disease development (Ammerman, Lindquist, Lohr, & Hersey, 2002).

The environment we live in today promotes unhealthy lifestyles and must be improved on all levels- individual, population and macro to make a difference (Brownell,

Schwartz, Puhl, Henderson, & Harris, 2009; Pomerleau, Lock, Knai, & McKee, 2005). Solely educating the public will not improve lifestyles (Krebs-Smith, Reedy, & Bosire, 2010), but perhaps creating a healthier eating environment at the community-level may lead to behavior change (Story, Ark-Sztainer, & French, 2002). Although, multifaceted interventions are needed to make healthier foods more accessible (Hood, Martinez-Donate, & Meinen, 2012) and to improve our environment as a whole (Knai, Pomerleau, Lock, & McKee, 2006), public policy may be the most challenging. It should be noted, the current environmental FV supply could not support the demand of all individuals following Dietary Guidelines for Americans FV recommendations (Krebs-Smith et al., 2010; U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

### **Conclusion**

Change must begin with an individual to see a lasting impact. Interventions targeted at improving self-efficacy, preferences, and nutrition knowledge are important for influencing personal agency. Awareness of personal nutrition recommendations and potential health risks associated with low FV consumption is pertinent information for motivation to change. Incorporating skill-building lessons to expand food preparation knowledge and cooking techniques is suggested to help sustain such behaviors.

Yet, younger generations must rely on their parent or guardian to make healthful decisions when it comes to buying and preparing FVs for the home. Interventions are needed to improve proxy agency of both children and parents. Children need to gain confidence in asking for more FV in the home, while the parent must be reliable for not only providing FVs, but making these FVs accessible for snacks and meals. Modeling

healthy behavior, setting family meal times, and providing a variety and repeated FV exposure is important in establishing healthy habits while children are young.

Ultimately, it is apparent that FV consumption relies on a multitude of factors from the individual, parent, and environment. Collective agency will be important for improving and sustaining FV consumption among all age groups, gender, and ethnicities within the US. Perhaps small changes within communities, such as promoting community or school gardens, can begin to make a positive, lasting impact on FV consumption.



## CHAPTER III: METHODS

### Introduction

The Immersion in Wellness project was funded by the Wellmark Foundation and was conducted at the Iowa 4-H Center near Madrid, Iowa during the summers of 2012 and 2013. The project goal was to immerse campers in a five day intervention focusing on nutrition, culinary, PA and gardening topics to improve health behaviors and construct a healthy lifestyle. The week-long Immersion in Wellness camp received Institutional Review Board approval from Iowa State University (ISU) for all data collection measures and interventions (Appendix A). Intervention campers received gardening, culinary, and nutrition education over the five-day immersion experience and were provided a take-home kit in an effort to influence the home environment after leaving camp. Control campers received the traditional camp experience; no educational lessons or take home kit was provided.

### Data Collection

Data was collected from enrolled campers through multiple forms and survey tools assessing nutrition, PA, and the home food and PA environment. Surveys were administered prior to the camp experience at check-in and were repeated through mailings at six months following camp for both control and intervention groups. Intervention campers also completed a survey to assess gained knowledge, self and proxy-efficacy, and preferences at the completion of the week-long immersion experience; this survey was not repeated in the control group. Data collection surveys and time table appears in Table 1.

**Table 1. Data Collection Surveys for Summer 2012 and 2013**

	Baseline	Post Camp	Six-Months Post Camp
Control	-Camper Information -Camper Survey -Home Environment Survey	X	-Camper Survey -Home Environment Survey
Intervention	-Camper Information -Camper Survey -Home Environment Survey	-Camper Survey	-Camper Survey -Home Environment Survey

### Camper Information

Gender, age, height, weight, known food allergies, and PA restrictions were collected on all campers from the camp registration and medical history forms (Appendix B). Neither the camper's height nor weight was used for analysis because information was dependent upon their most recent physical examination at the doctor's office, which varied widely.

### Camper Survey

The camper survey consisted of three sections assessing FV knowledge, preferences, and proxy and self-efficacy (Appendix C). This survey was completed individually by each camper, without the assistance of a parent. The FV knowledge tool was modified from its original version to reflect recently released MyPlate recommendations. The original survey consisted of 16 items (6 MyPyramid food groups, 10 nutrient-food and role associations) and was previously published by Struempfer & Raby (2005). FV preferences were collected on 30 fruit juices, fruits, and vegetables, using a survey published by Domel and colleagues (1993). Self and proxy-efficacy for FV intake was the last section of the survey tool and was measured using a survey created by Domel and colleagues (1996). This survey was administered prior to camp for both

intervention and control groups, on the last day of camp for the intervention group, and again at six months following for both intervention and control groups.

### **Home Environment Survey**

The home environment survey consisted of three sections which assessed the home environment relative to availability of PA, participation in various PAs, availability of food, and consumption via a food frequency questionnaire (FFQ) (Appendix D).

Parents were allowed to help campers fill out this survey since they were more familiar with the home food environment and frequencies of their children's intake. The home food and PA environment was measured using the "America on the Move" survey developed by Catenacci and Wyatt (2007). The frequency of PA was measured by specific activity (basketball, soccer, walking, etc.) using the Youth/Adolescent Activity Questionnaire developed by Harvard School of Public Health (2005). The last section of this survey assessed actual consumption of foods using the Youth/Adolescent Food Frequency Questionnaire developed by Rockett and colleagues (1997). This survey was administered prior to camp and again at six months following camp for both intervention and control campers.

### **Subjects**

Two specific week-long camps at the Iowa 4-H State Center were targeted for the study, Everything Camp and Counselors in Training Camp (CIT). Everything Camp allowed recruitment of 9-14 year olds and CIT Camp recruited 16-18 year olds. Control and intervention weeks were assigned among six weeks of Everything Camp and CIT Camp during summer of 2012. Two weeks of contained 4-H group camps were assigned control and intervention weeks during summer of 2013. Depending on the campers' chosen week of enrollment, they had the opportunity to enroll in the project, but were not

aware of whether they were in the control or intervention group. One hundred and forty eight total campers were recruited for Immersion in Wellness during the summers of 2012 and 2013. Table 2 indicates designated treatment (control or intervention) weeks throughout the Immersion in Wellness project.

**Table 2. Treatment Weeks During Summer 2012 and 2013**

Summer 2012					
Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Control	Intervention	Control	Intervention	Control	Intervention
June 10-16	June 17-23	June 24-30	July 8 -14	July 22 -28	July 29 – Aug 4
6 Campers	18 Campers	5 Campers	16 Campers	27 Campers	2 Campers
Summer 2013					
Week 1			Week 2		
Control			Intervention		
June 16 -22			July 28 – Aug 3		
56 Campers			18 Campers		

## Procedures

The research group consisted of ISU faculty and graduate students in Food Science and Human Nutrition; all members were trained on proper data collection procedures and passed a criminal background check as they would be working with youth. Surveys were mailed to all registered campers prior to the arrival at camp. In addition during check-in, campers and their parents were recruited through simple one-on-one discussion with the researchers or a cover letter drafted to explain the intent of the study and enrollment procedures (Appendix E). The research group assisted campers and parents with the survey materials and forms.

Eligible campers (Everything Campers or CIT) and their parents were asked to read and sign the informed consent documents (Appendix F). Campers were asked to individually complete the camper survey while the parent completed the home environment survey for their child. Important health form information was collected from

the camp registration and health form to monitor food allergies and PA restrictions throughout the week as necessary.

Two research participant receipt forms were completed to allow compensation for participation in the study (Appendix G). Both control and intervention campers were given a \$40 cash incentive at the end of the week for participating in the initial experience and another \$25 check incentive was mailed to their home address after completing and returning six-month post surveys. Intervention campers also received a “take-home kit” valued at approximately \$25. The take-home kit included: color-coded cutting boards, paring knife, vegetable scrub brush, Healthy and Homemade cookbook (ISU Extension publication), refrigerator and meat thermometers, pedometer, garden journal and various nutrition and PA publications related to the experiential learning topics (Appendix H).

### **Intervention**

Summer 2012 consisted of three intervention weeks and summer 2013 consisted of one intervention week. The same schedule of intervention was implemented both years (Table 3). Gardening lessons were developed and taught by Boone County Master Gardeners. The composting lesson was taught by employees from the National Laboratory for Agriculture and the Environment. Culinary lessons were developed and taught by an undergraduate culinary intern both summer 2012 and 2013, while the Culinary Science program director and a faculty member in nutrition helped modify camp lessons. Nutrition lessons were developed by an undergraduate nutrition student in a class, modified by a graduate student in nutrition, and taught by graduate level nutrition students each summer.

During intervention weeks, campers were divided into three groups and rotated between the garden, culinary and nutrition lessons. Each instructor had 30-40 minutes to teach their lesson before rotating campers to the next lesson. Control week campers had no interaction with the immersion staff after completing survey tools prior to the start of camp.

Table 3: Intervention Week Experiential Learning Activities for Summer 2012 and 2013

	Monday	Tuesday	Wednesday	Thursday	Friday
<b>Garden</b>	<b>Garden Planning</b> <ul style="list-style-type: none"> <li>Measurements</li> <li>Location</li> </ul>	<b>Soil</b> <ul style="list-style-type: none"> <li>Texture</li> <li>Improve quality</li> <li>pH</li> <li>Fertilizer nutrients</li> </ul>	<b>Seeds</b> <ul style="list-style-type: none"> <li>Growing requirements</li> <li>Zone maps</li> </ul> <b>Plants</b> <ul style="list-style-type: none"> <li>Thinning</li> <li>Transplanting</li> <li>Harvesting</li> </ul>	<b>Water Conservation</b> <ul style="list-style-type: none"> <li>Wasteful watering</li> <li>Conservation practices</li> </ul> <b>Garden Pest</b> <ul style="list-style-type: none"> <li>Pest identification</li> </ul>	<b>Composting</b> <ul style="list-style-type: none"> <li>Benefits</li> <li>Materials</li> <li>Care</li> <li>Bugs/worms</li> </ul>
<b>Culinary</b>	<b>Utensil Identification</b> <ul style="list-style-type: none"> <li>Basic utensils</li> <li>Knife skills</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Food borne illness</li> </ul>	<b>Mise en Place</b> <ul style="list-style-type: none"> <li>Organize workspace</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Danger Zone</li> </ul>	<b>Handling Raw Meat</b> <ul style="list-style-type: none"> <li>Storage</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Separate Safely</li> <li>Temperatures</li> </ul>	<b>Seasonal/Recipe Modifications</b> <ul style="list-style-type: none"> <li>Ingredient substitutions</li> <li>Economical</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Hand Washing</li> </ul>	<b>Yeast Dough</b> <ul style="list-style-type: none"> <li>Leavening</li> <li>Gluten</li> <li>Kneading</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Review</li> </ul>
<b>Nutrition</b>	<b>MyPlate</b> <ul style="list-style-type: none"> <li>Food groups</li> <li>Meals and snacks</li> </ul>	<b>Fruits and Vegetables</b> <ul style="list-style-type: none"> <li>Vitamins and minerals</li> <li>FV Recommendations</li> </ul>	<b>Get Up &amp; Go</b> <ul style="list-style-type: none"> <li>PA Recommendations</li> <li>Pedometer</li> <li>Heart Rate</li> </ul>	<b>Portion Distortion</b> <ul style="list-style-type: none"> <li>Portion control</li> <li>Reading a label</li> </ul>	<b>Hero vs. Villain Fats</b> <ul style="list-style-type: none"> <li>Heart healthy fats</li> <li>Dining out</li> </ul>

## Data Analysis

Data was analyzed using the IBM Statistical Package for Social Sciences for Windows (SPSS for Windows, Version 19.0, 2010). The level of significance  $p < 0.05$  was set for all results, while a trend was  $p < 0.10$ . Data was analyzed using frequencies, independent samples t-test, paired samples t-test, Chi-Square analysis, One-way ANOVA, and multivariate likelihood analysis modeling (Akaike, 1974). Likelihood analysis was programmed and assessed using MATLAB R2007A (MathWorks, Natick, MA).

## Statistical Analysis for Manuscript One (Chapter IV)

Manuscript one consists of baseline and six-month post data from summer one, approximately 53 camper's surveys. The sample size varies as not all campers completed entire survey sections. Higher FV self-efficacy, nutrition knowledge, and FV preferences are considered positive. A higher most preferred home food environment is considered desirable whereas a higher least preferred home food environment is negative.

Age was examined at baseline by intervention using independent samples t-test and chi-square analysis. FV self-efficacy, nutrition knowledge, FV preferences, and home food environment scores were compared at baseline and at six-months post by intervention using independent and paired samples t-test.

FV preferences were examined using four classifications: FV overall, fruit, vegetable, and vegetables grown in the garden (garden vegetables). The home food environment survey captured the availability of pantry and refrigerator food in the home in three categories: most preferred, neutral, and least preferred. For statistical analyses, most preferred and least preferred were used to characterize the home food environment and any subsequent change.



Change in survey responses from baseline to six-month post-camp data on FV self-efficacy, nutrition knowledge, preferences (overall, fruit, vegetable, garden vegetable), home food environment (most desired pantry, most desired refrigerator, least desired pantry, least desired refrigerator) and FV consumption (fruit, fruit juice, vegetable, starchy vegetable, garden vegetables and individual garden vegetables) were examined by Chi Square. Change scores were calculated as post minus pre score and categorized as negative or no change and positive change.

Further exploratory data analysis excluded campers who did not respond to the follow-up questionnaire (n=18) and CIT campers (n=3). Data from 49 subjects were tested for correlation factorially using Pearson's correlation coefficient. Any significant collinearity was noted for multivariate analysis. Potential multivariate models were identified through factorial testing of several independent variables to one dependent variable. Maximum likelihood estimates were examined using a small-sample-size corrected Akaike Information Criteria (AICc) (Akaike, 1974), and models with strong likelihood estimates were compared using a bootstrap method (Burnham & Anderson, 2002; Konishi & Kitagawa, 2008). This method consisted of randomly resampling the subject pool with replacement to generate 10,000 virtual subject samples. AICc values were computed for each tested model and the best performing model was identified with each resampling. Models were judged to be equivalent if they were equally represented in the resampling. Bootstrap protocol was programmed in MATLAB R2007a (Mathworks, Natick, MA). Random numbers were generated using the Mersenne Twister algorithm (Matsumoto & Nishimura, 1998).

### **Statistical Analysis for Manuscript Two (Chapter V)**

Baseline data for all campers (n=148) participating in the study from summer 2012 and 2013 were included in analyses. An independent sample t-test was used to examine differences in FV self-efficacy, nutrition knowledge, FV preferences, and FV intakes by gender. One-way ANOVA was used to examine differences in FV self-efficacy, nutrition knowledge, FV preferences, and FV intakes by three age groups (9-11, 12-15, and 16-18 years old). These age groups were broken into groups based on camp enrollment as an “Everything Camper” (9-11 and 12-15 years old) and “CITs” (16-18 years old).

Self-reported FV intake frequencies were converted into daily frequency equivalents (Helaine Rockett, 2013). Daily equivalents were converted to cups where one-half cup was used as the serving size for one daily equivalent per MyPyramid recommendations that were in place when the FFQ was created. The daily equivalents for all individual FV intakes were examined individually but also grouped accordingly as fruit, fruit juice, vegetable, starchy vegetable as well as Dietary Guideline (USDA & HHS, 2010) vegetable sub-groups including starchy, dark green/leafy, red/orange, legumes, and other. Percent meeting FV recommendations by age and gender was classified by using MyPlate specific age standards of 9-13 and 14-18 years.

Nutrient intake from FV consumption for three of the four nutrients of concern identified by the Dietary Guidelines for Americans (USDA & HHS, 2010) was estimated from the FFQ responses using the USDA National Nutrient Database for Standard Reference values (USDA, 2013a). The Economic Research Service Food Availability Data System (USDA, 2013b) was used to calculate nutrient composition for some FVs (ex: corn) where consumption form was not denoted. For these FVs, nutrient intake was

estimated using the proportional availability in the food supply (i.e. fresh, canned, frozen). When more than one food item was within a category of FFQ (ex: apple/applesauce), individual potassium, dietary fiber, and calcium contents were averaged. Estimated nutrient intakes were compared to the Dietary Reference Intakes Recommended Dietary Allowances (Institute of Medicine, 2006) for potassium, dietary fiber and calcium.

Data from 148 subjects were tested for correlation factorially using Pearson's correlation coefficient. Any significant correlations were noted both as end results as well as to protect against using collinear elements in multivariate analysis. Potential models were identified by building multivariate linear models factorially. Statistically significant models were identified and tested against each other using maximum likelihood estimates. These estimates were examined using the Akaike Information Criteria corrected for small sample size (AICc) (Akaike, 1974). Since the analysis yielded robust and nearly identical models according to the AICc, bootstrapping was not performed (Burnham & Anderson, 2002).

## CHAPTER IV: CAN AN IMMERSION IN WELLNESS CAMP INFLUENCE YOUTH HEALTH BEHAVIORS?

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A paper to be submitted to the Journal of Extension

### **Abstract**

*Background:* The Immersion in Wellness project was conducted at a Midwest 4-H Center during the summer of 2012 and 2013. The project goal was to immerse campers in a five day intervention focusing on nutrition, culinary and gardening topics to improve health behaviors and construct a healthy lifestyle.

*Methods:* Two specific week-long camps were targeted for the study, recruiting 9-18 year olds. Control and intervention weeks were assigned during both summers. Data was collected from enrolled campers through multiple forms and survey tools assessing nutrition, physical activity, and the home environment.

*Results:* A total of 74 campers completed baseline surveys during summer 2012; six month follow up rate was 72% (n=53). Camp increased the intervention groups nutrition knowledge ( $p<0.10$ ) and home food environment ( $p<0.05$ ). Likelihood analysis modeling suggests that preferences influence change in self-efficacy and consumption of produce relies on gender and age.

*Conclusions:* Results of this study suggest that the home food environment may influence FV self-efficacy, nutrition knowledge, FV preferences as well as FV intakes. Nutrition education programs targeting the home food environment can be an effective way to encourage healthier behaviors from a young age.

*Keywords:* nutrition education, adolescents, community nutrition educator

## **Introduction**

Progressively, more youth are overweight or obese, mounting concern for the future health of Americans (Daniels et al., 2005; Ogden, Carroll, Kit, & Flegal, 2012; Schwimmer, Burwinkle, & Varni, 2003; Whitlock, Williams, Gold, Smith, & Shipman, 2005). Overweight adolescents are more likely to be overweight or obese in adulthood and are subsequently at greater risk for chronic diseases (Dietz, 1998a, 1998b; Magarey, Daniels, Boulton, & Cockington, 2003). Inadequate fruit and vegetable (FV) consumption may contribute to the development and complications of overweight and obesity, as well as some chronic diseases including heart disease, cancer, stroke, hypertension, and diabetes (Bazzano, 2006; Daniels et al., 2005; Hung et al., 2004; Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009; Magarey et al., 2003; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000).

Inadequate FV consumption among all age groups, ethnicities, and gender is of great concern throughout the United States (US) (Kimmons et al., 2009; Yeh et al., 2008). Less than 10% of the US population meets daily FV recommendations, with the lowest levels of consumption among adolescents (Kimmons et al., 2009; Lorson, Melgar-Quinonez, & Taylor, 2009). Failing to meet nutrient needs provided by FV during growth is especially of concern among youth (Koletzko, de la Guéronnière, Toschke, & von Kries, 2004). Further, as FV consumption decreases, a notable rise in the consumption of solid fats and added sugars, as well as portion size has been observed (Koletzko et al., 2004; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Nielsen, 2003).

Exposing youth to a variety of FV early in life increases preferences for FV that may carry into adulthood (Birch, 1999; Domel, Baranowski, Hunter, Leonard, & Riley, 1993; Kristjansdottir et al., 2006; Larson, Laska, Story, & Neumark-Sztainer, 2012; Nicklas et al., 2001; Patrick & Nicklas, 2005; Wardle, 1995; Wolfe & Campbell, 1993). In fact, FV preferences have been identified as the strongest predictor of consumption (Brug, Tak, te Velde, Bere, & de Bourdeaudhuij, 2008) and may be more influential than nutrition education or increased knowledge (Harvey-Berino et al., 1997). Yet, there is also evidence in the literature that children with greater knowledge (Reynolds, Hinton, Shewchuk, & Hickey, 1999; Wardle, 1995) and awareness of FV recommendations (Bere & Klepp, 2005; Sandeno, Wolf, Drake, & Reicks, 2000) have greater FV consumption. Finally, a home food environment that supports FV consumption is also necessary to promote FV intake (Ball, Cohen, & Meyer, 2012; Neumark-Sztainer, Wall, Perry, & Story, 2003; Rabe, Ohri-Vachaspati, & Scheer, 2006). As parents provide access to more FV in the home, adolescents report eating more (Hanson, Neumark-Sztainer, Eisenberg, Story, & Wall, 2005).

This study examines whether a week-long camp experience with educational programming on gardening, culinary, and nutrition can improve youth's FV intake, self-efficacy, knowledge, or preferences. Further, the home food environment was explored relative to youth's self-efficacy, knowledge and preferences.

## **Methods**

The Immersion in Wellness camp experience was conducted at a Midwest State 4-H Center during the summers of 2012 and 2013. The goal was to immerse campers in a five-day intervention with experiential learning on nutrition, culinary and gardening to

foster health behaviors associated with a healthy lifestyle. Institutional Review Board approval was received for all data collection measures and interventions.

### *Data Collection*

Two specific week-long camps at the 4-H Center were targeted for the study, “Everything Camp” and “Counselors in Training Camp” (CIT). Everything Camp facilitated recruitment of 9-14 year olds while CIT Camp targeted 16-18 year olds. Three control and three intervention weeks were assigned among six weeks of Everything and CIT Camp during summer of 2012. Two weeks of 4-H group camps were assigned as control and intervention weeks during summer of 2013. Depending on the campers’ chosen week of enrollment, there was the opportunity to enroll in the project, but campers were not aware of whether they were in the control or intervention group.

Campers and their parents were recruited through a pre-camp mailing, which explained the intent of the study and enrollment procedures and/or simple one-on-one discussion with the researchers at camp registration. Eligible campers and their parents were asked to read and sign the informed consent documents. Two research participant receipt forms were completed to receive compensation for participation in the study.

Data was collected from enrolled campers using previously established survey tools (Catenacci & Wyatt, 2007; Domel et al., 1993; Domel, Thompson, Hunter, Baranowski, & Leonard, 1996; Harvard School of Public Health, 2005; Rockett et al., 1997; Struempfer & Raby, 2005) assessing nutrition, PA, and the home environment. Surveys were administered prior to the camp experience, collected at check-in and repeated at six months following the camp experience for both control and intervention groups. Intervention campers also completed surveys at the completion of the week-long immersion experience.

### *Intervention*

Intervention campers received experiential learning in gardening, culinary, and nutrition over the five-day immersion camp experience and a take-home kit intended to influence the home environment after leaving camp. The take-home kit included: color-coded cutting boards, paring knife, vegetable scrub brush, Healthy and Homemade cookbook (ISU Extension publication), refrigerator and meat thermometers, pedometer, garden journal and various nutrition and PA publications related to the experiential learning topics. Control campers received the traditional camp experience; no experiential learning or take-home kit was provided.

Table 1 provides an overview of all experiential learning activities throughout the week-long camp experience. Gardening lessons were developed and taught by the local County Master Gardeners. The composting lesson was taught by staff from the National Laboratory for Agriculture and the Environment. Culinary lessons were developed and taught by an undergraduate culinary intern both summer 2012 and 2013, while the Culinary Science program director and a faculty member in nutrition helped modify camp lessons. Nutrition lessons were developed by an undergraduate nutrition student class, modified by a graduate student in nutrition, and taught by graduate level nutrition students.

During intervention weeks, campers were divided into three groups, which rotated between the garden, culinary and nutrition lessons; each lesson was 30-40 minutes. Intervention weeks also had lunch menus tailored to incorporate vegetables harvested from the garden and prepared during the culinary lessons.



### *Data Analysis*

Data was analyzed using the IBM Statistical Package for Social Sciences for Windows (“IBM Statistical Package for Social Sciences for Windows,” 2010). Likelihood analysis and bootstrap modeling were programmed and analyzed using MATLAB R2007A (MathWorks, Natick, MA.). The level of significance used for all statistical analysis was  $p < 0.05$ , while a trend was  $p < 0.10$ . Data were compared to the normal distribution to test for normality. Data was analyzed using frequencies, chi-square, independent and paired-samples t-test (for normally distributed data) Mann-Whitney U test (for non-normally distributed data), and likelihood analysis estimates (Akaike, 1974). Higher FV self-efficacy, nutrition knowledge, and FV preferences were considered positive outcomes. A higher most preferred home food environment was considered desirable whereas least preferred home food environment was negative.

Population demographics (age and gender) by intervention were examined at baseline using independent samples t-test and chi-square analysis. FV self-efficacy, knowledge, preferences, and home food environment scores were compared at baseline and at six months post by intervention using independent samples and paired samples t-tests.

FV preferences were examined using four classifications: FV overall, fruit, vegetable, and vegetables grown in the camp garden (garden vegetables). The home food environment survey captured the availability of food in the pantry and refrigerator in three categories – most preferred, neutral, and least preferred. For statistical analyses, most preferred and least preferred were used to characterize the home food environment and examine any subsequent change.

Change scores for survey responses from baseline to six months post-camp were calculated for FV self-efficacy, knowledge, preferences (overall, fruit, vegetable, garden vegetable), home food environment (most desired pantry, most desired refrigerator, least desired pantry, least desired refrigerator) and FV consumption (fruit, fruit juice, vegetable, starchy vegetable, garden vegetables and individual garden vegetables). These scores were categorized as negative, no change or positive change for Chi Square analyses.

Further exploratory data analysis excluded campers who did not respond to the follow-up questionnaire (n=18) and CIT campers (n=3). Data from 49 subjects were tested for correlation factorially using Pearson's correlation coefficient and significant collinearities were noted for multivariate analysis. Potential multivariate models were identified through factorial testing of several independent variables to one dependent variable. Models with independent variables showing significant colinearity were excluded unless collinear variables were clearly unrelated. Maximum likelihood estimates were compared using a small-sample-size corrected Akaike Information Criteria (AICc) (Akaike, 1974), and models with strong likelihood estimates were tested using a bootstrap method (Burnham & Anderson, 2002; Konishi & Kitagawa, 2008). This method consisted of randomly resampling the subject pool with replacement to generate 10,000 virtual subject samples. AICc values were computed for each tested model and the best performing model was identified with each resampling. Models were judged to be equivalent if they were equally represented in the resampling. Random numbers were generated using the Mersenne Twister algorithm (Matsumoto & Nishimura, 1998).

## Results

A total of 74 campers (32 male, 42 female; 38 control, 36 intervention) completed baseline surveys during summer 2012 (Table 2). Due to the bimodal distribution of ages, a non-parametric test, Mann-Whitney, was used to examine the difference in age between the two groups and suggests a significant difference in age between intervention and control ( $p < 0.05$ ) at baseline. Gender was not significantly different between intervention and control campers at baseline. Six-month follow up response rate was 72% ( $n=53$ ); however, sample size on specific survey results varies among analyses due to incomplete surveys.

Baseline and six-month post-camp mean survey scores for FV self-efficacy, nutrition knowledge, FV preferences and home food environment appear in Table 3. The control group had significantly higher nutrition knowledge at baseline, which persisted through six months post-camp ( $p < 0.05$ ). However, the intervention group tended to improve nutrition knowledge from baseline to six months post ( $p < 0.10$ ), which was not observed in the control group and the variance decreased markedly at six-months post-camp. At six-months post-camp, both control and intervention groups significantly improved their most preferred home environment ( $p < 0.05$ ; Table 3); however, a trend was noted between the control and intervention at six-months post-camp ( $p < 0.10$ ; Table 3) suggesting the intervention group may have improved a bit more. A significant difference from baseline to six-months post-camp was noted among control campers' self-efficacy, overall FV preferences, as well as most and least preferred home food environment ( $p < 0.05$ , Table 3). These results indicate improved self-efficacy, FV preferences, and preferred home food environment; however, the least preferred home food environment also increased. In contrast, a significant difference from baseline to six-

months post-camp was noted among the intervention group's most and least preferred home food environment ( $p < 0.05$ ; Table 3) and a trend for overall FV preferences and fruit preferences was observed ( $p < 0.10$ ; Table 3). These results suggest greater availability of least and most preferred food in the home as well as a tendency towards greater fruit and FV preferences.

Chi square analysis of change score categories (negative or no change and positive change) revealed no significant difference between the control and intervention groups' change in self-efficacy, knowledge and preferences (data not shown). However, positive change in the home food environment, specifically the most preferred food pantry, was significantly greater in the intervention group ( $p < 0.05$ ; Table 4). Further examination of the preferred food pantry choices revealed the intervention group increased preferred food options for grains, FV, dairy, snacks and condiments (data not shown).

Chi-square results suggest no significant difference between control and intervention groups' change in fruit, fruit juice, vegetable, or starchy vegetable intakes (data not shown). An examination of change scores for individual garden vegetable intakes suggests intervention campers tended to have greater positive change for consumption of spinach and bell peppers ( $p < 0.10$ ) and significantly greater change in consumption of zucchini ( $p < 0.05$ ; Table 4).

Multivariate likelihood analysis modeling results with bootstrapping can be viewed in Table 5. A detailed supplemental table including all modeling results is available. Results of likelihood analysis modeling suggest FV preferences and home food environment influence change in self-efficacy; treatment (control/intervention), gender,

age, self-efficacy and least preferred home environment influence change in preferences; and treatment, age, and least preferred home environment influence change in knowledge (Table 5). Conversely, intakes of the various groups of food appear to be influenced by gender (with the exception of starchy vegetables and fruit juice), age, change in preferred home environment and change in intakes of other groups of food (Table 5).

### **Discussion**

Baseline scores revealed a large distribution of self-efficacy, knowledge, preferences and the home food environment scores among campers, likely related to the age range of the campers. Nutrition knowledge, FV self-efficacy, FV preferences, and the home food environment improved in both control and intervention campers at six-month post-camp. Improvements in the intervention group may be the result of the camp experience with gardening, culinary and nutrition education lessons as well as the take home kit. Yet, control campers also improved at six-month post-camp, which suggests other influential factors such as age/maturation, home, school and/or community factors. The significant difference in age by treatment (control campers being older) likely influenced some of these findings. For example, self-efficacy and knowledge increased significantly in both groups (control and intervention) from baseline to six-month post-camp. The significant change in the control group may be related to the age/maturation of these campers.

Data collected six-months post-camp suggest the intervention had marginal impact on camper self-efficacy, knowledge, or preference scores. However, the intervention group did appear to improve their home food environment at six months by increasing the amount of “preferred” pantry options (grains, FV, dairy, snacks and condiments). The intervention group also reported increased intakes of zucchini, spinach

and bell peppers, which had been included in the camp garden, culinary, and nutrition education lessons as well as camp meals. An association between dietary intakes and repeated exposure such as those incorporated into the camp experience has been previously documented (Heim, Stang, & Ireland, 2009; Morris, Neustadter, & Zidenberg-Cherr, 2001) .

Exploratory data analysis conducted on the data provides insights for future research. Self-efficacy, which has been shown to impact dietary intakes (Geller & Dzewaltowski, 2010), appeared to be influenced by food preferences and the home food environment. Preference for a food item as well as a home food environment, where the food item available and accessible, support an individual's self-efficacy to consume that food item. Interestingly, nutrition knowledge and FV preferences appeared to be influenced by age, treatment (control/intervention) and least preferred home environment. It was anticipated that change in knowledge would be impacted by age and intervention; however, least preferred home environment also appeared to influence change in knowledge. Some research suggests that knowledge is the first step to improving FV intake (Reynolds, Hinton, et al., 1999; Wardle, 1995). In contrast, gender appeared to influence the intake of each food group with the exception of starchy vegetables and fruit juice. This was not unexpected as gender differences relative to FV intake have been documented in the literature (Cartwright et al., 2003; Neumark-Sztainer, Story, Resnick, & Blum, 1996; Rasmussen et al., 2006; Reynolds, Baranowski, et al., 1999). Intake of food groups was also impacted by preferred home environment and change in intake of other food groups. Availability and accessibility of food as well as change in other food groups would likely alter the intake of another food group.

Limitations of this study include the small sample size for six-month post-camp data analysis. In addition, a significant difference was noted between control and intervention campers' age, which influenced data collected and interpretation. The researchers did examine the data omitting the CIT campers (n=5); however, a significant difference among the remaining camper' age persisted using Mann-Whitney test. Further, data represent a sample of Midwest youth with very limited demographic or socioeconomic information and may not be representative of other geographic regions. All data collected were based on self-report responses to surveys with inherent limitations. Finally, the home food environment survey tool has not been validated for research purposes and has been used previously as a personal assessment tool. It should also be noted that a seasonal difference (summer vs. winter) could have influenced the home food environment responses.

Carefully designed nutrition intervention programs for youth and their parents are needed to foster healthier behaviors among children, but more importantly influence their environment. Results of this study suggest that the home food environment may influence FV self-efficacy, nutrition knowledge, FV preferences as well as FV intakes. The socio-ecological model can be implemented on community-based interventions focusing on prevention and management of disease. This model considers the complex interaction youth are exposed to on multiple levels of the environment, including individual, social, community and policy. Many of these environments do not promote healthy lifestyles (Brownell, Schwartz, Puhl, Henderson, & Harris, 2009; Pomerleau, Lock, Knai, & McKee, 2005). Education alone will not improve lifestyles (Krebs-Smith, Reedy, & Bosire, 2010), but creating healthier nutrition and PA environments, particularly at the

community and policy level may lead to behavior change (Story, Ark-Sztainer, & French, 2002). This project modified the individual, community and policy levels of the camp environment, suggests potential influence on FV self-efficacy, knowledge, preferences and intakes but public policy change would have the most far-reaching effect.



Table 1: Intervention Week Experiential Learning Activities

	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>	<i>Friday</i>
<i>Garden</i>	<b>Garden Planning</b> <ul style="list-style-type: none"> <li>Measurements</li> <li>Location</li> </ul>	<b>Soil</b> <ul style="list-style-type: none"> <li>Texture</li> <li>Improve quality</li> <li>pH</li> <li>Fertilizer nutrients</li> </ul>	<b>Seeds</b> <ul style="list-style-type: none"> <li>Growing requirements</li> <li>Zone maps</li> </ul> <b>Plants</b> <ul style="list-style-type: none"> <li>Thinning</li> <li>Transplanting</li> <li>Harvesting</li> </ul>	<b>Water Conservation</b> <ul style="list-style-type: none"> <li>Wasteful watering</li> <li>Conservation practices</li> </ul> <b>Garden Pest</b> <ul style="list-style-type: none"> <li>Pest identification</li> </ul>	<b>Composting</b> <ul style="list-style-type: none"> <li>Benefits</li> <li>Materials</li> <li>Care</li> <li>Bugs/worms</li> </ul>
<i>Culinary</i>	<b>Utensil Identification</b> <ul style="list-style-type: none"> <li>Basic utensils</li> <li>Knife skills</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Food borne illness</li> </ul>	<b>Mise en Place</b> <ul style="list-style-type: none"> <li>Organize workspace</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Danger Zone</li> </ul>	<b>Handling Raw Meat</b> <ul style="list-style-type: none"> <li>Storage</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Separate Safely</li> <li>Temperatures</li> </ul>	<b>Seasonal/Recipe Modifications</b> <ul style="list-style-type: none"> <li>Ingredient substitutions</li> <li>Economical</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Hand Washing</li> </ul>	<b>Yeast Dough</b> <ul style="list-style-type: none"> <li>Leavening</li> <li>Gluten</li> <li>Kneading</li> </ul> <b>Food Safety</b> <ul style="list-style-type: none"> <li>Review</li> </ul>
<i>Nutrition</i>	<b>MyPlate</b> <ul style="list-style-type: none"> <li>Food groups</li> <li>Meals and snacks</li> </ul>	<b>Fruits and Vegetables</b> <ul style="list-style-type: none"> <li>Vitamins and minerals</li> <li>FV Recommendations</li> </ul>	<b>Get Up &amp; Go</b> <ul style="list-style-type: none"> <li>PA Recommendations</li> <li>Pedometer</li> <li>Heart Rate</li> </ul>	<b>Portion Distortion</b> <ul style="list-style-type: none"> <li>Portion control</li> <li>Reading a label</li> </ul>	<b>Hero vs. Villain Fats</b> <ul style="list-style-type: none"> <li>Heart healthy fats</li> <li>Dining out</li> </ul>

**Table 2: Baseline Demographics by Control and Intervention**

<b>Gender</b>	<b>Control</b>	<b>Intervention</b>	<b>Total</b>
<b>Male</b>	17	15	<b>32</b>
<b>Female</b>	21	21	<b>42</b>
<b>Total</b>	<b>38</b>	<b>36</b>	<b>74</b>
<b>Age <sup>a</sup></b>	<b>Control</b>	<b>Intervention</b>	<b>Total</b>
<b>9</b>	1	10	<b>11</b>
<b>10</b>	5	11	<b>16</b>
<b>11</b>	3	9	<b>12</b>
<b>12</b>	10	3	<b>13</b>
<b>13</b>	12	0	<b>12</b>
<b>14</b>	2	0	<b>2</b>
<b>15</b>	0	0	<b>0</b>
<b>16</b>	0	2	<b>2</b>
<b>17</b>	2	1	<b>3</b>
<sup>a</sup> Statistical difference ( $p < 0.05$ ) between control and intervention by Mann-Whitney Test			

**Table 3: Baseline and Six Month Post Survey Scores by Control and Intervention**

	Possible Score	Baseline		Six-Month Post-Camp	
		Control $\mu \pm$ (SEM) (n=30)	Intervention $\mu \pm$ (SEM) (n=23)	Control $\mu \pm$ (SEM) (n=30)	Intervention $\mu \pm$ (SEM) (n=23)
<b>FV Self-Efficacy</b>	0-12	8.27 $\pm$ (0.59)	7.96 $\pm$ (0.68)	9.53 $\pm$ (0.46) <sup>e</sup>	8.91 $\pm$ (0.47)
<b>Nutrition Knowledge</b>	0-16	13.20 $\pm$ (0.48) <sup>b</sup>	11.57 $\pm$ (0.64)	13.97 $\pm$ (0.32) <sup>c</sup>	12.91 $\pm$ (0.37) <sup>f</sup>
<b>FV Preferences (Overall)</b>	0-108	86.07 $\pm$ (2.93)	87.35 $\pm$ (3.38)	89.63 $\pm$ (2.35) <sup>e</sup>	89.83 $\pm$ (3.07) <sup>f</sup>
<b>Fruit</b>	0-66	48.77 $\pm$ (1.82)	50.00 $\pm$ (1.87)	50.07 $\pm$ (1.49)	51.70 $\pm$ (1.78) <sup>f</sup>
<b>Vegetable</b>	0-42	28.23 $\pm$ (1.06)	27.91 $\pm$ (1.51)	29.57 $\pm$ (1.11)	28.22 $\pm$ (1.38)
<b>Garden Vegetables</b>	0-18	12.00 $\pm$ (0.62)	11.65 $\pm$ (0.74)	12.53 $\pm$ (0.66)	12.04 $\pm$ (0.72)
<b>Home Food Environment</b>					
<b>Most Preferred</b>	0-44	15.00 $\pm$ (0.88) <sup>a</sup>	16.04 $\pm$ (0.90)	23.76 $\pm$ (1.17) <sup>a, e</sup>	27.30 $\pm$ (1.32) <sup>d, e</sup>
<b>Least Preferred</b>	0-44	12.27 $\pm$ (1.14)	12.09 $\pm$ (0.94)	17.73 $\pm$ (1.30) <sup>e</sup>	20.43 $\pm$ (1.80) <sup>e</sup>

<sup>a</sup> Sample Size = 29  
<sup>b</sup> Significant difference between control/intervention at baseline (p<0.05)  
<sup>c</sup> Significant difference between control/intervention at six-month post (p<0.05)  
<sup>d</sup> Trend between control/intervention at six-month post (p<0.10)  
<sup>e</sup> Significant difference from baseline to six-month post (p<0.05)  
<sup>f</sup> Trend from baseline to six-month post (p<0.10)

**Table 4: Change in Home Food Environment and Garden Vegetable Intakes by Control and Intervention**

	Control (n=30)		Intervention (n=23)		$\chi^2$ (p-value)
	% ↓ or no Δ	% ↑	% ↓ or no Δ	% ↑	
<b>Most Preferred Pantry</b>	62.1 <sup>a</sup>	37.9 <sup>a</sup>	30.4	69.6	5.14 (p=0.02)*
<b>Most Preferred Refrigerator</b>	62.1 <sup>a</sup>	37.9 <sup>a</sup>	54.5 <sup>b</sup>	45.5 <sup>b</sup>	0.29 (p=0.59)
<b>Least Preferred Pantry</b>	50.0	50.0	47.8	52.2	0.03 (p=0.88)
<b>Least Preferred Refrigerator</b>	65.5 <sup>a</sup>	34.5 <sup>a</sup>	56.5	43.5	0.44(p=0.51)
<b>Garden Vegetable Intake</b>	56.7	43.3	52.4 <sup>c</sup>	47.6 <sup>c</sup>	0.09 (p=0.76)
<b>Tomato</b>	73.3	26.7	68.2 <sup>b</sup>	31.8 <sup>b</sup>	0.16 (p=0.69)
<b>Soybeans</b>	83.3	16.7	86.4 <sup>b</sup>	13.6 <sup>b</sup>	0.09 (p=0.77)
<b>Broccoli</b>	83.3	16.7	81.8 <sup>b</sup>	18.2 <sup>b</sup>	0.02 (p=0.89)
<b>Peas</b>	80.0	20.0	77.3 <sup>b</sup>	22.7 <sup>b</sup>	0.06 (p=0.81)
<b>Spinach</b>	86.7	13.3	63.6 <sup>b</sup>	36.4 <sup>b</sup>	3.79 (p=0.05) +
<b>Greens</b>	83.3	16.7	63.6 <sup>b</sup>	36.4 <sup>b</sup>	2.63 (p=0.11)
<b>Bell Peppers</b>	86.7	13.3	63.6 <sup>b</sup>	36.4 <sup>b</sup>	3.79 (p=0.05) +
<b>Sweet Potato</b>	83.3	16.7	81.8 <sup>b</sup>	18.2 <sup>b</sup>	0.02 (p=0.89)
<b>Zucchini</b>	96.7	3.3	76.2 <sup>c</sup>	23.8 <sup>c</sup>	4.99 (p=0.03)*
<b>Lettuce</b>	80.0	20.0	59.1 <sup>b</sup>	40.9 <sup>b</sup>	2.70 (p=0.10)
<p><sup>a</sup> Control based on 29 responses  <sup>b</sup> Intervention based on 22 responses  <sup>c</sup> Intervention based on 21 responses  * Significant (p&lt;0.05)  + Trend (p&lt;0.10)  % ↓ or no Δ = percent negative or no change score  % ↑ = percent positive change score</p>					

**Table 5: Multivariate likelihood analysis modeling predicting change in fruit and vegetable intake**

Dependent Variable	Model	AICc	$\Delta$ AICc	Bootstrap Likelihood Percentage	Model
$\Delta$ FV Self-Efficacy	1	106.1	0.0	32.63	FV Preferences, $\Delta$ Preferred Home Refrigerator, $\Delta$ Preferred Home, $\Delta$ Starchy Vegetable Intake
	2	106.2	0.1	33.27	FV Preferences, $\Delta$ Preferred Home Refrigerator, $\Delta$ Preferred Home
	3	107.5	1.4	34.11	$\Delta$ Preferred Home Refrigerator, $\Delta$ Preferred Home
$\Delta$ Nutrition Knowledge	1	125.3	0.0	50.14	Treatment, Age, $\Delta$ Least Preferred Home
	2	126.5	1.2	49.86	Treatment, Age, Preferred Home, $\Delta$ Preferred Home, $\Delta$ Least Preferred Home
$\Delta$ FV Preferences	1	209.7	0.0	33.22	Treatment, Gender, Age, FV Self-Efficacy, Least Preferred home, $\Delta$ Garden Vegetable Intake
	2	211.0	1.3	33.58	Treatment, Gender, Age, FV Self-Efficacy, Least Preferred Home
	3	210.7	1.0	33.19	Treatment, Gender, Age, FV Self-Efficacy, Least Preferred Home, $\Delta$ Vegetable Intake, $\Delta$ Garden Vegetable Intake
$\Delta$ Fruit Intake	1	151.3	0.0	32.50	Gender, $\Delta$ Fruit Juice Intake
	2	151.9	0.6	32.50	Gender, $\Delta$ Fruit Juice Intake
	3	154.5	3.2	34.95	Gender
$\Delta$ Fruit Juice Intake	1	73.7	0.0	47.02	$\Delta$ Preferred Home, $\Delta$ Fruit Intake, $\Delta$ Starchy Vegetable Intake
	2	75.4	1.7	52.98	$\Delta$ Preferred Home, $\Delta$ Starchy Vegetable Intake
$\Delta$ Vegetable Intake	1	172.0	0.0	33.61	Gender, Age, $\Delta$ Fruit Juice Intake
	2	172.5	0.5	33.29	Gender, Age, $\Delta$ Nutrition Knowledge, $\Delta$ Fruit Juice Intake
	3	172.9	0.9	33.10	Gender, Age, $\Delta$ Nutrition Knowledge, $\Delta$ Preferred Home, $\Delta$ Fruit Juice Intake
$\Delta$ Starchy Vegetable Intake	1	79.6	0.0	25.08	$\Delta$ Fruit Juice Intake, $\Delta$ Garden Vegetable Intake
	2	80.1	0.5	24.74	Treatment, $\Delta$ Fruit Juice Intake, $\Delta$ Garden Vegetable Intake
	3	81.1	1.5	24.51	Treatment, $\Delta$ Preferred Home, $\Delta$ Fruit Juice Intake, $\Delta$ Garden Vegetable Intake
	4	80.6	1.0	25.66	$\Delta$ Garden Vegetable Intake
$\Delta$ Garden Vegetable Intake	1	139.7	0.0	33.11	Gender, $\Delta$ FV Preferences, $\Delta$ Preferred Home, $\Delta$ Starchy Vegetable Intake
	2	140.2	0.5	34.01	Gender, $\Delta$ Starchy Vegetable Intake
	3	141.2	1.5	32.88	Treatment, Gender, $\Delta$ FV Preferences, $\Delta$ Preferred Home, $\Delta$ Least Preferred Home, $\Delta$ Starchy Vegetable Intake

$\Delta$  = change in  
All results are significant at  $p < 0.05$   
Lowest AICc is the best predicting model, other AICc values within two units are considered closely related/nearly equivalent  
 $\Delta$  AICc = AICc of the model – best model

Supplementary Table: Complete Multivariate Likelihood Analysis Modeling Results with Bootstrapping

Dependent	Model	AICc	$\Delta$ AICc	Bootstrap Likelihood Percentage	Intercept	Treatment	Gender	Age	FV Self-Efficacy
$\Delta$ Fruit Intake	1	151.3	0.0	32.50	-1.72 (-3.20,-0.255)		3.09 (0.990,5.24)		
	2	151.9	0.1	32.50	0.251 (-3.00, 3.05)		3.27 (1.14,5.46)		
	3	154.5	1.4	34.95	-1.81 (-3.63,-0.0952)		3.56 (1.01,6.10)		
$\Delta$ Fruit Juice Intake	1	73.7	0.0	47.02	-0.275 (-0.824,0.273)				
	2	75.4	1.2	52.98	-0.303 (-0.946,0.290)				
	3	172.0	0.0	33.61	18.2 (4.87,32.26)		3.22 (-0.14,6.39)	-1.69 (-2.93,-0.50)	
$\Delta$ Vegetable Intake	1	172.5	1.3	33.29	18.4 (4.69,32.85)		3.16 (-0.12,6.11)	-1.74 (-3.00,-0.52)	
	2	172.9	1.0	33.10	18.6 (5.61,33.59)		3.51 (0.32,6.98)	-1.80 (-3.13,-0.65)	
	3	139.7	0.0	33.11	-1.64 (-2.99,-0.460)		2.12 (0.09,4.11)		
$\Delta$ Garden Vegetable Intake	1	140.2	0.6	34.01	-1.07 (-2.46, 0.0930)		2.21 (0.23,4.41)		
	2	141.2	3.2	32.88	-2.31 (-4.05,-1.00)	1.67 (-0.40,3.89)	1.65 (-0.36,3.80)		
	3	79.6	0.0	25.08	0.422 (-0.144,0.963)				
$\Delta$ Starchy Vegetables Intake	1	80.1	1.7	24.74	0.782 (-0.0241,1.59)	-0.826 (-2.12,0.31)			
	2	81.1	0.0	24.51	0.854 (0.0763,1.68)	-0.733 (-1.99,0.37)			
	3	80.6	0.5	25.66	0.441 (-0.143,1.02)				
	4	125.3	0.9	50.14	-6.2247 (-15.2,4.82)	2.106 (-0.208,4.444)		0.566 (-0.328,1.314)	
$\Delta$ Knowledge Preference	1	126.5	0.0	49.86	-4.65 (-14.4,6.56)	2.836 (0.376,5.279)		0.729 (-0.150,1.529)	
	2	209.7	0.5	33.22	38.93 (17.2,68.2)	-6.21 (-11.61,-1.62)	4.941 (-0.066,11.050)	-2.129 (-4.222,-0.498)	-0.820 (-1.682,-0.132)
	3	211.0	1.5	33.58	42.9 (19.2,70.8)	-6.44 (-11.99,-1.37)	6.268 (1.387,12.136)	-2.502 (-4.453,-0.832)	-0.782 (-1.648,-0.034)
$\Delta$ Self-Efficacy	1	210.7	1.0	33.19	40.7 (18.2,71.1)	-5.43 (-10.63,-0.51)	5.295 (0.356,11.185)	-2.316 (-4.469,-0.707)	-0.823 (-1.676,-0.138)
	2	106.1	0.0	32.63	5.92 (1.96,10.4)				
	3	106.2	0.5	33.27	5.55 (1.46,9.96)				
$\Delta$ Self-Efficacy	1	107.5	1.5	34.11	1.51 (0.647,2.34)				
	2	107.5	1.5	34.11	1.51 (0.647,2.34)				

Supplementary Table Continued

Dependent	Model	FV Preference	Most Preferred Home Environment	Least Preferred Home Environment	Δ FV Preferences	Δ Nutrition Knowledge	Δ Most Preferred Refrigerator	Δ Most Preferred Home Environment
Δ Fruit Intake	1							
	2							
	3							
Δ Fruit Juice Intake	1							0.172 (0.0320,0.301)
	2							0.187 (0.0540,0.312)
Δ Vegetable Intake	1							
	2					0.313 (-0.217,0.814)		
	3					0.360 (-0.157,0.831)		0.251 (-0.068,0.722)
Δ Garden Vegetable Intake	1				0.107 (0.025,0.269)			0.217 (-0.11,1.26)
	2							
	3				0.130 (0.036,0.303)			0.307 (-0.003,0.565)
Δ Starchy Vegetables Intake	1							
	2							
	3							-0.083 (-0.237,0.057)
	4							
Δ Knowledge	1							
	2		-0.227 (-0.150,1.529)					-0.135 (-0.422,0.0788)
Δ Preference	1			-0.467 (-0.965,-0.075)				
	2			-0.494 (-1.018,-0.078)				
	3			-0.469 (-0.974,-0.058)				
Δ Self-Efficacy	1	-0.050 (-0.100,-0.002)					0.588 (0.125,1.117)	-0.276 (-0.488,-0.087)
	2	-0.047 (-0.095, 0)					0.612 (0.139,1.158)	-0.287 (-0.498,-0.097)
	3						0.602 (0.134,1.118)	-0.307 (-0.514,-0.110)

Supplementary Table Continued

Dependent	Model	$\Delta$ Least Preferred Home Environment	$\Delta$ Fruit Intake	$\Delta$ Vegetable Intake	$\Delta$ Fruit Juice Intake	$\Delta$ Starchy Vegetable Intake	$\Delta$ Garden Vegetable Intake
$\Delta$ Fruit Intake	1				0.63 (-0.230,1.94)		
	2				0.64 (-0.190,1.97)		
	3						
$\Delta$ Fruit Juice Intake	1		0.119 (-0.0270,0.344)			0.359 (-0.133,0.679)	
	2					0.403 (0.0480,0.688)	
	3						
$\Delta$ Vegetable Intake	1				0.912 (0.16-1.33)		
	2				0.913 (0.20,1.36)		
	3				0.72 (-0.13,1.25)		
$\Delta$ Garden Vegetable Intake	1					0.942 (0.449,1.260)	
	2					1.033 (0.455,1.344)	
	3	-0.715 (-0.385,0.007)				0.902 (0.412,1.238)	
$\Delta$ Starchy Vegetables Intake	1				0.257 (-0.116,0.520)		0.249 (0.073,0.467)
	2				0.254 (-0.180,0.540)		0.262 (0.077,0.486)
	3				0.315 (-0.100,0.590)		0.261 (0.080,0.509)
	4						0.306 (0.106,0.493)
$\Delta$ Knowledge	1	-0.192 (-0.384,-0.020)					
	2	-0.201 (-0.397,-0.019)					
$\Delta$ Preference	1						0.454 (0.039,0.806)
	2						
	3			-0.502 (-1.434,0.090)			0.983 (0.228,2.098)
$\Delta$ Self-Efficacy	1					-0.239 (-0.542,0.199)	
	2						
	3						



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## CHAPTER V: ARE YOUTH DIETARY PATTERNS MEETING CURRENT MYPLATE AND DIETARY GUIDELINES FOR AMERICANS?

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A paper to be submitted to Journal of the Academy of Nutrition and Dietetics

### **Abstract**

*Background:* The Immersion in Wellness project was conducted at a Midwest 4-H Center during the summer of 2012 and 2013. The project goal was to immerse campers in a five day intervention focusing on nutrition, culinary and gardening topics to improve health behaviors and construct a healthy lifestyle.

*Methods:* Two specific week-long camps were targeted for the study, recruiting 9-18 year olds. Control and intervention weeks were assigned during both summers. Data was collected from enrolled campers through multiple forms and survey tools assessing nutrition, physical activity, and the home environment.

*Results:* No significant difference by gender for FV self-efficacy, nutrition knowledge, FV preferences or FV intakes was found. The oldest campers had greater knowledge and vegetable intake compared to younger campers.

*Conclusions:* Intake of FV among youth continues to be minimal and their intakes of potassium, dietary fiber and calcium are likely not meeting the RDAs. Awareness of personal nutrition recommendations and potential health risks associated with low FV consumption is pertinent information for motivation to change. Interventions should target improving FV preferences and FV self-efficacy to positively influence intake.

*Keywords:* adolescents, nutrition education, fruits and vegetables



## Introduction

Americans consume too many calories from solid fats, added sugars, and large portion sizes (Koletzko, de la Guéronnière, Toschke, & von Kries, 2004; Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Nielsen, 2003). In contrast, daily fruit and vegetable (FV) consumption is below current recommendations regardless of gender, ethnicity, or age (Kimmons, Gillespie, Seymour, Serdula, & Blanck, 2009; USDA & HHS, 2010; Yeh et al., 2008). Current Dietary Guidelines for Americans (USDA & HHS, 2010) recommend increasing intake of FVs, which also increases intake for three of the four nutrients of concern: potassium, dietary fiber, and calcium. Further, consuming a variety of FVs not only provides nutrients to support normal growth and development, but significantly reduces the risk of chronic disease (USDA & HHS, 2010).

In addition to increasing total FVs in our diet, vegetable subgroup (dark green, red/orange, legumes, starchy and other) recommendations are included in the Dietary Guidelines for Americans (USDA & HHS, 2010). Consuming nutrient dense vegetables such as legumes, dark green and orange colors is also encouraged amongst youth (Guenther, Dodd, Reedy, & Krebs-Smith, 2006; Krebs-Smith et al., 1996). School and childcare facilities have new school nutrition standards that increase the amount of FVs served, weekly requirements of vegetable subgroups, as well as limiting fruit juice and added sugar in fruits (Hartline-Grafton, Henchy, & Levin, 2012). Recent research suggests the new standards may in fact be improving FV intake (Taber, Chriqui, & Chaloupka, 2013).

The National Health and Nutrition Examination Survey (NHANES) data on 12-18 year olds indicate just 0.9% of males and females meet calorie specific FV



recommendations based on United States Department of Agriculture (USDA) MyPyramid servings (Kimmons et al., 2009). As children become older FV consumption decreases (Rasmussen et al., 2006), with the lowest levels of FV consumption among adolescents (Kimmons et al., 2009; Lorson, Melgar-Quinonez, & Taylor, 2009). In fact, less than 33% of adolescents aged 11 to 16 years old report eating any FV daily (National Institutes of Health, 2013). More alarming, starchy vegetables such as fried potatoes and processed tomato products including pizza sauce, contribute over half of all intake among adolescents (Kimmons et al., 2009).

Males are less likely to consume FVs than females (Cartwright et al., 2003; Neumark-Sztainer, Story, Resnick, & Blum, 1996; Rasmussen et al., 2006; Reynolds, Baranowski, et al., 1999). Gender differences of FV intake may exist due to females having greater FV preferences (Brug, Tak, te Velde, Bere, & de Bourdeaudhuij, 2008), knowledge and self-efficacy (Beech, Rice, Myers, Johnson, & Nicklas, 1999), peer pressure and concerns relative to body image (Krølner et al., 2011; McKinley et al., 2005; Neumark-Sztainer, Story, Perry, & Casey, 1999). This research describes the FV intake of a sample of Midwest youth relative to current MyPlate recommendations and nutrients of concern identified by the Dietary Guidelines for Americans (USDA & HHS, 2010).

## **Methods**

The Immersion in Wellness camp experience was conducted at a Midwest State 4-H Center during the summer of 2012 and 2013. The goal was to immerse campers in a five-day intervention with experiential learning on nutrition, physical activity (PA), culinary and gardening to foster health behaviors associated with a healthy lifestyle.

University Institutional Review Board approval was received for all data collection measures and interventions.

### *Data Collection*

Two specific week-long camps at the 4-H Center were targeted for the study, “Everything Camp” and “Counselors in Training Camp” (CIT). Everything Camp facilitated recruitment of 9-14 year olds while CIT Camp targeted 16-18 year olds. Six weeks of Everything and CIT Camp during summer of 2012 were used to recruit study participants. Two weeks of 4-H group camps during the summer of 2013 were also eligible to participate in the study.

Campers and their parents were recruited through a pre-camp mailing, which explained the intent of the study and enrollment procedures and/or simple one-on-one discussion with the researchers at camp registration. Eligible campers and their parents were asked to read and sign the informed consent documents. Two research participant receipt forms were completed to receive compensation for participation in the study.

Data was collected from enrolled campers using previously established survey tools (Domel, Baranowski, Hunter, Leonard, & Riley, 1993; Domel, Thompson, Hunter, Baranowski, & Leonard, 1996; Harvard School of Public Health, 2005; Rockett et al., 1997; Struempfer & Raby, 2005) assessing nutrition knowledge, FV preferences, FV self-efficacy, and food intake via food frequency questionnaire (FFQ). Surveys were administered prior to the camp experience and collected at check-in.

### *Data Analysis*

Data was analyzed using the IBM Statistical Package for Social Sciences for Windows (SPSS for windows, version 19.0, 2010). Likelihood analysis was programmed and assessed using MATLAB R2007A (MathWorks, Matworks, Natick, MA). The level

of significance  $p < 0.05$  was set for all results, while a trend was  $p < 0.10$ . Data was analyzed using frequencies, independent samples t-test, One-way ANOVA, and multivariate likelihood analysis modeling (Akaike, 1974).

Baseline data for all campers ( $n=148$ ) participating in the study from summer 2012 and 2013 were included in analyses. An independent sample t-test was used to examine differences in FV self-efficacy, nutrition knowledge, FV preferences, and FV intakes by gender. One-way ANOVA was used to examine differences in FV self-efficacy, nutrition knowledge, FV preferences, and FV intakes by three age groups (9-11, 12-15, and 16-18 years old). Age groups corresponded to camp enrollment as an “Everything Camper” (9-11 and 12-15 years old) and “CITs” (16-18 years old).

Self-reported FV intake frequencies were converted into daily frequency equivalents (Helaine Rockett, 2013). Daily equivalents were converted to cups where one-half cup corresponded to one daily equivalent per MyPyramid recommendations when the FFQ was created. Daily equivalents for all individual FV intakes were examined individually, but also grouped as fruit, fruit juice, vegetable, starchy vegetable as well as vegetable sub-groups including starchy, dark green/leafy, red/orange, legumes, and other. It should be noted that current Dietary Guidelines for Americans classifies sweet potatoes in the red/orange vegetable sub-group; however it was categorized as a starchy vegetable in other intake analyses. Those meeting FV recommendations by age and gender were determined using MyPlate recommendations for 9-13 and 14-18 year old age groups.

Nutrient intake from FV consumption for three of the four nutrients of concern identified by the Dietary Guidelines for Americans (USDA & HHS, 2010) was estimated

from the FFQ responses using USDA National Nutrient Database for Standard Reference values (USDA, 2013a). The Economic Research Service Food Availability Data System (USDA, 2013b) was used to calculate nutrient composition for some FVs (ex: corn) where consumption form was not denoted. For these FVs, nutrient intake was estimated using the proportional availability in the food supply (i.e. fresh, canned, frozen). When more than one food item was within a category of FFQ (ex: apple/applesauce), individual potassium, dietary fiber, and calcium contents were averaged. Estimated nutrient intakes were compared to the Dietary Reference Intakes Recommended Dietary Allowances (RDA) (Institute of Medicine, 2006) for potassium, dietary fiber and calcium by age and gender.

Data from 148 subjects were tested for correlation factorially using Pearson's correlation coefficient. Significant correlations were noted to protect against using collinear and related elements in multivariate likelihood analysis modeling. Potential models were identified by building multivariate linear models factorially. Statistically significant models were identified and tested against each other using maximum likelihood estimates. These estimates were examined using the Akaike Information Criteria corrected for small sample size (AICc) (Akaike, 1974). Since the analysis yielded robust and nearly identical models according to the AICc, bootstrapping was not performed (Burnham & Anderson, 2002).

## **Results**

A total of 148 campers (55 male, 93 female) completed the surveys during summer 2012 and 2013. There was no statistical difference in age by gender (Table 1). No significant difference in FV self-efficacy, nutrition knowledge, FV preferences, or FV intake by gender was noted; however, females tended to have greater vegetable

preferences ( $p < 0.10$ ; Table 2). Chi-Square analysis indicates 14-18 year olds meeting age specific fruit recommendations was statistically significant ( $p = 0.02$ ), while meeting age specific vegetable recommendations was a trend compared to 9-13 year olds ( $p = 0.07$ ; Figure 1). No statistical significance was found between gender and meeting age specific FV recommendations (Figure 1).

The oldest campers (16-18 years) had significantly greater knowledge than younger campers (9-11 and 12-15 years). They also had significantly greater consumption of vegetables, starchy vegetables, potassium, and specific vegetable subgroups (starchy, red/orange and other) than 12-15 year old campers (Table 2). Older campers (16-18 years) intake of fruit juice and calcium also tended to be greater compared to 12-15 year old campers ( $p < 0.10$ ; Table 2). The youngest campers (9-11 years), had significantly greater fruit intake, as well as a tendency to have greater fruit juice intake, starchy vegetable sub-group, and potassium intake compared to the 12-15 year old campers ( $p < 0.10$ ; Table 2).

Campers met 14% and 19% the daily recommendation for potassium, 22% and 25% for dietary fiber, and 4% and 6% calcium for 9-13 and 14-18 year age groups, respectively (data not shown) through FV intake. Potassium intake was contributed primarily from bananas, spaghetti sauce, apples, apple juice and lentils (Figure 2). Apples, lentils, bananas, pears and lima beans were the primary contributors of dietary fiber (Figure 2). Finally, calcium came from consumption of lentils, greens, oranges, broccoli and apple juice (Figure 2).

Further exploratory data analysis was conducted using multivariate likelihood analysis modeling (Table 3). Results suggest the most influential variables influencing

fruit, vegetable and starchy vegetable intake are FV preferences and FV self-efficacy. Knowledge was another predictor variable of fruit intake; however, the increase in likelihood was slight with the addition of knowledge to the model and may not be justified (Table 3).

### **Discussion**

Results of the current study suggest no significant difference by gender for FV self-efficacy, nutrition knowledge, FV preferences or FV intakes. This is in contrast to previously reported research suggesting females have greater self-efficacy, nutrition knowledge and FV preferences compared to males (Beech et al., 1999; Brug et al., 2008). The females in this study did have a slightly higher preference for vegetables than males.

The oldest campers (16-18 years) had greater knowledge compared to all younger campers. They also had greater consumption of vegetables, fruit juice, potassium, and calcium compared to 12-15 year old campers, which supports research suggesting knowledge leads to greater FV consumption (Reynolds, Hinton, Shewchuk, & Hickey, 1999). The youngest campers, 9-11 years, consumed more fruit, fruit juice, starchy vegetable and potassium compared to 12-15 year campers. While greater fruit intake is positive, fruit juice and starchy vegetable intake should be limited per the Dietary Guidelines for Americans (USDA & HHS, 2010).

Fruits and vegetables are an important source of potassium and dietary fiber. As such, they should be contributing a significant portion of the RDA for these nutrients. Results of this research suggest 14% and 19% of potassium and 22% and 25% of dietary fiber recommendations are being met with current FV intake for 9-13 and 14-18 year olds, respectively. Assuming youth consume the current recommendation of three cups of milk daily, an additional 1,146 mg of potassium would be consumed and total daily

potassium intake would equal 1,826 mg, 40% of the RDA. NHANES “What We Eat in America” data suggests males and females age 6-19 are consuming on average 2,499mg and 2,050mg of potassium respectively each day (USDA & ARS, 2012). A report on “Potassium Intake of the U.S. Population” indicates that FVs are the largest reported contribution to potassium intake (Hoy & Goldman, 2012). Presuming youth are also meeting current recommendations for daily grain intake, with half of grains consumed being whole, the current data suggests total daily dietary fiber recommendations would be met by 61% (17.4g) of 9-13 year olds and 67% (21.4g) of 14-18 year olds. NHANES “What We Eat in America” data suggests males and females age 6-19 are consuming on average 15.0g and 13.6g of dietary fiber respectively each day (USDA & ARS, 2012).

While FV intake does not contribute significantly to overall calcium intake, it is noteworthy as one of the four nutrients of concern identified by the Dietary Guidelines for Americans. Assuming youth consume the current recommendation of three cups of milk daily, an additional 918 mg of calcium would be consumed and total daily intake would equal 974 mg, 75% of the RDA. NHANES “What We Eat in America” data suggests males and females age 6-19 are consuming on average 1,194mg and 956mg of calcium respectively each day (USDA & ARS, 2012). Ultimately, campers are not meeting potassium, dietary fiber and calcium recommendations.

Further examination of the data on an individual basis suggests none of the campers met the three RDA nutrient recommendations for age and gender that were analyzed. However, a limitation to this study is the FFQ tool utilized included a limited number of FVs. A newly developed FFQ (Harvard School of Public Health, 2013) has

added watermelon, blueberries, pineapple, tomato juice, V8 Fusion, cauliflower, cabbage and okra, which would have added to the estimates of potassium and fiber intake.

Current MyPlate FV recommendations for males are: 9-13 years- 1 ½ cups fruit and 2 ½ cups vegetables; and 14-18 years- 2 cups fruit and 3 cups vegetables. Current FV recommendations for females are: 9-13 years- 1 ½ cups fruit and 2 cups vegetable; and 14-18 years- 1 ½ cups fruit and 2 ½ cups vegetables. Of males age 9-13 years, 15% met fruit and 4% met vegetable recommendations, while among females age 9-13 years, 16% met fruit and 8% met vegetable recommendations. Of males age 14-18 years, 38% met fruit and 13% met vegetable recommendations, while among females age 14-18 years, 39% met fruit and 23% met vegetable recommendations. A previous study analyzing NHANES 2-day, 24 hour recall data of adolescents age 12-18years old indicates that only 6.2% of fruit and 5.8% of vegetable recommendations were met in the population sample (Kimmons et al., 2009). Although the youth involved in this study are well below recommendations, they appear to be above national samples. Overall, there was no statistical difference between genders in the likelihood of meeting age specific FV recommendations, however age did influence whether specific FV recommendations were met. This finding conflicts with other research suggesting females are more likely to meet FV recommendations compared to males (Cartwright et al., 2003; Neumark-Sztainer et al., 1996; Rasmussen et al., 2006; Reynolds, Baranowski, et al., 1999).

Multivariate likelihood analysis modeling suggests that age and gender are not predictive of FV consumption. Fruit, vegetable and starchy vegetable intake was influenced more by FV preferences and self-efficacy for consuming FVs. Previous research suggests that youth with greater FV preferences (Brug et al., 2008), nutrition



knowledge (Reynolds, Hinton, et al., 1999), and self-efficacy for consuming FVs (Geller & Dzewaltowski, 2010) are more likely to consume FVs. The exploratory analysis conducted with data in this study is consistent with the previous research.

Limitations of this study include a limited sample of Midwest youth with minimal demographic or socioeconomic information, which may not be representative of other geographic regions. All data collected was based on self-report responses to surveys and parent perceptions with its inherent limitations. An uneven distribution of ages may skew some analyses and interpretation. Further, the FVs included in the original FFQ (Rockett et al., 1997) tool have since been updated with a new FFQ (Harvard School of Public Health, 2013) which survey a greater number of FVs. Finally, the FFQ was developed during previous version of the Dietary Guidelines for Americans recommendations (MyPyramid) and may not translate accurately to current recommendations (MyPlate) primarily, which are based on cup rather than serving recommendations.

In conclusion, intake of FV among youth continues to be marginal. Intakes of potassium, dietary fiber and calcium are likely not meeting the RDAs. The biggest concern lies within 12-15 year olds, as they are consuming the least amount of nutrients from FVs. Adequate consumption of FV is necessary to prevent development of overweight and obesity as well as chronic disease (Bazzano, 2006; Daniels et al., 2005; Hung et al., 2004; Kimmons et al., 2009; Magarey, Daniels, Boulton, & Cockington, 2003; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). Further, the lack of optimal nutrition in our youth during a critical time of growth and maturation is concerning (Koletzko et al., 2004). Awareness of personal nutrition recommendations and potential health risks associated with low FV consumption is

pertinent information for motivation to change. In this study, gender and age did not appear to influence FV consumption. Conversely, it appears, interventions should target improving FV preferences and FV self-efficacy to positively influence FV intake.

**Table 1: Baseline Demographics by Male and Female**

	Male	Female	Total
<b>Number of Campers</b>	55	93	<b>148</b>
<b>Age</b>			<b>Total</b>
<b><math>\mu \pm</math> (SEM)</b>	11.60 $\pm$ (0.28)	11.80 $\pm$ (0.24)	<b>11.72 <math>\pm</math> (0.18)</b>
<b>9</b>	6	5	<b>11</b>
<b>10</b>	11	27	<b>38</b>
<b>11</b>	15	18	<b>33</b>
<b>12</b>	12	18	<b>30</b>
<b>13</b>	3	9	<b>12</b>
<b>14</b>	2	0	<b>2</b>
<b>15</b>	1	2	<b>3</b>
<b>16</b>	2	5	<b>7</b>
<b>17</b>	3	2	<b>5</b>
<b>18</b>	0	4	<b>4</b>
<b>Missing Data</b>	0	3	<b>3</b>

**Table 2: Independent Samples T-Test and Oneway ANOVA Results for Baseline Self-Efficacy, Knowledge, Preferences, and Intake by Gender and Age Groups**

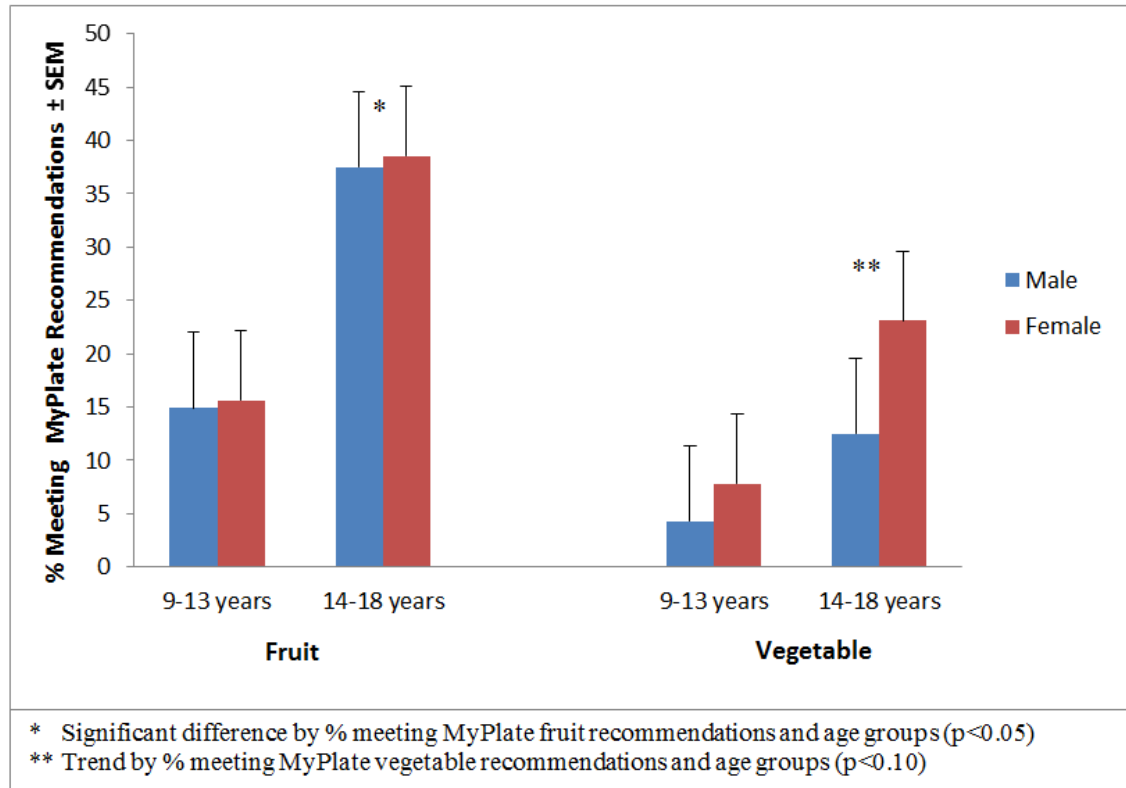
	Possible Score	Gender (n=148)		Age Groups (n=145)		
		Male (n=55) μ ± (SEM)	Female (n=93) μ ± (SEM)	9-11 years (n=82) μ ± (SEM)	12-15 years (n=47) μ ± (SEM)	16-18 years (n=16) μ ± (SEM)
<b>FV Self-Efficacy</b>	0-12	7.98 ± (0.43)	8.43 ± (0.33)	8.33 ± (0.34)	7.64 ± (0.50)	9.56 ± (0.63)
<b>Nutrition Knowledge</b>	0-16	12.64 ± (0.36)	12.68 ± (0.23)	12.39 ± (0.27) <sup>a</sup>	12.49 ± (0.34) <sup>a</sup>	14.75 ± (0.17) <sup>b</sup>
<b>FV Preferences</b>	0-108	85.89 ± (1.99)	89.76 ± (1.52)	89.98 ± (1.59)	86.32 ± (2.25)	88.75 ± (3.37)
<b>Fruit Preferences</b>	0-66	46.40 ± (1.24)	48.80 ± (0.84)	48.35 ± (0.95)	47.11 ± (1.29)	47.00 ± (1.81)
<b>Vegetable Preferences</b>	0-42	27.27 ± (0.76)	29.05 ± (0.63)	28.34 ± (0.64)	27.74 ± (0.89)	29.75 ± (1.49)
<b>Intakes †</b>						
<b>Fruit</b>		1.41 ± (0.17)	1.45 ± (0.10)	1.59 ± (0.12) <sup>a</sup>	1.09 ± (0.11) <sup>b</sup>	1.66 ± (0.32)
<b>Fruit Juice</b>		0.37 ± (0.08)	0.41 ± (0.06)	0.45 ± (0.07)	0.23 ± (0.04)	0.58 ± (0.19)
<b>Vegetable</b>		1.49 ± (0.15)	1.74 ± (0.14)	1.69 ± (0.13)	1.34 ± (0.16) <sup>a</sup>	2.38 ± (0.48) <sup>b</sup>
<b>Starchy Vegetable</b>		0.45 ± (0.05)	0.46 ± (0.03)	0.48 ± (0.04)	0.36 ± (0.04) <sup>a</sup>	0.64 ± (0.11) <sup>b</sup>
<b>Vegetable Sub-Groups</b>						
<b>Starchy</b>		0.42 ± (0.41)	0.44 ± (0.03)	0.46 ± (0.03)	0.33 ± (0.04) <sup>a</sup>	0.61 ± (0.11) <sup>b</sup>
<b>Dark Green/Leafy</b>		0.17 ± (0.03)	0.25 ± (0.04)	0.23 ± (0.03)	0.19 ± (0.04)	0.29 ± (0.09)
<b>Red/Orange</b>		0.49 ± (0.05)	0.54 ± (0.05)	0.55 ± (0.05)	0.40 ± (0.05) <sup>a</sup>	0.71 ± (0.16) <sup>b</sup>
<b>Legumes</b>		0.16 ± (0.02)	0.20 ± (0.03)	0.19 ± (0.02)	0.19 ± (0.03)	0.20 ± (0.08)
<b>Other</b>		0.26 ± (0.04)	0.30 ± (0.04)	0.27 ± (0.03) <sup>a</sup>	0.23 ± (0.04) <sup>a</sup>	0.58 ± (0.15) <sup>b</sup>
<b>Potassium (mg)</b>		662.17 ± (57.70)	699.96 ± (44.89)	722.80 ± (46.39)	552.57 ± (55.52) <sup>a</sup>	883.80 ± (137.21) <sup>b</sup>
<b>Fiber (g)</b>		6.15 ± (0.58)	6.56 ± (0.45)	6.77 ± (0.45)	5.32 ± (0.61)	7.84 ± (1.38)
<b>Calcium (mg)</b>		51.30 ± (4.85)	59.74 ± (4.62)	58.78 ± (4.31)	47.34 ± (5.84)	74.59 ± (14.13)

† Intakes reported in daily equivalents. 1.00 serving = ½ cup in MyPlate  
<sup>ab</sup> Means in the same row with different superscript letters are significantly different (p<0.05)  
 Data by gender analyzed using Independent Samples T-Test  
 Data by age groups analyzed using Oneway ANOVA, PostHoc Test: Bonferroni

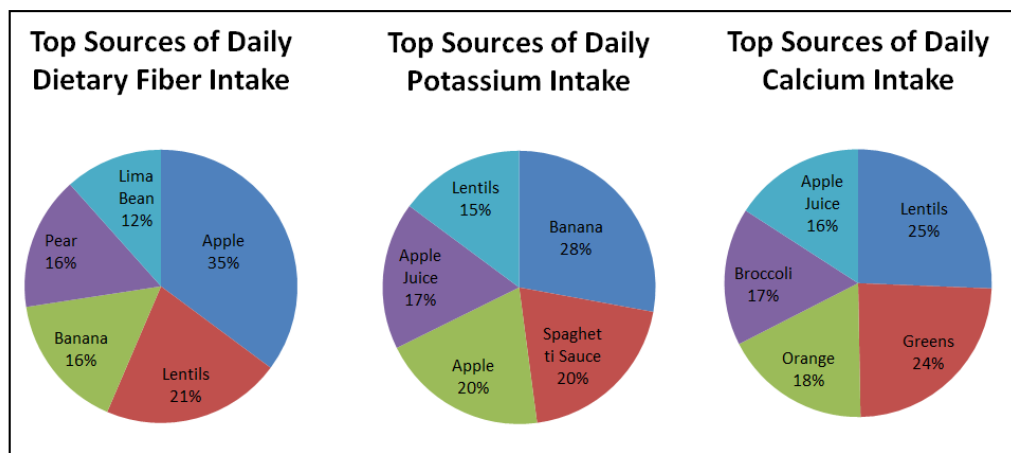
**Table 3: Multi-factorial Regression Using Likelihood Analysis and Information Criterion at Baseline**

Dependent Variables	Model (n=148)	p-value	AICc	$\Delta$ AICc
<b>Fruit Intake</b>	<b>Preferences, Self-Efficacy, Knowledge</b>	<b>0.0003</b>	<b>473.82</b>	<b>0.00</b>
	Preferences, Self-Efficacy	0.0002	473.98	0.16
	Preferences	0.0002	474.59	0.77
	Preferences, Knowledge	0.0004	475.22	1.40
<b>Vegetable Intake</b>	<b>Preferences, Self-Efficacy</b>	<b>&lt;0.0001</b>	<b>547.93</b>	<b>0.00</b>
	Preferences	<0.0001	549.68	1.75
<b>Starchy Vegetable Intake</b>	<b>Preferences, Self-Efficacy</b>	<b>0.0004</b>	<b>282.20</b>	<b>0.00</b>
	Self-Efficacy	0.0004	282.89	0.69
	Preferences	0.0008	284.42	2.22
<ul style="list-style-type: none"> <li>- All results are significant at <math>p &lt; 0.05</math></li> <li>- Lowest AICc is the best predicting model, other AICc values within two units are considered closely related/nearly equivalent</li> </ul>				

**Figure 1. Percent Meeting MyPlate Fruit and Vegetable Recommendations by Age and Gender**



**Figure 2. Top Sources of Nutrient Intakes**



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## CONCLUSIONS

This Immersion in Wellness research project was implemented in order to immerse youth in a five day intervention to improve health behaviors and construct a healthier lifestyle. The immersion focused on nutrition, physical activity, culinary and gardening topics throughout the week at camp. Intervention campers received the immersion camp experience along with a take-home kit to influence their home food environment, while the control group attended traditional camp.

The intervention campers at six-month post-camp did not score significantly higher in fruit and vegetable (FV) self-efficacy, nutrition knowledge, or FV preferences compared to the control group. However, the intervention group did see a greater increase in their most preferred home food environment and garden vegetable intakes. This suggests that camp may have positively influenced healthier pantry and refrigerator offerings as well as increased their exposure and familiarity with vegetables, therefore positively influencing garden vegetable intake.

There was no statistical difference between genders in the likelihood of meeting age specific FV recommendations, however age did influence whether specific FV recommendations were met. Overall, FV consumption was low and Iowa youth are likely not meeting daily potassium, dietary fiber, and calcium needs.

As for future research, results from exploratory data analysis suggest that the home food environment may influence FV self-efficacy, nutrition knowledge, FV preferences as well as FV intakes. In this study, gender and age did not appear to influence FV consumption. Therefore, interventions should target improving FV preferences and FV self-efficacy to positively influence FV intake.

## APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

Institutional Review Board  
Office for Responsible Research  
Vice President for Research  
1138 Pearson Hall  
Ames, Iowa 50011-2207  
515 294-4566  
FAX 515 294-4267

**Date:** 3/16/2012  
**To:** Dr. Ruth Litchfield  
1104 HNSB  
**From:** Office for Responsible Research  
**Title:** Immersion in Wellness at Iowa 4-H Center  
**IRB ID:** 11-548  
**Approval Date:** 3/15/2012 **Date for Continuing Review:** 12/8/2012  
**Submission Type:** Modification **Review Type:** Expedited

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.
- **Retain signed informed consent documents for 3 years after the close of the study**, when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study by submitting a Modification Form for Non-Exempt Research or Amendment for Personnel Changes form, as necessary.
- **Immediately inform the IRB of (1) all serious and/or unexpected adverse experiences** involving risks to subjects or others; and (2) **any other unanticipated problems involving risks** to subjects or others.
- **Stop all research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Research activity can resume once IRB approval is reestablished.
- **Complete a new continuing review form** at least three to four weeks prior to the **date for continuing review** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.
- Upon completion of the project, please submit a Project Closure Form to the Office for Responsible Research, 1138 Pearson Hall, to officially close the project.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.

**APPENDIX B: CAMPER INFORMATION****Camper Information**

Name (First, Last): \_\_\_\_\_

Gender: Male Female

Age at camp: \_\_\_\_\_ Weight: \_\_\_\_\_ Height: \_\_\_\_\_

Known food allergy: \_\_\_\_\_

Doctor recommendations or restrictions at camp regarding light physical activity?

\_\_\_\_\_

## APPENDIX C: CAMPER SURVEY

ID Number \_\_\_\_\_

ISU IRB # 1 11-548  
 Approved Date: 7 December 2012  
 Expiration Date: 8 December 2014

**Food can be put into 6 food groups. Think about what foods go into each group.**

For questions 1-6, circle the food that does not belong in the food group listed.

1. Grain group

Waffle                      Noodles                      Apples                      Oatmeal

2. Vegetable group

Broccoli                      Carrot                      Cabbage                      Pear

3. Fruit group

Strawberries                      Pineapple                      Watermelon                      Corn

4. Meat group

Turkey                      Chicken                      Potato                      Ham

5. Milk group

Cheese                      Cracker                      Pudding                      Yogurt

6. Fat, oil, and sweets group

Hamburger                      Butter                      Cupcake                      Candy

**Think about nutrients in foods.**

For questions 7-11, put the letter next to each nutrient in the blank beside the correct food.

- |                                |                  |
|--------------------------------|------------------|
| 7. _____ Milk                  | a. Vitamin C     |
| 8. _____ Bread                 | b. Calcium       |
| 9. _____ Fruits and Vegetables | c. Protein       |
| 10. _____ Meat                 | d. Sugar         |
| 11. _____ Soft drink           | e. Carbohydrates |


### Think about how nutrients work in your body.




For questions 12–16, put the letter next to each nutrient in the blank beside the correct job.

- |  |                    |
|--|--------------------|
| 12. ____ Helps eyes see in the dark              | a. Vitamin C       |
| 13. ____ Improves immunity (fewer cold symptoms) | b. Calcium         |
| 14. ____ Makes bones strong                      | c. Unsaturated Fat |
| 15. ____ Makes blood healthier                   | d. Vitamin A       |
| 16. ____ Gives you energy                        | e. Carbohydrates   |

### Food Preferences Questionnaire

We would like to know how much you like the following foods. Please put an “x” on the line below your response for each food. The responses are: I do not like this; I like this a little; I like this a lot.

Foods	 I do not like this	 I like this a little	 I like this a lot
1. 100% Orange juice	_____	_____	_____
2. 100% Apple juice	_____	_____	_____
3. 100% Grape juice	_____	_____	_____
4. Other 100% juice	_____	_____	_____
5. Bananas	_____	_____	_____
6. Apples	_____	_____	_____
7. Cantaloupe	_____	_____	_____
8. Grapes	_____	_____	_____
9. Oranges	_____	_____	_____
10. Pears	_____	_____	_____
11. Plums	_____	_____	_____
12. Kiwi	_____	_____	_____
13. Strawberries	_____	_____	_____
14. Raspberries	_____	_____	_____

Foods	 I do not like this	 I like this a little	 I like this a lot
15. Blueberries	_____	_____	_____
16. Pineapple	_____	_____	_____
15. Grapefruit	_____	_____	_____
16. Fruit cocktail	_____	_____	_____
17. Canned mandarin oranges	_____	_____	_____
18. Canned peaches	_____	_____	_____
19. Canned pears	_____	_____	_____
20. Applesauce	_____	_____	_____
21. Watermelon	_____	_____	_____
22. Raisins	_____	_____	_____
23. Other dried fruit	_____	_____	_____
24. Peaches	_____	_____	_____
25. Carrots	_____	_____	_____
26. Celery	_____	_____	_____
27. Spinach	_____	_____	_____
28. French fried potatoes	_____	_____	_____
29. Potato salad	_____	_____	_____
30. Other white potatoes	_____	_____	_____
31. Corn	_____	_____	_____
32. Green peas	_____	_____	_____
33. Tomatoes	_____	_____	_____
34. Broccoli	_____	_____	_____
35. Lettuce	_____	_____	_____
36. Green beans	_____	_____	_____
37. Cole slaw	_____	_____	_____
38. Beans (pinto, black eye peas, pork'n beans)	_____	_____	_____
39. Sweet potatoes	_____	_____	_____
40. Cabbage	_____	_____	_____
41. Okra	_____	_____	_____



### Think about your physical activity.

**INSTRUCTIONS:** Read this information on physical activity, then answer questions 1-5 by filling in the circle that goes with your answer.

**Physical Activity** is any activity that increases your heart rate and makes you get out of breath some of the time.

**Physical Activity** can be done in sports, playing with friends, or walking to school. Some examples of physical activity are running, brisk walking, rollerblading, biking, skateboarding, dancing, swimming, soccer, basketball, football, and volleyball.

	Not at all Sure	Somewhat Sure	Very Sure
1. How sure are you that you can do physical activity <u>60 minutes each day</u> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. How sure are you that you can be physically active <u>no matter how busy your day is</u> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. How sure are you that you can be physically active <u>no matter how tired you may feel</u> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. How sure are you that you can be physically active <u>even if it is hot or cold outside</u> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. How sure are you that you can be physically active <u>even if you have a lot of homework</u> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. How sure are you that you can get your parents to...			
• help you plan to do your favorite physical activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• give you a ride to participate in a physical activity?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• find a place where you can be physically active?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• help you find different types of physical activities you can do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• play outside with you, or do physical activity/sports with you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Think about eating fruits and vegetables.

**INSTRUCTIONS:** Read this information on servings, then answer questions by filling in the circle that goes with your answer.

*A serving of fruit is equal to:*

- 1 medium-size piece of fresh fruit
- ½ cup of fruit salad
- ¼ cup of raisins, apricots or other dried fruit
- 6 oz. of 100% orange, apple, or grape juice  
(Do not count fruit punch, lemonade, Gatorade, Sunny Delight or fruit drink)

*A serving of vegetables is equal to:*

- 1 medium carrot or other fresh vegetable
- 1 small bowl of green salad
- ½ cup of fresh or cooked vegetables
- ¾ cup of vegetable soup  
(Do not count French fries, onion rings, potato chips, or fried okra)

	Not at all Sure	Somewhat Sure	Very Sure
<b>How sure are you that you can eat...</b>			
1. <u>One</u> serving (½ cup) of fruit each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. <u>Two</u> servings (1 cup) of fruit each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. <u>Three</u> servings (1 ½ cups) of fruit each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. <u>One</u> serving (½ cup) of vegetables each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. <u>Two</u> servings (1 cup) of vegetables each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. <u>Three</u> servings (1 ½ cups) of vegetables each day?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>7. How sure are you that you can get your parents to...</b>			
• buy fruit for snacks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• fix your favorite vegetable dishes for dinner?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• keep 100% juice in the refrigerator?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
• fix a fruit and vegetable snack?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





## APPENDIX D: HOME ENVIRONMENT SURVEY

ID # \_\_\_\_\_

ISU IRB # 11-548  
 Approved Date: 7 December 2012  
 Expiration Date: 8 December 2014

### What Physical Activity Items are Available in Your Home?

1. Please place a check beside the following items you have in or around your home.

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Clothing appropriate for exercise<br>(e.g. offers easy movement)  | <input type="checkbox"/> Yard space   |  |
| <input type="checkbox"/> Walking/running/cross-training shoes  | <input type="checkbox"/> Sidewalks  |   |
| <input type="checkbox"/> Exercise equipment<br>(e.g. treadmill, weights, exercise ball, exercise video)  | <input type="checkbox"/> Street lighting  |   |
|  <input type="checkbox"/> Recreational equipment<br>(e.g. tennis racket, football, golf clubs, kite, jump rope) | <input type="checkbox"/> Pedestrian crossings   |   |
| <input type="checkbox"/> Bicycle   | <input type="checkbox"/> Bicycle lane   |   |
| <input type="checkbox"/> Boating equipment<br>(e.g. canoe, kayak)  | <input type="checkbox"/> Nature trail   |   |
| <input type="checkbox"/> A dog   | <input type="checkbox"/> Park   |   |
|  <input type="checkbox"/> Schedule of exercise classes held at the local recreation center                     | <input type="checkbox"/> Recreation center  |   |
| <input type="checkbox"/> Calendar/notebook dedicated for an exercise log   | <input type="checkbox"/> Swimming pool  |  |
| <input type="checkbox"/> Stairs  | <input type="checkbox"/> Creek/river/lake   |   |
|  | <input type="checkbox"/> Public transportation<br>(e.g. bus stop) within walking distance |   |

Please check the column that best describes you, your home, your choices.

Question	Yes	Sometimes	No
1. Can you take advantage of the exercise benefits of staircases in or close to your home? For example, can you walk upstairs to get a drink of water even if there is a refrigerator in the basement where you are working or watching television?			
2. Do you have audio/video equipment available to help you exercise? For example, do you watch exercise videos or listen to a stereo while being active?			
3. Do you minimize using energy saving devices so that you use more energy doing the job by hand? For example, do you get off the couch to change the channel on your television or turn off the self-propel option on your lawn mower?			

Question	Yes	Sometimes	No
<b>4.</b> Do you have yard space available for exercise? For example, do you garden, chop wood, or use the space for other forms of exercise?			
<b>5.</b> Do you have farm 'chores' you perform on a regular basis? For example, feeding livestock, grinding feed, picking up rock.			
<b>6.</b> Are there sidewalks around your home you can use to be active?			
<b>7.</b> Are the sidewalks around your home in good condition? For example, is it easy to skate, bike, or walk on the sidewalks?			
<b>8.</b> Is there adequate street lighting in your neighborhood?			
<b>9.</b> Are there sufficient pedestrian crossings for busy streets in your neighborhood?			
<b>10.</b> Do you feel safe walking in your neighborhood?			
<b>11.</b> Are there adequate signs showing bicycle lanes and bicycle routes in your neighborhood?			
<b>12.</b> Do you use nature trails close to your home for walking or bicycling?			
<b>13.</b> Do you use a local recreation center and/or swimming pool?			
<b>14.</b> Do you use a local park, playground, and/or sports field for physical activity?			
<b>15.</b> Do you use a creek, river, and/or lake close to your home for physical activity?			
<b>16.</b> Do you travel to destinations in your neighborhood or in nearby neighborhoods by walking or bicycling?			
<b>17.</b> Are you aware of the transit stops (e.g. bus) locations around your home?			
<b>18.</b> Do you minimize using drive through services so that you use more energy getting out of your car? For example, do you wash your car by hand, walk inside to do banking and dry cleaning, and enter food restaurants rather than ordering from the car?			
<b>19.</b> Do you have a friend, sibling, parent or pet that participates in physical activity with you?			

## Activity Survey

### MARKING INSTRUCTIONS

- Use a **NO. 2 PENCIL** only.
- Do not use ink or ballpoint pen.
- Darken in the circle completely.
- Erase cleanly any marks you wish to change.
- Do not make any stray marks on this form.

The **RIGHT** way to mark your answer! ●

The **WRONG** way to mark your answers! 



A	0	0	0	0	0	0	0
B	1	1	1	1	1	1	1
C	2	2	2	2	2	2	2
D	3	3	3	3	3	3	3
E	4	4	4	4	4	4	4
	5	5	5	5	5	5	5
	6	6	6	6	6	6	6
	7	7	7	7	7	7	7
	8	8	8	8	8	8	8
	9	9	9	9	9	9	9

People do lots of things that are called physical activities. People play, walk, take part in sports, and do many things that involve moving their body. We want to learn about your physical activities. We are going to ask you about the games you play, sports you take part in, and other exercise that you get. It is very important that you tell us about yourself honestly.

**1. Do you have any health condition that limits your physical activity?**

- No  
 Yes

If yes, please write the health condition here: \_\_\_\_\_

**2. How many months of the year did you participate in team sports that practiced regularly (like swimming, gymnastics, field hockey, basketball)?**

**a. During the 4th to 6th grade?**

- Never  
 1–4 months of the year  
 5–8 months of the year  
 9–12 months of the year

**b. During the 7th to 12th grade?**

- Not in the 7th grade yet  
 Never  
 1–4 months of the year  
 5–8 months of the year  
 9–12 months of the year

**3. In school, how many times per week do you have gym or PE?**

- None                       2                       4  
 1                               3                       5 or more



Please read the following example before answering the activity questions.

**EXAMPLE:**

If you were on a swim team during the winter that practiced 4 hours a week and had one meet each week and during the summer you swam with friends once a week, then your answer would look like this . . .

 **Swimming**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**4. Not including phys ed (gym), what have you done in the past 6 MONTHS?**

Mark "None/Zero" for any season you did not do that activity.

 **Baseball or Softball**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 **Basketball**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 **Biking**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 **Dancing or Aerobics**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 **Football**

Did you do this activity over the past 6 months?

NO  YES

How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 **Hard Work Outdoors (like mowing the lawn, raking, gardening)**

Did you do this activity over the past 6 months?

NO  YES






How much did you do it EACH season?

Fall  
Winter  
Spring  
Summer

None/Zero	Less than 1/2 hr./wk.	1/2 - 3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 <p><b>Ice, Field, Street Hockey or Lacrosse</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Running or Jogging</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Swimming</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Rollerblading, Rollerskating, or Iceskating</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Skateboarding</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Soccer or Rugby</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Tennis or Other Racquet Sports</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
 <p><b>Walking (to/from school, friend's house, store)</b></p> <p>Did you do this activity over the past 6 months?</p> <p><input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?</p>	Fall	None/Zero	Less than 1/2 hr./wk.	1/2-3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Winter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Spring	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>











	<b>Playing Outdoors</b> ( <i>jump rope, kickball, dodgeball</i> )	None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Did you do this activity over the past 6 months? <input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?	<input type="radio"/> Fall <input type="radio"/> Winter <input type="radio"/> Spring <input type="radio"/> Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<b>Gymnastics or Cheerleading</b>	None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Did you do this activity over the past 6 months? <input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?	<input type="radio"/> Fall <input type="radio"/> Winter <input type="radio"/> Spring <input type="radio"/> Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<b>Strength Training Exercises</b> ( <i>push-ups, lifting weights</i> )	None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Did you do this activity over the past 6 months? <input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?	<input type="radio"/> Fall <input type="radio"/> Winter <input type="radio"/> Spring <input type="radio"/> Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<b>Volleyball</b>	None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Did you do this activity over the past 6 months? <input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?	<input type="radio"/> Fall <input type="radio"/> Winter <input type="radio"/> Spring <input type="radio"/> Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<b>Marital Arts, Karate, or Wrestling</b>	None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
	Did you do this activity over the past 6 months? <input type="radio"/> NO <input type="radio"/> YES → How much did you do it EACH season?	<input type="radio"/> Fall <input type="radio"/> Winter <input type="radio"/> Spring <input type="radio"/> Summer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Did you do any other sports or activities that we haven't listed? ( <i>Please specify</i> )		None/ Zero	Less than 1/2 hr./wk.	1/2 -3 hr./week	4-6 hr./week	7-9 hr./week	10+ hr./week
Fall _____ →		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Winter _____ →		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spring _____ →		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Summer _____ →		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>5. How many hours, Monday thru Friday, do you spend doing the following? (a TOTAL for the week)</b>	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.
Watching T.V. ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching DVDs or videos ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading/Homework ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nintendo/PlayStation/computer games ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internet/Computers ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>6. How many hours, Saturday and Sunday, do you spend doing the following? (a TOTAL for the weekend)</b>	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.	None 1-5 hr. 6-10 hr. 11-15 hr. 16-20 hr. 21-30 hr. 31+ hr.
Watching T.V. ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching DVDs or videos ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reading/Homework ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nintendo/PlayStation/computer games ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Internet/Computers ....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>








## What Foods are in Your House?

1. Please check the items in the table below that you typically have in your **pantry or cupboard**. Ask an adult in your home to help you if you are not familiar with a food.

Type Food				
	<b>Grains</b>	<input type="checkbox"/> Unsweetened whole grain cereal (i.e. Shredded Wheat, Cheerios) <input type="checkbox"/> Whole wheat bread <input type="checkbox"/> Whole wheat noodles/pasta <input type="checkbox"/> Brown rice <input type="checkbox"/> Corn tortillas/Whole wheat tortillas	<input type="checkbox"/> Sweetened whole grain cereal (Raisin Bran, Frosted Shredded Wheat) <input type="checkbox"/> White bread <input type="checkbox"/> White noodles/pasta <input type="checkbox"/> White rice <input type="checkbox"/> Flour tortillas	<input type="checkbox"/> Sweetened cereals (Fruit Loops, Cocoa Puffs) <input type="checkbox"/> Breakfast pastries <input type="checkbox"/> Large muffins/bagels <input type="checkbox"/> Prepackaged rice dishes <input type="checkbox"/> Prepackaged pasta dishes <input type="checkbox"/> Doughnuts
	<b>Fruits &amp; Vegetables</b>	<input type="checkbox"/> Unsweetened dried fruit <input type="checkbox"/> Canned fruit in juice <input type="checkbox"/> Low sodium vegetable juice <input type="checkbox"/> Low sodium canned vegetables	<input type="checkbox"/> Vegetable juice <input type="checkbox"/> Sweetened dried fruit <input type="checkbox"/> Canned vegetables	<input type="checkbox"/> Canned fruit in syrup <input type="checkbox"/> Vegetable snack chips
	<b>Meat &amp; Protein</b>	<input type="checkbox"/> Canned tuna/salmon packed in water <input type="checkbox"/> Canned/dried beans	<input type="checkbox"/> Canned tuna/salmon packed in oil <input type="checkbox"/> Low fat bean dip <input type="checkbox"/> Low fat refried beans	<input type="checkbox"/> Beef jerky <input type="checkbox"/> Pork rinds <input type="checkbox"/> Refried beans <input type="checkbox"/> Spam
	<b>Dairy</b>	<input type="checkbox"/> Nonfat powdered milk <input type="checkbox"/> Skim evaporated milk <input type="checkbox"/> Soy milk <input type="checkbox"/> Rice milk	<input type="checkbox"/> Powdered low fat/whole milk	<input type="checkbox"/> Condensed/evaporated milk
	<b>Fats</b>	<input type="checkbox"/> Olive oil <input type="checkbox"/> Canola oil <input type="checkbox"/> Peanut oil <input type="checkbox"/> Cooking spray	<input type="checkbox"/> Soybean oil <input type="checkbox"/> Corn oil <input type="checkbox"/> Safflower oil	<input type="checkbox"/> Lard <input type="checkbox"/> Shortening <input type="checkbox"/> Coconut oil (sometimes found in popcorn popping oil)
	<b>Beverages</b>	<input type="checkbox"/> Water <input type="checkbox"/> 100% fruit juice	<input type="checkbox"/> Diet soda <input type="checkbox"/> Sports drinks <input type="checkbox"/> Unsweetened tea <input type="checkbox"/> Coffee	<input type="checkbox"/> Regular Soda <input type="checkbox"/> Kool Aid <input type="checkbox"/> Fruit punch <input type="checkbox"/> Sweetened tea
	<b>Snacks</b>	<input type="checkbox"/> Whole grain crackers (i.e. Triscuits) <input type="checkbox"/> Dried fruits <input type="checkbox"/> Unsalted nuts/seeds <input type="checkbox"/> Plain rice cakes <input type="checkbox"/> Low fat microwave popcorn	<input type="checkbox"/> Salted nuts/seeds <input type="checkbox"/> Crackers <input type="checkbox"/> Low fat granola bars <input type="checkbox"/> Pretzels <input type="checkbox"/> Flavored rice cakes <input type="checkbox"/> Trail mix	<input type="checkbox"/> Potato chips, <input type="checkbox"/> Candy bars <input type="checkbox"/> Granola bars <input type="checkbox"/> Fruit snacks <input type="checkbox"/> Buttered/kettle popcorn <input type="checkbox"/> Cookies
	<b>Condiments &amp; Preserves</b>	<input type="checkbox"/> Spices/pepper <input type="checkbox"/> Lime/lemon juice <input type="checkbox"/> Fish sauce <input type="checkbox"/> Mustard <input type="checkbox"/> Salsa	<input type="checkbox"/> Ketchup <input type="checkbox"/> Nut butters (e.g. peanut butter) <input type="checkbox"/> Sugar free jam/jelly	<input type="checkbox"/> Chocolate syrup <input type="checkbox"/> Pancake syrup <input type="checkbox"/> Regular jam/jelly

2. Please check the items that you typically have in your *refrigerator or freezer*.

Food Group				
	<b>Fruits &amp; Vegetables</b>	<input type="checkbox"/> Unsweetened frozen fruit <input type="checkbox"/> Frozen vegetables <input type="checkbox"/> Fresh fruits/vegetables	<input type="checkbox"/> Vegetables with seasoning <input type="checkbox"/> Fruit cups with juice	<input type="checkbox"/> Fruit in heavy syrup <input type="checkbox"/> Vegetables in high fat sauces
	<b>Meat &amp; Protein</b>	<input type="checkbox"/> Lean meat (poultry w/o skin, fish, canned fish tenderloin, round, roast, sirloin) <input type="checkbox"/> Eggs	<input type="checkbox"/> Medium fat meat (poultry w/skin, ground beef, pork, fried fish)	<input type="checkbox"/> High fat meat (sausage, bacon, ribs) <input type="checkbox"/> Hot dogs
	<b>Dairy</b>	<input type="checkbox"/> Non/low fat milk <input type="checkbox"/> Low fat plain or Greek yogurt <input type="checkbox"/> Non/low fat sour cream <input type="checkbox"/> Cottage cheese	<input type="checkbox"/> Whole milk <input type="checkbox"/> Low fat, sweetened yogurt <input type="checkbox"/> 2% milk <input type="checkbox"/> Full fat sour cream <input type="checkbox"/> Mozzarella cheese	<input type="checkbox"/> Coffee creamers <input type="checkbox"/> Half & half/heavy cream <input type="checkbox"/> Full fat, flavored yogurt  <input type="checkbox"/> Cheese (American, cheddar, Monterey jack, Swiss)
	<b>Fats</b>	<input type="checkbox"/> Avocado	<input type="checkbox"/> Light/trans fat free margarines <input type="checkbox"/> Low fat salad dressing <input type="checkbox"/> Vinaigrette salad dressings <input type="checkbox"/> Low fat sauces	<input type="checkbox"/> Butter/Margarine <input type="checkbox"/> Mayonnaise <input type="checkbox"/> Creamy salad dressings
	<b>Snacks &amp; Meals</b>	<input type="checkbox"/> Fruit ice (100% fruit or fruit juice) <input type="checkbox"/> Fresh salsa <input type="checkbox"/> Sugar free jello	<input type="checkbox"/> Sorbet/fat reduced ice cream <input type="checkbox"/> Yogurt based ice creams <input type="checkbox"/> Popsicles <input type="checkbox"/> Low fat portion-controlled frozen meals	<input type="checkbox"/> High fat, high calorie frozen meals <input type="checkbox"/> Ice cream <input type="checkbox"/> Whipping cream/Cool Whip <input type="checkbox"/> Full fat & sweetened frozen yogurt

**3. Check the statement that best describes the packaging and portion sizes of the foods you have in your home? Most snacks and higher calorie foods are in:**

- \_\_\_\_\_ Individual or single serving/small packages (i.e. single serving packages or bulk items repackaged into smaller portions)
- \_\_\_\_\_ Regular or standard sized packages
- \_\_\_\_\_ Bulk or family size packages for many items

Please check the column that best describes your family choices.

Question	Always	Sometimes	Never
<b>1.</b> Are your nutritious foods, such as dried fruits and nuts, easier to access than less nutritious foods such as cookies, crackers, and cakes? For example, do you keep healthier foods stored in front of unhealthy foods in the refrigerator or pantry?			
<b>2.</b> Do you keep fruits and vegetables prepared (washed and cut) so they are ready to eat? For example, are fruits and vegetables washed and on the countertop (if appropriate) rather than unwashed and in a refrigerator drawer?			
<b>3.</b> Do you and your family have mealtimes away from a television where it is easier to pay attention to what and how much you are eating?			
<b>4.</b> Do you control the portion size of your meals by serving individual plates from the kitchen rather than having large quantities of food readily accessible on the table?			
<b>5.</b> Do you control your portion size of food when snacking? For example, do you put a small amount of potato chips in a bowl rather than eat straight from the package?			
<b>6.</b> What size plates does your family typically use for meals?	Salad Plate 7-9 in.	Average Plate 10-12 in.	Large Plate 13+ in.
<b>7.</b> What size glassware does your family use to drink sweetened beverages or juice?	4-6 oz.	7-8 oz.	9+ oz.
<b>8.</b> Do you use nonstick pans and cooking sprays rather than oils and other fats to cook your meals?			
<b>9.</b> Do you use a kitchen scale, measuring cups or spoons so that you are better aware of portion sizes?			

Question	Always	Sometimes	Never
<b>10.</b> Do you use your garden or a shared/community garden to grow fruits and vegetables during the growing season?			
<b>11.</b> Do you shop at a supermarket or farmers market, where plenty of fresh fruit and vegetables are available rather than a convenience store where these items may be limited?			
<b>12.</b> Do you make a list prior to going to the grocery store so that you are less likely to purchase unnecessary items?			
<b>13.</b> Do you utilize free membership benefits at your local supermarket so you can purchase healthier food at more affordable prices?			
<b>14.</b> Do you prepare more meals than you purchase? For example, do you cook at home more times a week than you buy prepackaged, takeout or restaurant meals?			




PAGE ONE EATING SURVEY K-95-1 HARVARD MEDICAL SCHOOL

### MARKING INSTRUCTIONS

- Use a **NO. 2 PENCIL** only.
- Do not use ink or ballpoint pen.
- Darken in the circle completely.
- Erase cleanly any marks you wish to change.
- Do not make any stray marks on this form.

The **RIGHT** way to mark your answer! ●

The **WRONG** way to mark your answers! ☒ ☓ ☉ ☉



A	0	0	0	0	0	0
B	1	1	1	1	1	1
C	2	2	2	2	2	2
D	3	3	3	3	3	3
E	4	4	4	4	4	4
	5	5	5	5	5	5
	6	6	6	6	6	6
	7	7	7	7	7	7
	8	8	8	8	8	8
	9	9	9	9	9	9

**1. What is your AGE?**

Less than 9     13  
 9     14  
 10     15  
 11     16  
 12     17  
           18 or older

**2. Are you:**

Male  
 Female

**3. Your Height**

FEET	INCHES
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7

**4. Your Weight (lbs)**

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
	5	5
	6	6
	7	7
	8	8
	9	9

---

Questionnaire refers to what you ate over the past 6 months.

**5. Do you now take vitamins (like Flintstones, One-A-Day, etc.)?**

No     Yes → **If yes**

**a) How many vitamin pills do you take a week?**

2 or less     3 - 5     6 - 9     10 or more

**b) For how many years have you been taking them?**

0 - 1 years     2 - 4     5 - 9     10+ years

**6. How many teaspoons of sugar do you ADD to your beverages or food each day?**

None/less than 1 teaspoon per day  
 1 - 2 teaspoons per day  
 3 - 4 teaspoons per day  
 5 or more teaspoons per day

**7. Which cold breakfast cereal do you usually eat?**

Never eat cold breakfast cereal

**8. Where do you usually eat breakfast?**

At home  
 At school  
 Don't eat breakfast  
 Other

**9. How many times each week (including weekdays and weekends) do you usually eat breakfast prepared away from home?**

Never or almost never  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

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**SERIAL #**

PAGE TWO Questionnaire refers to what you ate over the past 6 months. HARVARD MEDICAL SCHOOL

10. How many times each week (including weekdays and weekends) do you usually eat lunch prepared away from home?

Never or almost never  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

11. How many times each week do you usually eat after-school snacks or foods prepared away from home?

Never or almost never  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

12. How many times each week (weekdays and weekends) do you usually eat dinner prepared away from home?

Never or almost never  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

13. How many times per week do you prepare dinner for yourself (and/or others in your house)?

Never or almost never  
 Less than once per week  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

14. How often do you have dinner that is ready made, like frozen dinners, Spaghetti-O's, microwave meals, etc.

Never/less than once per month  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

15. How many times each week (including weekdays and weekends) do you eat late night snacks prepared away from home?

Never/less than once per month  
 1 - 2 times per week  
 3 - 4 times per week  
 5 or more times per week

16. How often do you eat food that is fried at home, like fried chicken?

Never/less than once per week  
 1 - 3 times per week  
 4 - 6 times per week  
 Daily

17. How often do you eat fried food away from home (like french fries, chicken nuggets)?

Never/less than once per week  
 1 - 3 times per week  
 4 - 6 times per week  
 Daily

## DIETARY INTAKE

How often do you eat the following foods:

**Example** if you drink one can of diet soda 2 - 3 times per week, then your answer should look like this:

E1. Diet soda (1 can or glass)

Never  
 1 - 3 cans per month  
 1 can per week  
 2 - 6 cans per week  
 1 can per day  
 2 or more cans per day





PAGE FOUR Questionnaire refers to what you ate over the past 6 months. HARVARD MEDICAL SCHOOL

30. Instant Breakfast Drink (1 packet)

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

31. Whipped cream

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

32. Yogurt (1 cup) - Not frozen

Never/less than 1 per month  
 1 - 3 cups per month  
 1 cup per week  
 2 - 6 cups per week  
 1 cup per day  
 2 or more cups per day

33. Cottage or ricotta cheese

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

34. Cheese (1 slice)

Never/less than 1 per month  
 1 - 3 slices per month  
 1 slice per week  
 2 - 6 slices per week  
 1 slice per day  
 2 or more slices per day

35. Cream cheese

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

36. What TYPE of yogurt, cottage cheese & dairy products (besides milk) do you use mostly?

Nonfat  
 Lowfat  
 Regular  
 Don't know

37. Butter (1 pat) - NOT margarine

Never/less than 1 per month  
 1 - 3 pats per month  
 1 pat per week  
 2 - 6 pats per week  
 1 pat per day  
 2 - 4 pats per day  
 5 or more pats per day

38. Margarine (1 pat) - NOT butter

Never/less than 1 per month  
 1 - 3 pats per month  
 1 pat per week  
 2 - 6 pats per week  
 1 pat per day  
 2 - 4 pats per day  
 5 or more pats per day

39. What FORM and BRAND of margarine does your family usually use?

None  
 Stick  
 Tub  
 Squeeze (liquid)

40. What TYPE of oil does your family use at home?

Canola oil  
 Corn oil  
 Safflower oil  
 Olive oil  
 Vegetable oil  
 Don't know

WHAT SPECIFIC BRAND AND TYPE (LIKE "PARKAY CORN OIL SPREAD")?

Leave blank if you don't know.

**MAIN DISHES**

41. Cheeseburger (1)

Never/less than 1 per month  
 1 - 3 per month  
 One per week  
 2 - 4 per week  
 5 or more per week

42. Hamburger (1)

Never/less than 1 per month  
 1 - 3 per month  
 One per week  
 2 - 4 per week  
 5 or more per week

43. Pizza (2 slices)

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

44. Tacos/burritos (1)

Never/less than 1 per month  
 1 - 3 per month  
 One per week  
 2 - 4 per week  
 5 or more per week

45. Which taco filling do you usually have:

Beef & beans  
 Beef  
 Chicken  
 Beans

46. Chicken nuggets (6)

Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week





**65. French toast (2 slices)**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

**66. Grilled cheese (1)**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

**67. Eggrolls (1)**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

**MISCELLANEOUS FOODS****68. Brown gravy**

- Never/less than 1 per month  
 Once per week or less  
 2 - 6 times per week  
 Once per day  
 2 or more times per day

**69. Ketchup**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

**70. Clear soup (with rice, noodles, vegetables) 1 bowl**

- Never/less than 1 per month  
 1 - 3 bowls per month  
 1 bowl per week  
 2 or more bowls per week

**71. Cream (milk) soups or chowder (1 bowl)**

- Never/less than 1 per month  
 1 - 3 bowls per month  
 1 bowl per week  
 2 - 6 bowls per week  
 1 or more bowls per day

**72. Mayonnaise**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 6 times per week  
 Once per day

**73. Low calorie/fat salad dressing**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 6 times per week  
 Once or more per day

**74. Salad dressing (not low calorie)**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 6 times per week  
 Once or more per day

**75. Salsa**

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 6 times per week  
 Once or more per day

**76. How much fat on your beef, pork, or lamb do you eat?**

- Eat all  
 Eat some  
 Eat none  
 Don't eat meat

**77. When you have chicken or turkey, do you eat the skin?**

- Yes  
 No  
 Sometimes

## BREADS & CEREALS

### 78. Cold breakfast cereal (1 bowl)

- Never/less than 1 per month
- 1 - 3 bowls per month
- 1 bowl per week
- 2 - 4 bowls per week
- 5 - 7 bowls per week
- 2 or more bowls per day

### 79. Hot breakfast cereal, like oatmeal, grits (1 bowl)

- Never/less than 1 per month
- 1 - 3 bowls per month
- 1 bowl per week
- 2 - 4 bowls per week
- 5 - 7 bowls per week
- 2 or more bowls per day

### 80. White bread, pita bread, or toast (1 slice)

- Never/less than 1 per month
- 1 slice per week or less
- 2 - 4 slices per week
- 5 - 7 slices per week
- 2 - 3 slices per day
- 4+ slices per day

### 81. Dark bread (1 slice)

- Never/less than 1 per month
- 1 slice per week or less
- 2 - 4 slices per week
- 5 - 7 slices per week
- 2 - 3 slices per day
- 4+ slices per day

### 82. English muffins or bagels (1)

- Never/less than 1 per month
- 1 - 3 per month
- 1 per week
- 2 - 4 per week
- 5 or more per week

### 83. Muffin (1)

- Never/less than 1 per month
- 1 - 3 muffins per month
- 1 muffin per week
- 2 - 4 muffins per week
- 5 or more muffins per week

### 84. Cornbread (1 square)

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 - 4 times per week
- 5 or more per week

### 85. Biscuit/roll (1)

- Never/less than 1 per month
- 1 - 3 per month
- 1 per week
- 2 - 4 per week
- 5 or more per week

### 86. Rice

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 - 4 times per week
- 5 or more times per week

### 87. Noodles, pasta

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 - 4 times per week
- 5 or more times per week

### 88. Tortilla - no filling (1)

- Never/less than 1 per month
- 1 - 3 per month
- 1 per week
- 2 - 4 per week
- 5 or more per week

### 89. Other grains, like kasha, couscous, bulgur

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 or more times per week

### 90. Pancakes (2) or waffles (1)

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 or more times per week

### 91. French fries (large order)

- Never/less than 1 per month
- 1 - 3 orders per month
- 1 order per week
- 2 - 4 orders per week
- 5 or more orders per week

### 92. Potatoes - baked, boiled, mashed

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 - 4 times per week
- 5 or more times per week



## FRUITS & VEGETABLES

### 93. Raisins (small peck)

- Never/less than 1 per month  
 1 - 3 times per month  
 1 per week  
 2 - 4 times per week  
 5 or more times per week

### 94. Grapes (bunch)

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

### 95. Bananas (1)

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 - 4 per week  
 5 or more per week

### 96. Cantaloupe, melons (1/4 melon)

- Never/less than 1 per month  
 1 - 3 times per month  
 1 per week  
 2 or more times per week

### 97. Apples (1) or applesauce

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 - 6 per week  
 1 or more per day

### 98. Pears (1)

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 - 6 per week  
 1 or more per day

### 99. Oranges (1), grapefruit (1/2)

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 - 6 per week  
 1 or more per day

### 100. Strawberries

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 or more times per week

### 101. Peaches, plums, apricots (1)

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 or more per week

### 102. Orange juice (1 glass)

- Never/less than 1 per month  
 1 - 3 glasses per month  
 1 glass per week  
 2 - 6 glasses per week  
 1 glass per day  
 2 or more glasses per day

### 103. Apple juice and other fruit juices (1 glass)

- Never/less than 1 per month  
 1 - 3 glasses per month  
 1 glass per week  
 2 - 6 glasses per week  
 1 glass per day  
 2 or more glasses per day

### 104. Tomatoes (1)

- Never/less than 1 per month  
 1 - 3 per month  
 1 per week  
 2 - 6 per week  
 1 or more per day

### 105. Tomato/spaghetti sauce

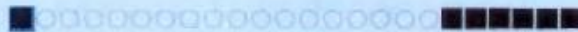
- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

### 106. Tofu

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week

### 107. String beans

- Never/less than 1 per month  
 1 - 3 times per month  
 Once per week  
 2 - 4 times per week  
 5 or more times per week



SERIAL #

<b>108. Beans/lentils/soybeans</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> Once per week or less <input type="radio"/> 2 - 6 times per week <input type="radio"/> Once per day	<b>109. Broccoli</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>110. Beets (not greens)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> Once per week or less <input type="radio"/> 2 or more times per week	108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124
<b>111. Corn</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>112. Peas or lima beans</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>113. Mixed vegetables</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	
<b>114. Spinach</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once a week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>115. Greens/kale</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>116. Green/red peppers</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once a week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	
<b>117. Yams/sweet potatoes (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once a week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>118. Zucchini, summer squash, eggplant</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>119. Carrots, cooked</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	
<b>120. Carrots, raw</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>121. Celery</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>122. Lettuce/tossed salad</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 6 times per week <input type="radio"/> One or more per day	
<b>123. Coleslaw</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 or more times per week	<b>124. Potato salad</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 or more times per week		

Think about your usual snacks. How often do you eat each type of snack food.

**Example** If you eat poptarts rarely (about 6 per year) then your answer should look like this:

**E3. Poptarts (1)**

- Never/less than 1 per month
- 1 - 3 per month
- 1 - 6 per week
- 1 or more per day

**SNACK FOODS/DESSERTS**

125. Fill in the number of snacks (food or drinks) eaten on school days and weekends/vacation days.

**Snacks**

Between breakfast and lunch  
After lunch, before dinner  
After dinner

	School Days					Vacation/Weekend Days				
	NONE	1	2	3	4 OR MORE	NONE	1	2	3	4 OR MORE
Between breakfast and lunch	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
After lunch, before dinner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
After dinner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**126. Potato chips (1 small bag)**

- Never/less than 1 per month
- 1 - 3 small bags per month
- One small bag per week
- 2 - 6 small bags per week
- 1 or more small bags per day

**127. Corn chips/Doritos (small bag)**

- Never/less than 1 per month
- 1 - 3 small bags per month
- One small bag per week
- 2 - 6 small bags per week
- 1 or more small bags per day

**128. Nachos with cheese (1 serving)**

- Never/less than 1 per month
- 1 - 3 times per month
- Once per week
- 2 or more times per week

**129. Popcorn (1 small bag)**

- Never/less than 1 per month
- 1 - 3 small bags per month
- 1 - 4 small bags per week
- 5 or more small bags per week

**130. Pretzels (1 small bag)**

- Never/less than 1 per month
- 1 - 3 small bags per month
- 1 small bags per week
- 2 or more small bags per week

**131. Peanuts, nuts (1 small bag)**

- Never/less than 1 per month
- 1 - 3 small bags per month
- 1 - 4 small bags per week
- 5 or more small bags per week

**132. Fun fruit or fruit rollups (1 pack)**

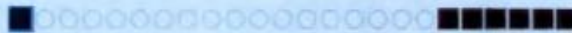
- Never/less than 1 per month
- 1 - 3 packs per month
- 1 - 4 packs per week
- 5 or more packs per week

**133. Graham crackers**

- Never/less than 1 per month
- 1 - 3 times per month
- 1 - 4 times per week
- 5 or more times per week

**134. Crackers, like saltines or wheat thins**

- Never/less than 1 per month
- 1 - 3 times per month
- 1 - 4 times per week
- 5 or more times per week



SERIAL #



<b>135. Poptarts (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 poptarts per month <input type="radio"/> 1 - 6 poptarts per week <input type="radio"/> 1 or more poptarts per day	<b>136. Cake (1 slice)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 slices per month <input type="radio"/> 1 slice per week <input type="radio"/> 2 or more slices per week	<b>137. Snack cakes, Twinkies (1 package)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 per month <input type="radio"/> Once per week <input type="radio"/> 2 - 6 per week <input type="radio"/> 1 or more per day	135 136 137
<b>138. Danish, sweetrolls, pastry (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 per month <input type="radio"/> 1 per week <input type="radio"/> 2 - 4 per week <input type="radio"/> 5 or more per week	<b>139. Donuts (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 donuts per month <input type="radio"/> 1 donut per week <input type="radio"/> 2 - 6 donuts per week <input type="radio"/> 1 or more donuts per day	<b>140. Cookies (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 cookies per month <input type="radio"/> 1 cookie per week <input type="radio"/> 2 - 6 cookies per week <input type="radio"/> 1 - 3 cookies per day <input type="radio"/> 4 or more cookies per day	138 139 140
<b>141. Brownies (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 per month <input type="radio"/> 1 per week <input type="radio"/> 2 - 4 per week <input type="radio"/> 5 or more per week	<b>142. Pie (1 slice)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 slices per month <input type="radio"/> 1 slice per week <input type="radio"/> 2 or more slices per week	<b>143. Chocolate (1 bar or packet) like Hershey's or M &amp; M's</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 per month <input type="radio"/> 1 per week <input type="radio"/> 2 - 6 per week <input type="radio"/> 1 or more per day	141 142 143
<b>144. Other candy bars (Milky Way, Snickers)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 candy bars per month <input type="radio"/> 1 candy bar per week <input type="radio"/> 2 - 4 candy bars per week <input type="radio"/> 5 or more candy bars per week	<b>145. Other candy without chocolate (Skittles) (1 pack)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>146. Jello</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	144 145 146
<b>147. Pudding</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>148. Frozen yogurt</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	<b>149. Ice cream</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 times per month <input type="radio"/> Once per week <input type="radio"/> 2 - 4 times per week <input type="radio"/> 5 or more times per week	147 148 149
<b>150. Milkshake or frappe (1)</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 per month <input type="radio"/> 1 per week <input type="radio"/> 2 or more per week	<b>151. Popsicles</b> <input type="radio"/> Never/less than 1 per month <input type="radio"/> 1 - 3 popsicles per month <input type="radio"/> 1 popsicle per week <input type="radio"/> 2 - 4 popsicles per week <input type="radio"/> 5 or more popsicles per week		150 151

152. Please list any other foods that you usually eat at least once per week that are not listed (for example, coconut, hummus, falafel, chili, plantains, mangoes, etc. . .)

FOODS

HOW OFTEN?

a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_  
 d) \_\_\_\_\_

a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_  
 d) \_\_\_\_\_

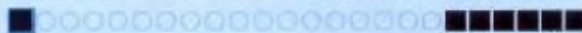
a	b	c	d
0 0 0	0 0 0	0 0 0	0 0 0
1 1 1	1 1 1	1 1 1	1 1 1
2 2 2	2 2 2	2 2 2	2 2 2
3 3 3	3 3 3	3 3 3	3 3 3
4 4 4	4 4 4	4 4 4	4 4 4
5 5 5	5 5 5	5 5 5	5 5 5
6 6 6	6 6 6	6 6 6	6 6 6
7 7 7	7 7 7	7 7 7	7 7 7
8 8 8	8 8 8	8 8 8	8 8 8
9 9 9	9 9 9	9 9 9	9 9 9

a	b	c	d
0 0	0 0	0 0	0 0
1 1	1 1	1 1	1 1
2 2	2 2	2 2	2 2
3 3	3 3	3 3	3 3
4 4	4 4	4 4	4 4
5 5	5 5	5 5	5 5
6 6	6 6	6 6	6 6
7 7	7 7	7 7	7 7
8 8	8 8	8 8	8 8
9 9	9 9	9 9	9 9

THANK YOU  
 FOR  
 COMPLETING  
 THIS  
 SURVEY!

Mark Reflex® by NCS 88-201379-1-854321 Printed in U.S.A.

1 2 3 4 5 6 7 8 9 10 11 12 33 34 35 36 37 38 39



SERIAL #

152  
a  
b  
c  
d

0  
1  
2  
3  
4  
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**APPENDIX E: RECRUITMENT AND COVER LETTERS**

ISU IRB # 1 11-548  
 Approved Date: 7 December 2012  
 Expiration Date: 8 December 2014

# Immersion in Wellness

*Interested in earning \$65 for attending camp?*

## During the week you will...

### Develop culinary skills

- Safe Food Handling
- Seasonal Availability
- Equipment Identification



### Experience gardening

- Basic Skills
- Harvesting
- Composting

### Gain nutrition knowledge

- MyPlate
- Portion Distortion
- Hero vs. Villain Fats



### Learn about physical activity

- Get Up and Go
- Recommendations
- Use pedometers

Please contact us with any questions...

Ruth Litchfield  
 litch@iastate.edu  
 (515) 294-9484

Beth Mabary  
 eamabary@iastate.edu

**IOWA STATE UNIVERSITY**  
 Extension and Outreach

ISU IRB # 1	11-548
Approved Date:	7 December 2012
Expiration Date:	8 December 2014

Dear Camper and Parents:

The Iowa 4-H Center is excited to have you joining us this summer for a number of opportunities for ‘learning by doing’. One of these opportunities is the ‘Immersion in Wellness’ opportunity available during your week of camp. This opportunity provides campers to engage in the 4-H Center garden (plant, care and harvest garden produce), culinary experiences (food preparation and safety skills), and interactive nutrition education.

This opportunity is a research project conducted by faculty from the Department of Food Science and Human Nutrition at Iowa State University with funding from the Wellmark Foundation. As a research project, one week of camp has been designated to receive the ‘immersion’ experience and one week has been designated to receive the ‘traditional camp’ experience.

If you elect to participate in this research project, you will be required to complete an informed consent(s), surveys pre- and post-camp experience, basic information pertaining to the camper, and a Research Participant Receipt Form. For your participation **you will receive up to \$65** (\$40 when checking out of camp with all completed documents; \$25 after completing survey 6-months after the camp experience).

Prior to arriving at camp, you will not be informed if you are receiving the ‘immersion’ or ‘traditional’ camp experience; this has been pre-determined by the researchers according to the week for which you have enrolled.

To enroll in the research project, please complete the following:

1. Informed consent. Two consent forms are enclosed.
  - a. Campers age 16 and older and their parents will sign the ‘Older youth assent and parental consent form’.
  - b. Campers under age 16 will sign the ‘Assent form for younger youth’ and their parents will sign the ‘Older youth assent and parental consent form’.
2. Surveys. Two surveys are enclosed.
  - a. CAMPER: The survey with the GREEN dot must be completed individually by the camper. A parent may assist with reading questions but may not suggest an answer.
  - b. TOGETHER: Parents can assist younger campers to complete the home environment survey with the BLUE dot. Please remember these answers are based on the child’s food intake and physical activity, not the parent. If multiple siblings are enrolling in the study, we ask that you fill out separate surveys to ensure accuracy pertaining to each individual camper.

3. Research Participant Receipt Form (RPRF). Two RPRF forms are enclosed
  - a. Both forms must be signed by a parent in order to receive \$40 compensation after camp and \$25 compensation for completing six month post-surveys.
  - b. Please include your current mailing address on both forms.
4. Camper Information
  - a. Campers must list any food allergies or physical activity restrictions prior to the start of camp.

If you should have any questions regarding the ‘Immersion in Wellness’ camp experience please contact:

Ruth Litchfield – principal investigator  
(515) 294-9484  
litch@iastate.edu

Beth Mabary – graduate student  
eamabary@iastate.edu

We look forward to seeing you at the 4-H Center this summer! If you elect to enroll in the research project, please thoroughly complete all forms and surveys listed above and bring them to camp this summer to ensure inclusion and compensation for the study.

Dear Camper and Parents:

ISU IRB # 1	11-548
Approved Date:	7 December 2012
Expiration Date:	8 December 2014

Thank you for your participation in the “Immersion in Wellness” study this summer at the Iowa 4-H Center! Can you believe it has been six months since camp took place?

**It is now time to complete the final surveys to receive an additional \$25.**

To receive final compensation (\$25) for the study, all enclosed documents must be thoroughly completed.

- 1.) CAMPER: The survey with the GREEN dot must be completed individually by the camper. A parent may assist with reading questions but may not suggest an answer.
- 2.) TOGETHER: Parents can assist younger campers to complete the home environment survey with the BLUE dot. Please remember these answers are based on the child’s food intake and physical activity, not the parent. If multiple siblings were enrolled in the study, we ask that you fill out separate surveys to ensure accuracy pertaining to each individual camper.

Please return all completed documents using the enclosed pre-paid envelope. If multiple siblings were enrolled, use a separate pre-paid envelope to return each campers surveys. All campers were assigned a three-digit subject number specific to each camper. Please make sure each of your campers completes the survey mailed to them by matching the survey number appearing on the surveys to the number located near the return address on the envelope.

If you should have any questions regarding the “Immersion in Wellness” camp experience or completing final surveys please contact:

Ruth Litchfield – principal investigator      litch@iastate.edu  
(515)-294-9484

Beth Mabary – graduate student              eamabary@iastate.edu

We would like to thank you again for your participation in the “Immersion in Wellness” project this summer. Best wishes to you and your family in the New Year!

## APPENDIX F: INFORMED CONSENT DOCUMENTS

### 1. General Information About This Research Study

ISU IRB # 1	11-548
Approved Date:	7 December 2012
Expiration Date:	8 December 2014

Study Title: “Immersion in Wellness at Iowa 4-H Center”

(Older youth assent and parental consent form)

Name of Principal Investigator on This Study: Dr. Ruth Litchfield

#### *Note to Parents:*

*The information in this form describes a research project that we are asking your child to take part in during his or her time at camp. The things your child will be asked to do are explained below, along with other important information about being a research participant. Please review this form carefully, and sign it if you agree that your child can take part in the study.*

*Your child also has an opportunity to choose whether or not to participate in the research. If your child is 16 or over, and able to read and understand the information in this form, please also ask that he or she read the form and sign it if they agree to take part in the study. A simplified version of this form is also included, which should be reviewed and signed by children who are under age 16.*

*A copy of the signed forms should be returned with the packet of camp materials. Please keep the second copy for your records.*

#### *A. Study Eligibility and Purpose*

You are being asked to take part in this research study because we want to understand how immersion in a wellness program addressing diet and physical activity at camp helps children learn good nutrition and health practices and use these practices once they leave camp.

As you read this form describing the study, ask any questions you have. Take your time to decide. Feel free to discuss the study with your family, friends, and healthcare provider before you decide. You may stop participating at any time during the study, either at your request or your parent’s. If so, none of your current benefits, normal health care, or camp experience will be affected in any way. When you feel comfortable that all your questions have been answered, and you wish to take part in this study, sign this form in order to begin your participation. Your signature means you have been told about the study and what the risks to you are. Your signature on this form also means that you want to take part in this study.

If you are unclear about anything along the way, please ask until you feel you understand.

### ***B. Number of Participants***

The plan is to have 150 people take part in this study at the Iowa 4-H Center Camp.

### ***C. Additional Information You Should Know***

Wellmark Blue Cross and Blue Shield and Iowa State University are funding this study. Any costs of the study will be paid for by Wellmark Blue Cross and Blue Shield and Iowa State University. Individual subject data will not provide to Wellmark Blue Cross and Blue Shield, and all data collected for this study will be coded such that Wellmark Blue Cross and Blue Shield will not be able to associate any data to any subject.

## ***2. What Will Happen to You While You Are in This Research Study?***

If you agree for you to be in the study, you will be asked to participate in the following:

### ***Screening (before camp)***

You will complete the enrollment process at least two weeks before the study starts. Surveys for you to fill out and consent forms for you and your parents to sign will be included in the package of materials that must be returned at the beginning of camp. Demographic data will be collected from the health history and medical information forms (age, height, weight, physical restrictions, diet restrictions/allergies), which are required by the Iowa 4-H Center to attend camp. Before the beginning of camp you will be assigned to one of two groups. The first, or control group will be assigned to the standard camp experience. This camp will be conducted in the same manner as camps from the previous year. The second, or experimental group will attend camp that has been formatted to include a “Wellness Immersion” experience, where you will focus on concepts related to health and wellness through diet and physical activity.

### ***Study protocol***

Prior to the camp, at the end of the camp week, and six months after the camp you will be asked to complete surveys that will assess the home environment, your activity, and your knowledge of nutrition. If you are assigned to the control group, your camp experience will be similar to the experience of previous camps. If you are assigned to the experimental group, you will attend an immersion experience focusing on health and wellness. These will include modules on Nutrition Education, Gardening, Culinary Skills, Health Promoting Environments, and Physical Activity. During the camp, you will wear a small removable device on your ankle that will allow the investigators to determine the number of steps you have taken per minute throughout the week of camp.

## ***3. How Long Will You Be in This Research Study?***

You will be in this study for six months, including completing surveys before camp, the 1 week of camp and the follow-up surveys.

#### ***4. Why You Might Want To Take Part in This Research Study***

This study will educate you about healthy eating habits and the knowledge necessary to have those habits in your life. You will also learn about foods and physical activity. You will participate in activities geared towards reinforcing the knowledge and healthy habits you may develop.

#### ***5. What Are the Risks of This Research Study?***

You will not incur any risks greater than the minimal risks associated with attending summer camp. You will wear a small activity monitor on your ankle that may cause some minor discomfort.

#### ***6. What Other Choices Do You Have If You Don't Take Part in This Research Study?***

You will gain a camp experience whether or not you are enrolled in this study. You do not have to enroll in this study to attend this summer camp.

#### ***7. Are there Reasons You Might Leave This Research Study Early?***

Taking part in this research study is your decision. You may decide to stop at any time. You should tell the researcher if you or your parents decide to stop your participation.

In addition, the researchers or Iowa State University may stop you from taking part in this study at any time:

- if it is in your best interest,
- if you do not follow the study rules,
- if the study is stopped.

#### ***8. Will You Need to Pay for Any of the Tests and Procedures?***

You will not need to pay for any procedures which are done just for this research study. These procedures are:

- Completion of surveys
- Physical activity monitoring

However, your parents and/or your health plan will need to pay for all other tests and procedures that you would normally have as part of his/her regular clinical care.

#### ***9. Will You Be Paid for Participating in this Research Study?***



If you complete this study, you will earn a monetary reward.

- \$40 for returning preliminary surveys/forms and for completing surveys at the end of the camp week
- \$25 for completing six-month follow-up surveys

### ***10. What Are Your Rights if You Are in This Research Study?***

Taking part in this research study will not change your rights and benefits. Taking part in this research study does not give you any special privileges. If you decide to not participate in this study, or stop in the middle of the study, no benefits are taken away from you. Specifically, you do not have to be in this research study to receive or continue to receive medical care or to participate in the 4-H camp.

You and your parents will be told of important new findings or any changes in the study or procedures that may affect you or your willingness to continue in the study.

### ***11. What About Your Privacy?***

Your privacy is important to us, and we want to protect it as much as possible. This information might be in different places but we will only disclose information that is related to this research protocol for the purposes listed below.

This information will be given out for the proper monitoring of the study, checking the accuracy of study data, analyzing the study data, and other purposes necessary for the proper conduct and reporting of this study. If some of the information is reported in published medical journals or scientific discussions, it will be done in a way that does not directly identify you.

If this information is given out to anyone outside of Iowa State University, the information may no longer be protected by federal privacy regulations and may be given out by the person or entity that receives the information. However, Iowa State University will take steps to help other parties understand the need to keep this information confidential.

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy your child's records for quality assurance and data analysis. These records may contain private information.

Confidentiality of all records is strictly maintained by established procedures. The original study data are kept in the study facility and are entered into a computer by the primary investigator. Physical records are stored under lock and key and electronic records through security pass words. The primary investigator will review all data. Study records will not identify you by name, but using a number.



### ***12. What Will Happen to Your Samples?***

No samples or physical specimens will be taken during this study

### ***13. What is the Institutional Review Board (IRB) and How Does it Protect You?***

The IRB reviews human research studies. It protects the rights and welfare of the people taking part in those studies. You may contact the IRB if you have questions about your rights as a participant or if you think you have been treated unfairly.

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, [IRB@iastate.edu](mailto:IRB@iastate.edu), or Director, Office of Responsible Research, (515) 294-3115, 1138 Pearson Hall, Ames, Iowa 50011.

### ***14. Who Can Answer Your Questions?***

Principal Investigator:  
Dr. Ruth Litchfield  
Phone: 515-294-9484

- Questions about the study tests and procedures
- Research-related injuries or emergencies
- Any research-related concerns or complaints

IRB Administrator

- Phone:515-294-4566
- Rights of a research subject
- Use of protected health information
- Any research-related concerns or complaints

### ***15. Summary and Enrollment Signatures***

You have been asked to take part in a research study, at Iowa State University. The information about this study has been provided to you and your parents to inform you about the nature of this IRB approved study. Please sign and date below to show that you agree to take part in the research. Please do not sign unless you have read the entire packet of information. If you do not want to sign, you don't have to, but you will not be able to participate in this study.

Remember:

- Joining the study is voluntary and you can still attend camp, even if you do not join the study.
- Nobody will be mad if you choose not to join the study.
- You can call the investigator and research staff at any time with any new questions or to tell them about side effects.
- You may stop being in the study at any time. Your parents may withdraw you from this study at any time.

\_\_\_\_\_  
(Date / Time)

\_\_\_\_\_  
(Printed Name of Participant)

\_\_\_\_\_  
(Signature of Participant)

\_\_\_\_\_  
(Date / Time)

\_\_\_\_\_  
(Printed Name of Parent/Guardian)

\_\_\_\_\_  
(Signature of Parent/Guardian)

**Assent Form to Take Part in a Research Study** (Assent form for younger youth)

**TITLE:** “Immersion in Wellness at State 4-H Center”

**ASSENT FORM**

You are being asked to be in a research study. This research study lasts shortly before you start camp, while you are in camp, and then continues until 6 months after camp. You are being asked to take part in this research study because we want to understand how 4-H camp will teach you about healthy eating, food, and exercise.

Before you start the study, we will have you with help from your parents fill out paperwork that will tell us about you, where you live, how you eat, and how much you exercise.

While you are at camp, we will measure how much you move by putting a small step counter on your ankle. You can remove this monitor when you take a shower or go swimming. We will assign you to one of two groups. One of the groups will attend the regular 4-H camp. The other group will attend the same camp but will teach you a lot of information on growing food, how to eat healthy, how to cook, and will also give you lots of time to be physically active.

At the end of camp and six months after you went to camp we will ask you with help from your parents to fill out the same paperwork you filled out at the beginning of the study.

We will keep the information private that you give to us as part of being in the study. The study information is kept in the study office and is entered into a computer by the researcher. The electronic records on the computer are locked under security pass words. Any written records are stored under lock and key. Study records will not identify you by name, but using a number.

If you have any questions about this project you may call the researcher, Dr. Ruth Litchfield, at 515-294-9484. If you have questions about your rights as a research participant or think you have been treated unfairly, you can call the Institutional Review Board at Iowa State University at 515-294-4566. The Institutional Review Board is an office that helps protect people who join research projects.

If you do not want to be in this research project, you do not have to say yes or sign your name on this form. No one will be mad at you if you say no. You will still be able to go to camp if you do not want to be in this research project.

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Assent by Child

Date

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(Printed name of parent/guardian)

**APPENDIX G: RESEARCH PARTICIPANT RECEIPT FORM**

ISU IRB # 1	11-548
Approved Date:	7 December 2012
Expiration Date:	8 December 2014

**CONFIDENTIAL****CONFIDENTIAL****CONFIDENTIAL****CONFIDENTIAL**

**Iowa State University  
Research Participant Receipt Form (RPRF)  
Use if this payment is less than \$75**

Iowa State University (ISU) is required to maintain the confidentiality of information about research study participants while still complying with record keeping requirements of the State of Iowa, the Internal Revenue Service (IRS), and funding agencies. The purpose of this form is to serve as documentation of the receipt of compensation associated with participation in a research study conducted by ISU personnel.

I, \_\_\_\_\_, have received/or am requesting compensation in the form and amount indicated below:  
(Print Research Participant Name)

Cash      \$ \_\_\_\_\_

Check      \$ \_\_\_\_\_

Gift Certificate/Card      \$ \_\_\_\_\_

Other Property – Describe: \_\_\_\_\_

Value: \$ \_\_\_\_\_

\_\_\_\_\_  
Research Participant Signature

\_\_\_\_\_  
Date

**TO ISU PERSONNEL:**

Research participants may be given the opportunity to participate without receiving payment if they choose not to complete this receipt form.

This form provides documentation for gift certificates/cards or other property purchased by ISU p-card--keep original form as part of your p-card documentation.

If an ISU check needs to be issued for payment, attach RPRF to completed honoraria voucher and submit to Accounting, 3606 ASB.















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## ACKNOWLEDGEMENTS

First and foremost, I would like to thank my major professor, Ruth Litchfield, for her continuous support and encouragement throughout my graduate degree. Her guidance and wisdom has advanced my knowledge markedly. Next, I would like to thank my committee members, Lorraine Lanningham-Foster and Daniel Russell, for their assistance, suggestions, and for serving on my committee. Randy Foster was a tremendous help with the project statistics. This project would not have been possible without the collaboration between Iowa 4-H State center staff, ISU Extension and Outreach employees, Boone County Master Gardeners, ISU faculty and graduate students, and Greek House Chefs. Finally, I would like to thank my family and friends for their support and words of encouragement and the Food Science and Human Nutrition staff for their assistance during my graduate degree at Iowa State University.