PHYSICAL HEALTH BEHAVIORS OF GARDENING AND NON-GARDENING PARENTS AND THEIR CHILDREN

by

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Abstract

Professionals in health promotion are starting to look at gardening as a strategy for health behavior change. This popular leisure time activity provides access to physical activity and fresh fruits and vegetables for consumption, two behaviors consistently recommended for optimum physical health. Coupled with a lifestyle low in sedentary behavior these behaviors can offset the health risks of the prevailing trends of overweight and obesity. Spending time outdoors is associated with higher levels of physical activity, while screen based behaviors are associated with unhealthy eating. No studies to date have looked at the health behaviors of gardeners, or the effects it may have on their family's health behaviors. The purpose of this report is to examine, through descriptive research, the health behaviors of gardening and non-gardening parents and their fourth or fifth grade child. Surveys were administered to a convenience sample of 366 fourth and fifth grade students and their guardians within a school district in Riley County, Kansas. The survey assessed the physical health behaviors mentioned above; comparisons were made according to parental classification of gardener (n=189) or non-gardener (n=177). Significant association was found with gardening classification and adult self-reports of the number of days and amount of time respondents participated in moderate to vigorous physical activity. The median days per week parents reported participation in moderate to vigorous physical activity was 3 for non-gardeners, and 4 for gardeners and was influenced by gender. Eighty-seven percent of gardeners compared to 59.3% of non-gardeners reported meeting the current physical activity recommendation of 150 minutes per week of moderate intensity activity.

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Dedication

To my Daddy, Timothy J. Smith.

Without your consistent example of the love of learning and independent thinking, I would not be who I am today. Your life is an inspiration and your belief in me has caused me to not only believe, but to truly know that I can do anything I set my mind to.

To my Momma, Mayola B. Smith and Grandma, Irene Smith.

For showing me the beauty of gardening at an important age.

Introduction

Childhood overweight and obesity is prevalent in boys and girls, across all socio-economic strata and ethnic groups. (Ogden et al. 2010; Troiano and Flegal 1998; Troiano 1996; Berg 1997). In 2005, Olshansky et al. reported that this generation of children would be the first to live shorter lives than their parents. Though obesity is a multi-factorial problem, the simplest explanation of its cause is an overall imbalance between the energy individuals consume and expend.

For the health of today's youth, it has become necessary to change behaviors associated with physical health. Interdisciplinary strategies for public health promotion and intervention are being developed and evaluated at multiple environmental levels on a variety of populations. This project is among the first to investigate the effects of home gardening on physical health behaviors. It is easy to see how gardening might affect physical activity levels and fruit and vegetable consumption of those participating in the activity. However, if and how home gardening affects these and other health behaviors is currently undocumented. Below, behaviors empirically shown to affect physical health are described, and a case for gardening for physical health benefits is presented.

Health Behaviors

Health behaviors (HB) refer to behavior patterns related to health maintenance, improvement, and restoration (Gochman 1982). Concurrent with the rise in obesity has been the failure of children to meet guidelines for obesity-protective behaviors such as regular physical activity and the consumption of fruits and vegetables (CDC 2003; Eaton et al. 2006). Health behaviors established in childhood continue on through adolescence and adulthood, as do the afflictions manifested at an overweight or obese status. Severe overweight and obesity at any age is more likely to continue, and the older the child is when it begins, the more likely it will track into adulthood (Fontvielle and Ravussin 1993; Whitaker et al. 1997).

Health promotion programs with an ecological perspective direct attention to both individual behavior and environmental influences, and have been most effective when implemented at several environmental levels. Home environments influence children's weight status (Strauss and Knight 1999; Birch and Davison 2001) and health behaviors (Lau, Quadrel, & Hartman. 1990). Children are reliant on parental assistance in forming healthy behaviors,

especially physical activity and fruit and vegetable intake, therefore healthy home environments have ample availability and accessibility of opportunities for children to develop and practice healthy behaviors (Blanchette and Brug 2005; Sallis et al. 2006; Golan and Crow 2004; Golan, Kaufman, & Shahar 2006; Rosenkranz, Geller, & Dzewaltowski 2007). Rosenkranz, Geller, and Dzewaltowski (2007) posit that efforts to promote children's health through school and community health programs will be more successful if reinforced in the home. Tinsley (1992) reported that there is a relation between parent's daily health behaviors and children's later preventive health behaviors, when they are mature enough to make their own health decisions. Family-centered programs aimed at improving diet, increasing exercise, budgeting screen-based behaviors, and reducing sedentary behavior have been effective (DeMattia, Lemont, & Meurer 2007).

Another reason for targeting family health behaviors is that children's physical health-related behaviors are associated with social class indices, with parents' education being the most consistent correlate. Low levels of physical activity, fruit and vegetable consumption, time in outdoor play, and high levels of television viewing are positively associated with lower scores on socio-economic status (SES) indices, and time in reading and sports are associated with higher SES (Vereecken, Maes and DeBacquer 2004; McHale, Crouter, & Tucker 2001). National Health Examination Survey studies suggest that the number of years of parents' education, especially the mother's, is the best demographic predictor of children's health status (Edwards and Grossman 1978, 1979).

Physical Activity

Physical activity (PA) patterns are established in childhood and adolescence (Janz et al. 2000). Participation in physical activity declines most steeply in adolescence, especially between 13 and 18 years of age, during the sensitive transition from middle school to high school (Caspersen, Pereira, & Curran 2000).

The Centers for Disease Control (CDC) defines moderate-intensity activities as those that expend 3.0 to 5.9 times the amount of energy expended at rest, while vigorous-intensity activities expend more than 6.0 times the intensity at rest. Current recommendations are for children to participate in moderate to vigorous physical activity (MVPA) for at least one hour daily, and adults should participate in moderately intense PA for at least 150 minutes, or vigorously intense

PA for at least 75 minutes per week in sessions of at least ten minutes (HHS 2008). In a national study, 42% of children ages 6 to 11 were physically active for 60 minutes on most days of the week, and 3.5% of adults ages 20 to 59 were physically active for 30 minutes on most days of the week (Troiano, Berrigan & Dodd 2008).

Fletcher and colleagues (1996) report on many benefits of physical activity and Blair and Brodney's research (1999) offers evidence that regularly active people are protected against health risks associated with obesity. Health professionals are coming to a consensus that the emphasis should be on lifelong active living versus a "no-pain-no gain" exercise mentality (Bocarro et al. 2008; Sallis et al. 2009). With busy lives, it's helpful to weave regular activity into the fabric of each day, within the school and work routine. Concepts include choosing pleasurable activities and spending quality active time in nature with family and friends. Epstein and colleagues (1985) examined the efficacy of three different types of exercise treatment programs for obese children and found that the life-style exercise group (e.g. walking, cycling, gardening, cleaning) maintained weight loss, while the other subjects participating in calisthenics and aerobic exercise gained significant amounts of weight.

Environmental determinants of children's PA include parent PA behavior, time spent outdoors, and opportunities for PA in the physical environment, including convenience and availability of play spaces, equipment and facilities (Trost 2005). Negative determinants of PA in children include female gender, especially as age increases, and African-American and Hispanic ethnicity. Trost also lists common reasons reported for not participating in PA: safety, obesity, and other perceived barriers such as time constraints, poor weather conditions, homework, and lack of interest. Obese children may need to overcome shyness about using their body (Ball, Crawford, & Owen 2000). However, as time in a valued physical activity increases and success is experienced, likelihood for continued participation increases (Xiang et al. 2003).

Sedentary Behavior

Sedentary behavior (SB) is an independent factor related to obesity and overweight. Sedentary behaviors result in an energy expenditure of no more than 1.5 times resting energy expenditure, and are typically associated with time spent sitting, reclining, or lying down during waking hours. Sedentary lifestyles are a risk factor for obesity and coronary heart disease in youth (Raitakan 1994).

There has been a reduction of energy expenditure in day to day living for both children and adults. Nationally, public schools are reducing recess times and physical education courses to achieve more time in the classroom. Inactive children and adolescents, as compared to their active counterparts, are more likely to become inactive adults (Janz, Dawson & Mahoney 2000; Malina 2001; Taylor et al. 1999). A study objectively measuring sedentary behaviors in the United States found that an average of 7.7 hours per day was spent in sedentary behaviors across all populations, with older adolescents being one of the most sedentary groups, spending 60% of their waking hours sedentary (Matthews et al. 2008).

Until recent times in human history, strenuous activity was essential for survival; basic human biology evolved in times of frequent famine, and is now essentially maladaptive in our current environment of food abundance and sedentariness. Chakravarthy and Booth (2004) suggest that when individuals are primarily inactive, normal signals fail to activate the theorized physical activity genome inherited from our Paleolithic Age ancestors. The underlying reason why inactivity produces chronic health disorders is that the protein expression of cells changes.

Screen-based Sedentary Behaviors

Recent studies have begun to examine the activities people are involved in while they are sedentary, screen based behaviors have emerged as a primary use of time. Nationally, an average of 3.43 hours per day of adult's leisure time is spent on screen based behaviors such as using computers, watching television, and playing video games, hereafter referred to as screentime (BLS 2009). Sixty-six percent of children ages 8 to 10 personally own handheld video games (Roberts, Foehr, & Rideout 2005). Roberts and Foehr (2003) reported that children spent 5.6 hours daily on screen based behaviors, the only other activity spent more time in is sleep (Huston and Wright 1997). A 2004 study of 9 to 12 year olds found that children with lower weight status used computers for moderate amounts of time, while those with higher weight status used the computer either very little or a lot, and spent higher amounts of time in sedentary activities in general (Vandewater, Shim, & Caplovitz 2004). In Salmon and colleague's 2005 study, 39 to 52% of children report that parents use screen-based behaviors as rewards within the family environment. Current recommendations are to reduce time spent watching television to two hours or less per day for children (AAP 2001).

Most children and adults in the United States are increasingly using technology during leisure time. Television alters time use and activity choices of families (Robinson 1972). Since the introduction of television, adolescent engagement in health promoting exercise has significantly decreased (Williams and Handford 1986). There is a weak association with screen based behaviors and decreased physical activity (Robinson et al. 1993; Durant et al. 1994).

Screentime is positively associated with unhealthy eating behaviors in children and adults (Matheson et al. 2004; Epstein et al. 2002). It is common for advertising to target children, both on the television and Internet, and product placement is common in television and movies. Rosenkranz and Dzewaltowski (2008) describe media advertising as a moderator of children's dietary intake. A 1987 content analysis of television food advertisements revealed that 80% of commercials showed foods with low nutritional value, and many investigations have shown that children's requests for foods were related to the frequency with which children saw the foods advertised (Cotugna 1988; Galst and White 1976; Taras et al. 1989). In the late seventies and early eighties Goldberg, Gorn, and Greenberg (1978) revealed that children experimentally exposed to commercials advertising sugary snacks chose more low nutrition and fewer high-nutrition foods; boys were especially susceptible to this targeted advertising (as cited in Jeffrey, McClerran, & Fox 1982). Coon et al.'s 2001 study demonstrated that parent-child pairs who eat while watching television had reduced FV consumption, and Boynton-Jarrett et al. (2003) found that each hour of television represents a 0.14 reduction in FV daily servings. Additionally, media actively suggests to children that risky behaviors are socially acceptable, and social norms have been associated with dietary habits (Kristal et al. 1990).

This combination of improper diet and insufficient exercise (Rey-Lopez et al. 2008) associated with excessive screentime has dangerous effects. Hei and Gold's 1990 study found that children watching television two to four hours per day had higher cholesterol levels than children watching television less than two hours per day. Screentime has other associations with obesity (Dietz and Gortmaker 1985) and obesity-related health problems (DeMattia, Lemont & Meurer 2007). Proctor et al. (2003) conducted a seven year longitudinal study following children from age 4 to age 11, and found that television viewing was an independent predictor of BMI change over the study; at age 11, children who watched more than three hours per day had a mean BMI of 20.8 kg/m2, versus those who watched less than 1.75 hours/day having a BMI of

18.7 kg/m2. Gortmaker et al.'s Planet Health intervention (1999) showed that for each hour girls reduced television viewing, there was a predicted decrease in obesity prevalence.

Fruit and Vegetable Consumption

In addition to being an important source for micronutrients, fruits and vegetables are high in water and fiber, making them a low-energy-dense food group that contributes to satiety (Grunwald et al. 2001; Rolls et al. 1998; Rolls et al. 1999), which reduces energy intake (Howarth et al. 2001; Pereira and Ludwig 2001).

Behavioral Risk Factor Surveillance System (BRFSS) 2009 data revealed that 32.5% of adults ate fruit two or more times daily and only 26.3% ate vegetables three or more times a day (Grimm et al. 2010). NHANES (National Health and Nutrition Examination Survey) data shows that only 0.9% of adolescents achieve both fruit and vegetable (FV) consumption recommendations (Kimmons et al. 2009). Lin and Morrison (2002) report that overweight children of both genders consume significantly fewer servings of fruits daily, and overweight boys consumed 0.4 fewer servings of vegetables daily. One study found that adolescents who ate more frequently were more likely to meet fruit intake recommendations, but less likely to meet vegetable recommendations (Sebastian et al. 2007). The 1994 to1996 Continuing Survey of Food Intakes by Individuals (CSFII) data indicated that Asian and Hispanic children have diets significantly higher in low-energy-dense foods, and that FV consumption increases slightly with family income (ARS 1998). Newby (2007) suggests that energy intake affects body weight more than dietary composition. Reicks and associates (1994) revealed that the taste of fruits and vegetables, and habit of FV consumption since childhood are important predictors of consumption for low-income families.

Eating behaviors such as fruit and vegetable consumption are established in youth and track into adulthood; therefore, establishing a pattern of adequate levels of consumption among youth has the potential to prevent adulthood chronic disease related to FV intake, as well as to yield current nutritional and health benefits that result from healthful levels of FV intake (Kelder 1994). Eating behaviors of people living together are similar (Vauthier et al. 1996). Rosenkranz and Dzewaltowski (2008) describe parental eating behaviors as a micro-level mediator of children's dietary intake patterns. Parent led exposure to FV (Wardle et al. 2003; Lederman et al. 2004) and parental role modeling of FV consumption is a predictor of child FV consumption

(Young, Fors, & Hayes 2004). Researchers suggest influencing children's preference for FV to affect consumption (Domel et al. 1996; Resnicow et al. 1997). Exposure to foods is key to developing preferences (Birch et al. 1987; Birch 1992; Pliner 1982). In Wardle et al.'s 2003 study, ten daily exposures to an unfamiliar vegetable was associated with significant increase in children's consumption of that vegetable.

Gardening

The 2008 Bureau of Labor Statistics (BLS) American Time Use Survey indicated that 9.4% (total n=12,700) of adult respondents engaged in lawn and garden care per day, of those who reported participation, an average of 2.35 hours/day for men, and 1.56 hours/day for women was reported (BLS 2009). Children particularly enjoy gardening, as evidenced from the rising number of school gardens, children's gardens, and organizations committed to gardening with children. An international study of urban and rural home gardens reported that 63% of children with gardens at their homes played there at least 3-4 times a week, if not daily (Shamsuddin and Said 2008).

People are consciously choosing to garden for many reasons other than enjoyment and aesthetics. Household food gardening increased by 14% from 2008 to 2009; two of the top six reasons reported for that increase were that gardening provides the benefits of physical activity and healthy food (Butterfield 2009). Participation in gardening for physical benefits is common across age, gender, socioeconomic strata, and ethnicity (Wood 2002; Crespo et al. 1996; Yusuf et al. 1996; Ford et al. 1991; Pate et al. 1995, Blair et al. 1991; and Hlubik et al. 1994). Respondents from Clayton's 2007 study claim one motivation for gardening is exercise, and that natural benefits of gardening include spending time outdoors and producing food.

One of the greatest barriers to FV consumption is availability and accessibility. A home garden increases the exposure, availability, and preference for the fruits and vegetables grown, which increases the likelihood of children's FV consumption (Bell and Dyment 2008; Armstrong 2000; Lackey and Associates 1998; Patel 1991, 1996; Irvine et al. 1999; Dickinson et al. 2003; Libman 2007; Lineberger and Zajicek 2000; Morris, Neustadter, & Zidenberg-Cherr 2001; Pothukuchi 2004). Devine and colleagues (1999) found that among white respondents, having a garden as an adult was positively associated with fruit and vegetable consumption. A 2004 study found that families with a home garden served significantly more (P=0.017) vegetables with

dinner (Shoemaker unpublished). Rosenkranz and Dzewaltowski (2008) classify home gardens as a micro-level mediator of children's dietary intake patterns. Children's participation in food gardening usually results in significant increase in vegetable preferences (Heim, Stang & Ireland 2009) and consumption (Lineberger and Zajicek 2000). Devine's research team also reported that, for Hispanics and whites, eating fresh-picked FV while growing up or as an adult enhances consumption. The gardening experience, exposure to the taste of fresh FV early in life, and the availability of fresh produce may also enhance FV consumption. Small mixed vegetable gardens can provide a significant percentage of the recommended dietary allowance for protein (10-20%), iron (20%), calcium (20%), vitamin A (80%), and vitamin C (100%) (Marsh and Talukder 1994; Asian Vegetable Research and Development Center 1989, as reported in Marsh 1998).

Gardening is a non-competitive, weight bearing physical activity that is intrinsically rewarding and provides task-interest. Gardening easily serves as a motivation to get moving, and during the growing season, a gardener can readily find moderately intense physical tasks that do not have to be done all at once. Gardening uses all the major muscle groups, which do most of the calorie burning in the human body. Additionally, people spend a significantly greater amount of time per week gardening in comparison to other physical activities such as walking or bicycling (Caspersen et al. 1991).

General gardening is included in the CDC's 2008 list of moderately intense physical activities. Heavy gardening (continuous digging or hoeing with heart rate increases) is included in the CDC's list of vigorous intensity activities. Ainsworth et al.'s 2000 Compendium of Physical Activity lists some of the most common gardening task's energy expenditures between 3.0 and 5.0 METS (metabolic equivalent of task); these include digging, composting, planting, raking, weeding, and harvesting. Several others also rank gardening as adequate MVPA (Brooks 1988; Ford et al. 1991; Dannenberg et al. 1989).

Gardening's physical benefits reach beyond those of physical activity and fruit and vegetable accessibility. Research has exposed physical benefits of gardening for older adults (Park, Shoemaker, & Haub 2009). Recent studies have found that youth television viewing on school days was significantly less ($p=0.025$) for families who gardened (Shoemaker unpublished).

Statement of Problem and Purpose for Study

A change in the home environment is necessary to benefit physical health and effectively promote healthy behaviors for the entire family—introducing gardening to the home environment is a method health professionals can use to do that. The above literature review summarizes health behaviors that are affected by family. Although published research exists concerning psychological and restorative health benefits of nature and gardening, no publications exist regarding gardening's affect on physical health behaviors (Gigliotti and Jarrott 2005; Stuart 2005; Kaplan 2001; Kuo and Taylor 2004; Sullivan 2005; Taylor, Kuo, & Sullivan 2002; Ulrich 1984). The purpose of this study is to investigate whether gardening affects the health behaviors of gardeners and those of their children.

Materials and Methods

This study drew data from the baseline assessment of project PLANTS, a school-randomized controlled trial focusing on childhood overweight and obesity prevention through an after-school garden club with child and parent components. The project was developed and implemented by an interdisciplinary team from Kansas State University's Department of Horticulture, Forestry, and Recreation Resources and Department of Kinesiology. The university's Institutional Review Board approved all procedures (document # 4177) and school district permission was obtained.

Participants

Participants were recruited through fourth and fifth grade classrooms of eight different elementary schools in the same school district in north central Kansas in Fall 2008. Recruitment occurred during back-to-school classroom meetings. Study purpose and requirements were explained to parents and informed consent was obtained. Letters were provided to teachers to send home with students whose parents were not in attendance at back-to-school sessions. There were 684 4th and 5th grade students enrolled, 637 informed consents were received (93.1%); 601 students were surveyed (98.7% of students with informed consents); height and weight were measured for 605 students (99.34%); and 411 students returned completed parent questionnaires (67.49%). Data used in this study were pair-matched questionnaires of parents and their child. Data collection yielded 366 dyads of complete and useable data for analysis; this represents 89.05% of the parent data pool, and 53% of children enrolled.

Instrumentation

Child Survey

The child questionnaire measured the constructs of fruit and vegetable consumption, physical activity, sedentary behavior, time spent outdoors, and screentime. Appendix A provides all parent questionnaire items used in this project.

Fruit and vegetable consumption was assessed through a dietary recall questionnaire (Moore et al. 2007). Food-related questions were embedded within items related to the child's

activities over the past 24 hours as prompts to enhance recall and to minimize social desirability biases from the researcher's interest in eating behaviors.

Physical activity was assessed using two items. Children indicated how many days they were physically active for a total of at least 60 minutes per day over a) the past 7 days, and b) a typical or usual week. The response categories for both were: 0 days, 1 day, 2 days, . . .7 days. The respondents were asked not to include time spent in physical education or gym class. A verbal explanation of PA was expressed as any play, game, sport, or exercise that gets you moving, breathing harder, and your heart beating faster. Furthermore, they were told that PA can be done in sports, playing with friends, or walking to school, and the children were asked to provide examples of PA out loud before completing the questions. These item's responses were averaged to yield a score for physical activity. The World Health Organization's 2001 – 2002 Health Behavior of School-aged Children (HBSC) Survey used these items to measure participation in physical activity.

Ten items from the SMART Questionnaire (Robinson 1999) were used to measure sedentary behavior. Children were asked to estimate how much time they spent doing activities such as watching television, listening to music or reading a book, last Saturday (LS) all day long and yesterday after school (YAS). Response categories were: 0, 15, and 30 minutes, and 1 to "6 or more" hour intervals. LS and YAS responses were averaged to yield a single score for child sedentary behavior. Four of these items that assessed screen-based sedentary activities were used to calculate total screentime for LS and YAS. Mean minutes per day of screen-based activities were calculated from the four items for comparison. Time spent outdoors and time spent gardening were calculated independently from two separate items in the same manner.

Child BMI

Adiposity was indirectly assessed from the averages of two measurements of height and weight and the subsequent calculation of BMI (weight in kg divided by height in meters squared). BMI was converted to BMI z-scores to account for children's age and gender, as suggested by the U.S. Centers for Disease Control and Prevention (CDC 2000). In accordance with Centers for Disease Control guidelines, a z-score below the 5th percentile was considered under- weight, a score between the 5th and 85th percentile was considered desirable, a score at or above the 85th

percentile but below the 95th percentile was considered at risk for overweight, and a score at or above the 95th percentile was considered overweight.

Parent Survey

Gardening behavior, physical activity, sedentary behavior, screentime, fruit and vegetable consumption, and height and weight were the constructs assessed in the parent questionnaire. Gardening behavior was assessed with two items regarding time spent doing light gardening activities and heavy gardening activities. Appendix B provides all parent questionnaire items used in this project.

Physical activity was assessed with four items from the CDC's Behavioral Risk Factor Surveillance System (BRFSS) directly asking the number of days per typical week respondents participated in a) moderate and b) vigorous physical activities for at least ten minutes. A subsequent question asked how much total time they spend in these activities on those days. Definitions and examples of both types of physical activity were given in the instructions. Participants were asked not to include time spent in physical activity for work in their report. These scores were averaged to yield a mean score for number of days per week participating in moderate to vigorous physical activity (MVPA). Total weekly time typically spent in moderate and vigorous PA was calculated in Excel from these self-reports.

Nelson et al. (2001) concluded, from more than 200 studies, that most questions on the core BRFSS questionnaire were at least moderately reliable and valid, and many were highly reliable and valid. Among measures determined to be of moderate reliability and validity on the BRFSS Questionnaire were measures of sedentary lifestyle, intense leisure-time physical activity, and fruit and vegetable consumption. Prince et al. (2008) reported that self-report measures of physical activity were both higher and lower than directly measured levels of physical activity, which poses a problem for attempts to correct for self-report measures.

Sedentary behavior was assessed by one item asking how much time respondents typically spend sitting down during work and leisure time, including screen-based behaviors. Parent screentime was also assessed independently from sedentary behaviors with two items. Respondents were asked to report about the past month's average daily hours spent a) watching TV or videos, and b) using a computer during leisure time. The sum of these two items was used as the measurement of parent screentime.

Typical daily fruit and vegetable consumption were assessed independently by one item each with response categories of none, 1 serving, 2 servings, . . . 4 servings or more. These two items were combined to yield the total number of fruit and/or vegetable servings per day.

Parents self-reported height in feet and inches and weight in pounds in two separate items at the end of the questionnaire. Although females tend to under-report weight, self-reports of BMI place 86% of females in the appropriate weight category, and subjectively reported BMI is an appropriate measure (Brunner Huber 2007).

Procedure

Child Survey Protocol

Self-report questionnaires were administered by two or more trained researchers with the aid of a prepared script in each fourth and fifth grade classroom during August and September of the 2008 to 2009 school year. If children were absent on the date of their classroom's survey day, the research team worked with the child's teacher to gain that child's participation during another classroom's survey time. In-class time to complete the survey was approximately 45 minutes.

After children completed the questionnaire, weight and height were directly measured by project researchers. Each staff member was trained prior to data collection on the protocol for measurement of height and weight. Participants were asked to remove shoes and heavy clothing before measurement. Height was measured twice for reliability using a portable stadiometer (Road Rod, Seca) and weight was measured twice using high precision digital scales (Seca) that were calibrated prior to transportation to the measurement sites. This required between 3 and 5 minutes per child measured.

Each participating child was permitted to choose an inexpensive school supply (eraser, pencil, pencil sharpener, etc.) after completion of individual height and weight measurements.

Parent Survey Protocol

Prior to receiving the questionnaire, parents were given informed consent letters outlining the study, provided contact information and assured confidentiality. Following measurement of height and weight, children were given a survey to take home for their parents to complete, and reminded that parents were expecting the survey. Additional incentives were promised to children to try to obtain a high return rate of parent surveys. Children were told that the

researchers would return on a certain day to collect their parent's questionnaire. During the second visit, fresh fruit from a local grocer was awarded to those who returned their parent's questionnaire. A basket of fruit was displayed in each participating classroom to continue to encourage parental completion and return of the questionnaire for later retrieval by the research team.

School Incentives

The eight elementary schools participating had incentives offered due to this survey being the baseline measurement of a larger study. In the larger study, the eight schools were nested by size and number of students eligible to receive free or reduced meals, and then randomly selected as control or intervention schools. Intervention schools received a high tunnel (an unheated greenhouse) and 22 week, bi-weekly, after school garden club for two years. Both intervention and control schools received monetary incentives for cooperative participation as well.

Analysis

A single trained coder individually coded open-ended responses to the children's food recall questionnaire for the frequency of fruits and vegetables a child ate in a single day. Frequency sums were substituted for servings because serving sizes are not typically accurate with children, a report of eating a fruit or vegetable would equal one serving. For example, a child report of 'fruit salad' would equal one serving or '2 bananas' would equal 2 servings. A second coder individually coded 10% of the surveys to check coder reliability (Moore et al. 2007). Remaining questionnaire items were entered into Teleform, an application used to create machine-readable data forms. Teleform was also used to "read" and create a database of collected responses.

This study determined gardening classification by using questionnaire responses about the amount of light and heavy gardening activity a parent participates in during a typical week, during the growing season. Response categories were: less than two hours per week; 2 – 5 hours per week; 5 – 10 hours per week; 10 – 15 hours per week; more than 15 hours per week; or I do not engage in these activities at all. Regardless of intensity, a parental report of gardening for more than two hours per week during a typical growing season resulted in being classified as a gardener, while reports of gardening less than two hours per week, or no engagement resulted in classification as a non-gardener. Thus, 51.6% (n=189) were classified as gardeners for analysis.

Body Mass Index (BMI) was calculated from self-reported height and weight data using Excel 2008 for Mac Version 12.0 (Microsoft Corporation, Redmond, WA). A 2-tailed, unequal variance TTEST function was used within Excel to test for significance between gardeners and non-gardeners total weekly MVPA minutes. Excel was also used to obtain all median values within this report.

Individual level statistical analyses of parent and child health behaviors were conducted with SAS (Version 9.2, Cary, NC). Gardening classification group differences with respect to health behaviors (BMI, FV, PA, SB, screentime, and child's time spent outside) were tested using proc GLM. Chi-square analyses (proc FREQ) were used to determine association of demographic variables with parental gardening behavior. The demographic variables tested include parent and child age and gender, and parental ethnicity, education, marital status, employment in the field, and eligibility to receive free or reduced school meals. Exact tests of significance are appropriate when data set is small, sparse, skewed, or heavily tied. This study reports Fisher's Exact Test two-sided probability that chi-square test statistic values are greater than or equal to chi-square critical values. Statistical significance was set at an alpha level of 0.05 for both types of analyses.

Univariate Analysis of Variance was conducted within SPSS for Windows, Version 18 (SPSS, Inc., Chicago, IL) with models containing parent ethnicity, eligibility for meal assistance, and parent gender to determine if highly significant differences were correlated with these demographic variables commonly known to affect trends in health behaviors. SPSS was also used to calculate means and standard deviations for BMI-z scores and parent and child individual fruit and vegetable consumption. SPSS ANOVA procedure was conducted to test for significant differences in these variables.

Results and Discussion

Demographic Factors

Children

Children were 52.2% (n=191) female and averaged 9.5 years of age. This was representative of the gender and age across the fourth and fifth grades for the school district surveyed in this study. Child age and gender were not significantly associated with whether a parent was classified as a gardener or not.

Parents

The average adult respondent was a white, married female in her late thirties with a home that had a yard. Average parental age for non-gardeners was 38.9 (+/- 0.47) and 39.5 (+/- 0.45) for gardeners, 83.0% of adult respondents were female. There were 302 white adult respondents and 64 individuals with minority ethnicities including American Indian or Alaskan native, Asian, African American or Black, Hispanic or Latino, and Native Hawaiian or other Pacific Islander. Fisher's exact chi-square test shows parental ethnicity is weakly associated with gardening ($p=0.0283$). Thirty-nine non-white and 138 white adult respondents were non-gardeners versus 25 non-white and 164 white gardeners.

Of the 366 adult respondents, 85% reported being married, 9.6% reported being divorced, separated, or widowed, and 5.5% reported being single. Marital status and parental gardening behavior was approaching association ($p=0.0597$). Of single respondents, 70% were non-gardeners. Single parents may be gardening, but at a lesser amount than this study's definition of a gardener. Further studies could investigate the actual and perceived barriers to gardening for single parents.

Of adult respondents, 18.4% have been employed for wages in one of the following fields: agriculture or farming, landscaping, floral design, teaching or university extension in agriculture, botany, or horticulture, or nursery and/or greenhouse production.

Of the families surveyed, 68 did not have a yard; only 14.7% of families (n=49) who have a yard, did not do any kind of gardening. Nearly 28% (n=19) of families who did not have a yard were gardeners, regardless.

Socioeconomic Status

Gardeners and non-gardeners were not significantly different in measures of SES or parental education.

Our measurement of SES was the child's eligibility to receive free or reduced price school meals, which is based on household income and number of children attending school; 26.4% of respondents answered "yes", that their 4th or 5th grader is eligible, and 71.9% of respondents answered "no"; 1.7% answered, "Prefer not to answer" to this item; these records were removed from analysis.

Only 11.6% of female respondents and 13.4% of male respondents obtained high school education or less. A majority of parent respondents had college education; 27.6% of females and 25.8% of males attended some college or received an A.S. degree, 34.7% of females and 24.9% of males received an undergraduate degree, and 26.2% of females and 35.9% of males earned a graduate degree.

Health Behaviors

Parents

There was a significant difference in the number of days gardeners and non-gardeners reported participation in MVPA for over ten minutes ($p=0.0006$) (Table 1, Figure 1). When considering median reported days per week participating in a minimum of ten minutes of MVPA, gardeners reported participation in MVPA 4 days of the week, and non-gardeners reported a median of 3 days per week (Figure 2). Both groups reported meeting recommendations of participating in a minimum of 150 minutes of MVPA weekly, however, more gardeners achieved more minutes in MVPA ($p=0.0026$) (Table 2). A separate analysis controlled for differences in variances based on gender, ethnicity, and eligibility for meal assistance. Gender significantly ($p= 0.068$) affected variance in the days per week reported participation in PA, however minutes per week in reported MVPA were not affected by gender.

Parent typical FV consumption was approaching significance (p=0.0599) (Table 1). Non-gardeners consume an average of 2.04 servings per day (1.922, 2.1578 (95%CL)), and gardeners averaged 2.19 servings per day (2.08, 2.30 (95% C.L.)). However, when the median is considered as central tendency, both groups reported typical consumption of 2 daily servings of combined fruits and vegetables. Gardeners reported higher typical consumption of vegetables than those classified as non-gardeners (p=0.026), however reported fruit consumption was not significantly different (p=0.193) (Table 1). Nationally, adult's average consumption of FV is 3.24 times daily; our entire sample is consuming FV less frequently than the 2005 national BRFSS sample. However, 9.52% of gardeners reported typical consumption of 3.5 to 4 (max) servings of FV.

Gardeners spend about 0.5 hours less time in sedentary behaviors than non-gardeners; 71.9% of gardeners and 70.6% of non-gardeners in the sample reported spending less than two hours per day on screen-based behaviors (Table 1).

Our sample is overall less overweight and obese than the national representative sample from 2007-2008 NHANES data. Flegal et al. (2010) reported that 72.3% of males and 64.1% of females are classified as overweight or obese. By Flegal's definition of having a BMI of 25 kg/m2 and above, 40.2% of gardeners and 44.8% of non-gardeners would be classified as overweight or obese.

Children

Health behaviors were not significantly different between children of parents who garden and those whose parents do not garden. However, there are some trends emerging between these groups of children.

Children from gardening families spend an average of 20 minutes less in sedentary behaviors than children whose parents do not garden (Table 3). Only 1.3% of variance in sedentary behavior is unexplained by the screentime subset of sedentary behavior. Of children from non-gardening households 74.6% reported spending less than two hours per day on non-homework screen time compared to 61.9% in gardening households. It appears that children with parents that garden spend more leisure time on screen-based activities (Table 3). There could be many reasons for this. One explanation may include the observed trend for single parents to be non-gardeners. Typically, a household with two incomes has more income to

acquire screen-based media, thereby increasing accessibility to these activities in garden families. Nevertheless, the children in this sample spend less time on screen-based behaviors than common reports of five or more hours per day. This is positive news because of screen-based behavior's association with negative affects on eating behaviors.

No differences in children's fruit or vegetable consumption emerged between the two groups (Table 3). The amount of children in this sample consuming the recommended minimum of five daily servings of combined fruits and vegetables is low; 5.6% (n=10) of children from non-gardening households, and 3.2% (n=6) of children from gardening households.

Children from both groups in the sample reported meeting PA recommendations for participation in physical activity for one hour an average of five days per week (Table 3). Twenty-two percent of children of parents classified as non-gardeners, and 27.7% of children of parents classified as gardeners reported meeting recommendations for being physically active every day.

One might hypothesize that children of gardeners might spend more time outside; this was not the case with our sample. Both groups reported spending an approximate average of one hour per day outside during August and September (Table 3); this is independent of time spent in other outdoor activities such as youth sports and after-school clubs.

The BMI-z score for children of parents classified as gardeners or non-gardeners was not significantly different (Table 3). From our sample, 14.8% of children with parents classified as gardeners have a BMI at or above the 95th percentile, compared to 16.4% of children with non-gardening parents. The fourth and fifth grade children in our sample seem to have a lower incidence of obesity than the most recent nationally representative sample from NHANES. Ogden et al. (2010) reported that 18% of female and 21.2% of male children ages 6 to 11 have a BMI at or above the 95th percentile.

It is possible that no significant differences were discovered in child health behaviors because children are not spending significant amounts of time gardening with or without their parents. Children were asked to estimate how many minutes they spent gardening on a weekday afterschool and during an entire Saturday the week prior to data collection. For children with parents classified as gardeners, the reported average time spent gardening was 9.72 (+/- 24.22) minutes/day, and children of non-gardeners reported gardening an average of 5.0 (+/- 16.97) minutes per day.

Conclusion

These measurements of home gardening's potential affect on the health behaviors of gardeners and their children are the first to be reported. Our results suggest that gardening alone does not directly and significantly affect FV consumption, sedentary behavior, screentime, time spent outdoors, or children's MVPA. However, pathways of influence are not always direct, and mediators, which can be targeted through intervention, measured, and taken into effect on future analyses, may act upon these behaviors effectively. Quantifying pre- and post- intervention changes in psychosocial and environmental variables will give a broader perspective on the pathways of health behaviors of gardening and non-gardening families. Analysis of the health behaviors of this population draws out significant differences and many trends that, if targeted through intervention may impact the health behaviors of parents and their children.

In addition to the known physical benefits of gardening, parental reports of gardening for more than two hours per week during the season were associated with parental reports of typically spending significantly more time in moderate to vigorous physical activity on a weekly basis. This implies that health behavior interventions in this area, developed around home gardening, can potentially influence the physical activity patterns of the adults involved. The next step in this line of questioning is to conduct experiments to test what this descriptive study has found; i.e. "Do parents who begin gardening increase participation in moderate to vigorous physical activity?"

Limitations

The majority of the respondents sampled were college educated and did not report accepting meal assistance; this may be one reason for the overall healthy behaviors and weight status observed in our participants. Additionally, survey responses may have been different if participant's health behaviors were being assessed during other seasons.

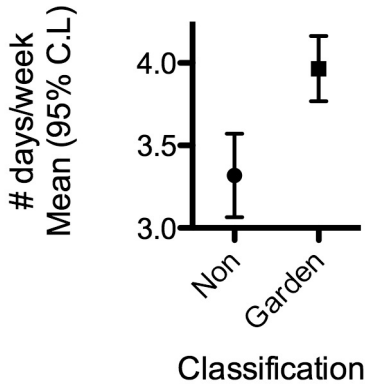
Convenience sampling methods are practical for descriptive studies. It is not confirmed that dyads analyzed in the current study are independent of each other. It should be noted that due to this sampling method, results are specific to the school district sampled and are not generalizable to all fourth and fifth graders and their parents; more research is needed on larger,

random samples. Descriptive survey studies have nearly dominated research on health behaviors, however experimental study would benefit the field of gardening for physical health. The parent project for this study, projectPLANTS, (Promoting Lifelong Activity and Nutrition Through Schools) is a quasi-experimental study, and as of the writing of this report has completed implementation and is nearing completion of data collection. Confounding factors, including changes in behavior over time, can be assessed with the data set obtained from that study.

The limitations discussed here create opportunities for further research as more researchers seek implementation of gardening in homes to affect health behaviors.

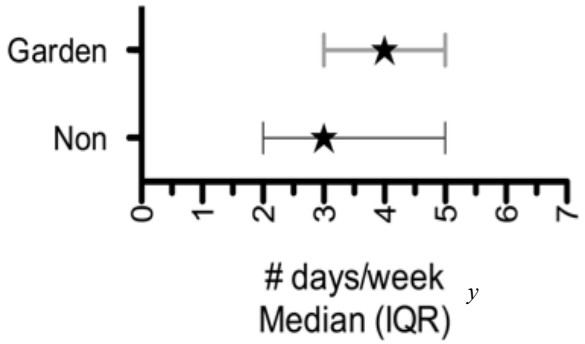
Figures and Tables

Figure 1: Comparison of mean number of days per week parents classified as gardeners and non-gardeners[z] self-report participation in moderate and vigorous physical activity



[z] Non-gardeners reported gardening less than 2 hours per week during the gardening season. Gardeners reported gardening more than 2 hours per week during the season.

Figure 2: Comparison of median number of days per week parents classified as gardeners and non-gardeners[z] self-report participation in moderate and vigorous physical activity



[z] Non-gardeners reported gardening less than 2 hours per week during the gardening season. Gardeners reported gardening more than 2 hours per week during the season.

[y] IQR – Interquartile Range

Table 1: Comparison of health behaviors of parents classified as gardeners and non-gardeners

	Non-Gardeners [z] n=177 Mean (SE)	Gardeners [z] n=189 Mean (SE)	P value [y]
Screentime n=359	2.81 hrs/day (0.26)	2.59 hrs/day (0.24)	0.5497
Sedentary Behavior [x] n=355	6.04 hrs/day (0.25)	5.5 hrs/day (0.24)	0.1221
Fruit and Vegetable Consumption n=362	2.04 srvgs/day (0.06)	2.2 srvgs/day (0.06)	0.0599
Fruit Consumption n=403	1.94 srvgs/day (0.973)	2.06 srvgs/day (0.921)	0.193[w]
Vegetable Consumption n=405	2.20 srvgs/day (0.977)	2.40 srvgs/day (0.845)	**0.026**[w]
MVPA [v] -days/week n=351	3.34 days/wk (0.12)	3.93 days/wk (0.12)	**0.0006**
MVPA [v] –minutes/week n=398	535.57 min/wk (72.17)	955.58 min/wk (118.5)	**0.0026**[u]
Body Mass Index [t] n=342	23.57 (0.63)	23.22 (0.61)	0.6923

[z] Non-gardeners reported gardening less than 2 hours per week during the gardening season. Gardeners reported gardening more than 2 hours per week during the gardening season.
[y] P value from SAS Version 9.2, PROC GLM, Analysis of Variance
[x] Sedentary Behavior includes time spent in screentime sedentary behaviors
[w] P value from SPSS Version 18, Analysis of Variance
[v] MVPA - Moderate and Vigorous Physical Activity
[u] P value from Excel 2008 2-tailed TTEST for unequal variances
[t] Body Mass Index calculated from self-report of height and weight

Table 2: Comparison of weekly minutes spent in MVPA [z] for parents classified as gardeners and non-gardeners

	Weekly MVPA (median minutes)	% Achieving Recommendations [x]
Gardeners [y]	460	86.9%
Non-Gardeners [y]	240	59.3%

[z] MVPA - Moderate and Vigorous Physical Activity

[y] Non-gardeners reported gardening less than 2 hours per week during the gardening season. Gardeners reported gardening more than 2 hours per week during the gardening season.

[x] Percent of sample acquiring recommendations of participation in MVPA for at least 150 minutes per week.

Table 3: Comparison of health behaviors of 4th and 5th graders with parents classified as gardeners and non-gardeners

	Non-Gardeners [z] n=177 Mean (SE)	Gardeners [z] n=189 Mean (SE)	P value [y]
Screentime n=342	107.28 min/day (8.16)	124.7 min/day (8.01)	0.1285
Sedentary Behavior[x] n=325	211.36 min/day (11.04)	231.41 min/day (10.87)	0.1967
Fruit and Vegetable Consumption n=356	1.47 times/day (0.11)	1.58 times/day (0.11)	0.5165
Fruit Consumption n=403	0.71 times/day (0.965)	0.76 times/day (0.941)	0.618[w]
Vegetable Consumption n=405	0.67 times/day (0.963)	0.76 times/day (0.927)	0.376[w]
MVPA[v] n=358	4.68 days/week (0.15)	4.9 days/week (0.15)	0.2873
Time Outside n=354	64.56 min/day (4.73)	62.32 min/day (4.7)	0.7370
Body Mass Index-z score[u] n=366	0.3955 (0.98)	0.3590 (0.99)	0.706[t]

[z] Children's parents were classified as Non-gardeners if they reported gardening less than 2 hours per week during the gardening season. Parents were classified as Gardeners if they reported gardening more than 2 hours per week during the gardening season.

[y] P value from SAS Version 9.2, PROC GLM, Analysis of Variance

[x] Sedentary behavior includes time spent in screentime sedentary behaviors

[w] P value from SPSS Version 18, Analysis of Variance

[v] MVPA - Moderate and Vigorous Physical Activity

[u] Body Mass Index calculated from objectively measured height and weight, then converted to z-scores to account for child age and gender

[t] P value from SPSS Version 18, Analysis of Variance

Bibliography

(ARS) Agriculture Research Service (1998). Food and Nutrient Intakes by Individuals in the United States, by Sex and Age, 1994–96. Springfield, VA, U.S. Department of Agriculture. Nationwide Food Surveys: 197 pages.

Ainsworth, B. E., Haskell, W.L., Whitt, M.C., Irwin, M.L., Swartz, A.M., Strath, S.J., O'Brien, W.L., Bassett, DR Jr, Schmitz, K.H., Emplaincourt, P.O., Jacobs, DR Jr, Leon, A.S. (2000). "Compendium of Physical Activities: an update of activity codes and MET intensities." Medicine and Science in Sports and Exercise 32(Supp 9): S498-504.

AAP. 2001. Policy Statement, American Academy of Pediatrics Committee on Public Education: Children, Adolescents, and Television. Pediatrics Vol. 107 No. 2 February 2001, pp. 423-426

Armstrong, D. L. (2000). "A survey of community gardens in upstate New York: Implications for health promotion and community development." Health and Place 6(4): 319-327.

Asian Vegetable Research and Development Center. (1983-1989). "Annual Progress Report: Shanhua, Taiwan Province of China."

Ball, K., Crawford, D., Owen, N. (2000). "Too fat to exercise? Obesity as a barrier to physical activity." Aust N Z J Public Health 24(3): 331-333.

Baranowski, T., Davis, M., Resnicow, K, Baranowski, J., Doyle, C., Lin, L.S., Smith, M., Wang, D.T. (2000). "Gimme 5 fruit, juice, and vegetables for fun and health: outcome evaluation." Health Education Behav 27: 96-111.

Bell, A. C., Dyment, J. E. (2008). "Grounds for health: The intersection of green school grounds and health-promoting schools." Environmental Education Research 14(1): 77-90.

Berg, F. (1993). "Teen Obesity increases heart risk." healthy Weight Journal/Obesity and Health 7(2).

Berg, F. (1997). "Heaviest Children Log Increases." Healthy Weight Journal 11(1).

Berg, F. M. (2004). Underage & Overweight: America's Childhood Obesity Crisis--What Every Family Needs to Know. Long Island City, NY, Hatherleigh Press.

Birch, L. L., McPhee, L., Shoba, B.C., Pirok, E., and Steinberg, L. (1987). "What kind of exposure reduces children's food neophobia?" Appetite 9: 171–178.

Birch, L. L. (1992). "Children's preferences for high-fat foods." Nutrition Reviews 50: 249-255.

Birch, L. L., Davison, K.K. (2001). "Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight." Pediatric Clinics of North America 48: 893-907.

Blair, D., Giesecke, C., and Sherman, S. (1991). "A dietary, social, and economic evaluation of the Philadelphia Urban Gardening Project." Journal Nutrition Education 23: 161-167.

Blair, S. N., and Brodney, S.(1999). "Effects of physical inactivity and obesity on morbidity and mortality: current evidence and research issues." Medicine & Science in Sports & Exercise 31(11 (Supplement)): S646-S662.

Blanchette, L., Brug, J. (2005). "Determinants of fruit and vegetable consumption among 6-12 year old children and effective interventions to increase consumption." Journal of Human Nutrition and Dietetics 18(431-443).

(BLS), Bureau of Labor Statistics (2009). American Time Use Survey—2008 Results. U. S. D. o. Labor. Washington, D.C.

Bocarro, J., Kanters, M.A., Casper, J., and Forrester, S. (2008). "School Physical Education, Extracurricular Sports, and Lifelong Active Living." Journal of Teaching in Physical Education 27: 155-166.

Boynton-Jarrett, R., Thomas, T.N., Peterson, K.E., Weicha, J., Sobol, A.M., Gortmaker, S.L. (2003). "Impact of television viewing patterns on fruit and vegetable consumption among adolescents." Pediatrics 112: 1321 - 1326.

Brooks, C. (1988). "Adult physical activity behavior: a trend analysis." Journal of Clinical Epidemiology 41: 385-392.

Brunner Huber, L. R. (2007). "Validity of Self-reported Height and Weight in Women of Reproductive Age." Matern Child Health J 11: 137–144.

Butterfield, B. (2009). The Impact of Home and Community Gardening In America. National Gardening Association. South Burlington, VT, National Gardening Association.

Caspersen, C. J., Bloembers, B.P., Saris, W.H., Merritt, R.K., and Kromhout, D. (1991). "The prevalence of selected physical activities and their relation with coronary heart disease risk factors in elderly men: the Zutphen Study, 1985." American Journal of Epidemiology 133: 1078-1092.

Caspersen, C. J., Pereira, M. A, .and Curran, K.M. (2000). "Changes in physical activity patterns in the United States, by sex and cross-sectional age." Med. Sci. Sports Exerc. 32(9): 1601-1609.

(CDC), Center for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Survey Questionnaire (BRFSS). United States Department of Health and Human Services, Atlanta, GA.

(CDC), Center for Disease Control and Prevention (2003). "Physical activity levels among children aged 9-13 years--United States 2002." Morbidity and Mortality Weekly Report 52: 785-788.

(CDC). Table for Calculated Body Mass Index Values for Selected Heights and Weights for Ages 2 to 20. http://www.cdc.gov/nccdphp/dnpa/bmi/00binaries/bmi-tables.pdf. June 2000.

Chakravarthy, M. V. and Booth, F.W. (2004). "Eating, exercise, and "thrifty" genotypes: connecting the dots toward an evolutionary understanding of modern chronic diseases." Journal of Applied Physiology 96: 3-10.

Clayton, S. (2007). "Domesticated nature: Motivations for gardening and perceptions of environmental impact." Journal of Environmental Psychology 27(3): 215 - 224.

Coon, K. A., Godberg, J., Rogers, B.L., Tucker, K.L. (2001). "Relationships between use of television during meals and children's food consumption patterns." Pediatrics 107: E7.

Cotugna, N. (1988). "TV ads on Saturday morning children's programming: what's new?" Journal Nutrition Education 20: 125 - 127.

Crespo, C. J., Keteyian, S.J., Heath, G.W., and Sempos, C.T. (1996). "Leisure time physical activity among U.S. Adults, Results from the third National Health and Nutrition Examination Survey." Archives of Internal Medicine 156: 93-98.

Dannenberg, A. L., Keller, J.B., Wilson, P.W., and Castelli, W.P. (1989). "Leisure time physical activity in the Framingham Offspring Study." American Journal of Epidemiology 129(1): 76-87.

DeMattia, L., Lemont, L., Meurer, L. (2007). "Do interventions to limit sedentary behaviors change behaviour and reduce childhood obesity? A critical review of the literature." Obesity Review 8: 69 - 81.

Dempsey, J. M., Kimiecik, J.C., & Horn, T.S. (1993). "Parental influence on children's moderate to vigorous physical activity participation: An expectancy-value approach." Pediatric Exercise Science 5: 151-167.

Devine, C. M., Wolfe, W.S., Frongillo, E.A., Bisogni, C.A. (1999). "Life-course events and experiences: association with fruit and vegetable consumption in 3 ethnic groups." Journal of the American Dietetic Association 99(3): 309-314.

Dickinson, J., Duma, S., Paulsen, H., Rilveria, L., Twiss, J., and Weinman, T. (2003). "Community gardens: lessons learned from California healthy cities and communities." American Journal of Public Health 93: 1435-1438.

Dietz, W. H., & Gortmaker, S. L. (1985). "Do we fatten our children at the television set? Obesity and television viewing

in children and adolescents." Pediatrics 75: 807-812.

Domel, S. B., Thomson, W.O., Davis, H.C., Baranowski, T., Leonard, S.B., and J. Baranowski (1996). "Psychosocial predictors of fruit and vegetable consumption among elementary school children." Health Educ Res 11: 299-308.

Durant, R. H., Baranowski, T., Johnson, M., & Thompson, W. O. (1994). "The relationship among television watching, physical activity, and body composition of young children." Pediatrics 94: 449-455.

Eaton, D. K., Kann, L., Kinchen, S., Ross, J., Hawkins, J., Harris, W.A., Lowry, R., McManus, T., Chyen, D., Shanklin, S., Lim, C., Grunbaum, J., Wechsler, H. (2006). "Youth Risk Behavior Surveillance --- United States, 2005." Morbidity and Mortality Weekly Report (CDC) 55 (Surveillance Summaries 2005): 1 - 108.

Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., and W. Harris, Lowry, R., McManus, T., Chyen, D, Lim, C., Whittle, L., Brener, N.D., Wechsler, H. (2010). "Youth Risk Behavior Surveillance --- United States, 2009." Morbidity and Mortality Weekly Report 59(Surveillance Summaries (SS05)): 1-142.

Edwards, L. N., & Grossman, M (1978). Children's health and the family, National Bureau of Economic Research Working Paper No. 256.

Edwards, L. N., & Grossman, M. (1979). Income and race differences in children's health, National Bureau of Economic Research Working Paper No. 308.

Enns, C. W., Mickle, S.J., Goldman, J.D. (2002). "Trends in food and nutrient intakes by children in the United States." Fam Econ Nutr Rev 14: 56- 58.

Epstein, L., Wing R, Koeske R, et al (1985). "A comparison of lifestyle exercise, aerobic exercise, and calisthenics on weight loss in obese children." Behavioral Therapy 16: 345-356.

Epstein, L. H., Paluch R.A., Consalvi A., Riordan K., Scholl T. (2002). "Effects of manipulating sedentary behavior on physical activity and food intake." J Pediatr 140: 334-339.

Excel (2008). Redmond, WA, Microsoft Corporation.

Flegal, K. M., Margaret D. Carroll, MSPH; Cynthia L. Ogden, PhD; Lester R. Curtin, PhD (2010). "Prevalence and Trends in Obesity Among US Adults, 1999-2008." JAMA 303(3): 235-241.

Fletcher, G. F., Balady, G., Blair, S.N., Blumenthal, J., Caspersen, C., Chaitman, B., Epstein, S., Sivarajan Froelicher, E.S., Froelicher, V.F., Pina, I.L., and Pollock, M.L. (1996). Statement on Exercise: Benefits and Recommendations for Physical Activity Programs for All Americans, Circulation, American Heart Association, Inc. 94: 857-862.

Fontvielle, A. and Ravussin, E (1993). "Metabolic Rate and Body Composition of Pima Indian and Caucasian Children." Critical Reviews in Food Science and Nutrition 33(4): 363-368.

Ford, E. S., Merrit, R.K., Heath, G.W., Powell, K.E., Washburn, R.A., Kriska, A., and Haile, G. (1991). "Physical activity behaviors in lower and higher socioeconomic status populations." American Journal of Epidemiology 133(12): 1246-1256.

Galst, J. P., White M.A. (1976). "The unhealthy persuader: the reinforcing value of television and children's purchase-influencing attempts at the supermarket." Child Development 47: 1089-1096.

Gigliotti, C. M., Jarrott, S.E. (2005). "Effects of Horticulture Therapy on Engagement and Affect." Canadian Journal on Aging 24(4): 367-377.

Gochman, D. S. (1982). "Labels, systems and motives: Some perspectives for future research and programs." Health Education Quarterly 9: 167 - 174.

Golan, M., Crow, S. (2004). "Parents are key players in the prevention and treatment of weight related problems." Nutrition Reviews 62(1): 39-50.

Golan, M., Kaufman, V., & Shahar, D.R. (2006). "Childhood obesity treatment: Targeting parents exclusively v. parents and children." The British Journal of Nutrition 95: 1008-1015.

Goldberg, M. E., Gorn, G.J., Gibson, W (1978). "TV messages for snack and breakfast foods: do they influence children's preferences?" J Consumer Res 5: 73-81.

Gorn, G. J., & Greenberg, M.E. (1982). "Behavioral evidence of the effects of televised food messages on children." Journal of Consumer Research 9: 200 - 205.

Gortmaker, S. L., Peterson, K., Weicha, J., Sobol, A.M., Sixit, S., Fox, M.K., Laird, N. (1999). "Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health." Arch Pediatr Adolesc Med 153: 409-418.

Grimm, K., Blanck, H., Scanlon, K., Moore, L., Grummer-Strawn, L. (2010). "State-Specific Trends in Fruit and Vegetable Consumption Among Adults—United States, 2000-2009." MMWR Weekly.

Grunwald, G. K., Seagle, H.M., Peters, J.C., Hill, J.O. (2001). "Quantifying and separating the effects of macronutrient composition and non-macronutrients on energy density." Br J Nutr 86: 265-276.

Hausenblas (2002). "Perceptions of Exercise Stages, Barrier Self-Efficacy, and Decisional Balance for Middle-Level School Students." The Journal of Early Adolescence 22.

Hearn, M. D., Baranowski, T., Baranowski, J., Doyle, C., Smith, M. Lin, L.S., Resnicow, K. (1998). "Environmental influences on dietary behavior among children: Availability and accessibility of fruits and vegetables enable consumption." Journal of Health Education 29(1): 26-32.

Hei, T. K., & Gold, V. (1990). American Heart Association, annual meeting. Dallas, TX.

Heim, S., Stang, J., Ireland, M. (2009). "A Garden Pilot Project Enhances Fruit and Vegetable Consumption among Children." J Am Diet Assoc 109: 1220-1226.

Hlubik, W. T., Hamm, M.W., Winokur, M.A., and Baron, M.V. (1994). Incorporating research with community gardens: the New Brunswick Community Gardening and Nutrition Program. The Healing Dimensions of People-Plant Relations: Proceedings of a Research Symposium, UC Davis, CA; Center for Design Research, Department of Environmental Design.

Howarth, N. C., Saltzman, E., Roberts, S.B. (2001). "Dietary fiber and weight regulation." Nutr Rev 59: 129-139.

Huston, A. C., & Wright, J. C. (1997). Mass media and children's development. Handbook of child psychology. A. R. I. Siegel. New York, Wiley. Vol. 4: Child psychology in practice: 999–1058.

Irvine, S., Johnson, L., and Peters, K. (1999). "Community gardens and sustainable land use planning: a case-study of the Alex Wilson Community Garden." Local Environment 4: 33-46.

Janz, K. F., Dawson J.D., Mahoney L.T. (2000). "Tracking physical fitness and physical activity from childhood to adolescence: the muscatine study." Medicine and Science in Sports and Exercise 32: 1250-1257.

Jeffrey, D. B., McClerran, R.W., & Fox, D.T. (1982). "The development of children's eating habits: The role of television commercials." Health Education Quarterly 9: 78 - 93.

Kaplan, R. (1973). "Some psychological benefits of gardening." Environment and Behavior 5: 145-162.

Kaplan, R. (2001). "The nature of the view from home: psychological benefits." Environ Behav 33: 507-542.

Kaplan, R. and Kaplan, S. (1990). Restorative experience: The healing power of nearby nature. The Meaning of Gardens. M. H. R. T. J. Francis. Cambridge, MA, MIT Press: 238-243.

Kelder, S. (1994). "Longitudinal tracking of adolescent smoking, physical activity and food choice behaviors." American Journal of Public Health 84: 1121 - 1126.

Kien, C. L., and Chiodo, A.R. (2003). "Physical activity in middle school-aged children participating in a school-based recreation program." Archives of Pediatrics & Adolescent Medicine 157(8): 811-815.

Kimmons, J., Gillespie, C., Seymour, J., Serdula, J., Michels-Blanck, H. (2009). "Fruit and Vegetable Intake Among Adolescents and Adults in the United States: Percentage Meeting Individualized Recommendations." Medscape Journal of Medicine 11(1).

Kristal, A. R., Bowen, D.J., Curry, S.J., Shattuck, A.L., & Henry, H.J. (1990). "Nutrition knowledge, attitudes and perceived norms as correlates of selecting low-fat diets." Health Education Research 5: 467 - 477.

Kuo, F. E., and Taylor, A.F. (2004). "A potential natural treatment for attention deficit-hyperactivity disorder: Evidence from a national study." American Journal of Public Health 94: 1580-1586.

Lackey and Associates (1998). Evaluation of community gardens, University of Wisconsin Cooperative Extension.

Lau, R. R., Quadrel, M.J. and Hartman, K.A. (1990). "Development and Change of Young Adults' Preventive Health Beliefs and Behavior: Influence from Parents and Peers." Journal of Health and Social Behavior 31(3): 240-259.

Lederman, S. A., Akabas, S., Moore, F.J., Bentley, M.E., Devaney, B., Gillman, M.W., Kramer, M.S., Mennella, J.A., Ness, A., Wardle, J. (2004). "Summary of the presentations at the Conference on Preventing Childhood Obesity, December 8, 2003." Pediatrics 114: 155-162.

Libman, K. (2007). "Growing youth growing food: How vegetable gardening influences young people's food consciousness and eating habits." Applied Environmental Education & Communication 6(1): 87-95.

Lin, B.-H., Morrison R.M. (2002). "Higher fruit consumption linked with lower body mass index." Food Rev 25: 28- 32.

Lineberger, S. E., & Zajicek, J. M. (2000). "School gardens: Can a hands-on teaching tool affect students' attitudes and behaviors regarding fruit and vegetables?" HortTechnology 11: 593-596.

Lytle, L. (2000). "How do children's eating patterns and food choices change over time? Results from a cohort tracking study." American Journal of Health Promotion 14: 222-228.

Malina, R. M. (2001). "Adherence to physical activity from childhood to adulthood: a perspective from tracking studies." Quest 53: 346-355.

Marsh, R., Talukder, A. (1994). Production and consumption effects of the introduction of home gardening on target, interaction and control groups: a case study from Bangladesh. International Symposium on Systems-Oriented Research, Montpellier, France, Rural Institutions and Participation Service of FAO's Sustainable Development Department.

Marsh, R. (1998). "Building on traditional gardening to improve household food security." FNA/ANA 22.

Matheson, D. M., Killen JD, Wang Y, Varady A, Robinson TN. (2004). "Children's food consumption during television viewing." American Journal of Clinical Nutrition 79: 1088-1094.

Matthews, C. E., Kong, Y.C, Freedson, P.S., Buchowski, M.S., Bettina M., and R. Beech, Pate, R., and Troiano, R.P. (2008). "Amount of Time Spent in Sedentary Behaviors in the United States, 2003–2004." American Journal of Epidemiology 167(7).

McHale, S. M., Crouter, A.C., Tucker, C.J. (2001). "Free-Time Activities in Middle Childhood: Links with Adjustment in Early Adolescence." Child Development 72(6): 1764–1778.

Moore, G. F., Tapper, K., Murphy, S., Clark, R., Lynch, R., and Moore, L. (2007). "Validation of a self-completion measure of breakfast foods, snacks and fruits and vegetables consumed by 9- to 11-year-old schoolchildren." European Journal of Clinical Nutrition 61: 420–430.

Morris, J. L., Neustadter, A., & Zidenberg-Cherr, S. (2001). "First-grade gardeners more likely to taste vegetables." California Agriculture 55(1): 43-46.

Morris, J. L., & Zidenberg-Cherr, S. (2002). "Garden-enhanced nutrition curriculum improves fourth-grade school children's knowledge of nutrition and preferences for some vegetables." J Am Diet Assoc 102(1): 91-93.

Mornison, J. A., Payne, G., Barton, B.A., Khoury, P.R., and Crawford, P. (1994). "Mother-Daughter Correlations of Obesity and Cardiovascular Disease Risk Factors in Black and White Households: TheNHLBI Growth and Health Study." American Journal Public Health **84**(11): 1761-1767.

Munoz, K. A., Krebs-Smith, S.M., Ballard-Barbash, R, & Cleveland, L.E. (1997). "Food intakes of US children and adolescents compared with recommendations." Pediatrics 100(3 pt. 1): 323-329.

Nelson, D. E., Holtzman, D., Bolen, Stanwych, C.A., Mack, K.A. (2001). "Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS)." Social and Preventive Medicine 46(Supplement 1): S03 - S42.

Newby, P. K. (2007). Are Dietary Intakes and Eating Behaviors Related to Childhood Obesity? A Comprehensive Review of the Evidence. Journal of Law, Medicine, & Ethics.

Obarzanek, E. e. a. (1994). "Energy Intake and PA in Relation to Indexes of Body Fat (NHLBI)."

Ogden, C. L., Flegal, K.M. Carroll M.D., Johnson, C.L. (2002). "Prevalence and trends in overweight among US children and adolescents, 1999 - 2000." JAMA 288: 1728-1732.

Ogden, C. L., Carroll, M.D., Lester R. Curtin, PhD; Molly M. Lamb, PhD; Katherine M. Flegal, PhD (2010). "Prevalence of High Body Mass Index in US Children and Adolescents, 2007-2008." JAMA 303(3): 242-249.

Olshansky, S. J., Passaro, D.R., Hershow, R.C., Layden, J. Carnes, B.A., and Brody, J. et al (2005). "A Potential Decline in Life Expectancy in the United States in the 21st Century." New England Journal of Medicine.

Park, S., Shoemaker, C.A., Haub, M.D. (2009). "Physical and Psychological Health Conditions of Older Adults Classified as Gardeners or Nongardeners." HortScience 44(1): 206-210.

Pate, R. R., Pratt, M., Blair, S.N., Haskell, W.L., Macera, C.A., Bouchard, C., Buchner, D., Ettinger, W., Heath, G.W., King, A.C., and et al. (1995). "Physical activity and public health." Journal of the American Medical Association 273(5): 402-407.

Patel, I. C. (1991). "Gardening's socioeconomic impacts: community gardening in an urban setting." Journal of Extension 29: 7-8.

Patel, I. C. (1996). "Rutgers urban gardening: A case study in urban agriculture." Journal of Agriculture and Food Information 3(3): 35-46.

Pereira, M. A., Ludwig, D.S. (2001). "Dietary fiber and body weight regulation." Pediatric Clinics of North America 48: 969-980.

Perry, C. L., Luepker,R V, Murray, D M, Kurth, C, Mullis, Crockett, S, and Jacobs, D R Jr. (1988). "Parent involvement with children's health promotion: the Minnesota Home Team." American Journal of Public Health 78(9): 1156-1160.

Pliner, P. (1982). "The effects of mere exposure on liking for edible substances." Appetite 3: 283–290.

Poston, S. A., Shoemaker, C. A., Dzewaltowski, D. A. (2005). "A comparison of a gardening and nutrition program with a standard nutrition program in an out-of-school setting." Horttechnology 15(3): 463-467.

Pothukuchi, K. (2004). "Hortaliza: A Youth 'Nutrition Garden' in Southwest Detroit." Children, Youth and Environments 14(2): 124-155.

Prince, S. A., Adamo, K.B., Hamel, M.A., Hardt, J., and S. C. Gorber, and Tremblay, M. (2008). "A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review." International Journal of Behavioral Nutrition and Physical Activity 5(1): 56.

Proctor, M. H., Moore, L.L., Gao, D., Cupples, L.A., Bradlee, M.L., Hood, M.Y., Ellison, R.C. (2003). "Television viewing and change in body fat from preschool to early adolescence: the Framingham Children's Study." Int J Obes Relat Metab Disord 27: 827-833.

Raitakan, O. T., Porkka, K.V.K., Taimela, S., Telama, R., Räsänen, L., and Vllkari, J.S. (1994). "Effects of Persistent Physical Activity and Inactivity on Coronary Risk Factors in Children and Young Adults The Cardiovascular Risk in Young Finns Study." Am J Epidemiol 140: 195–205.

Reicks, M., Randall, J.L., Haynes, B.J. (1994). "Factors affecting consumption of fruits and vegetables by low-income families." Journal American Dietetic Association 94: 1309-1311.

Resnicow, K., Davis-Hearn, M., Smith, M., Baranowski, T., Lin, L.S., Baranowski, J., Doyle, C., and Dongqing Terry Wang (1997). "Social cognitive predictors of children's fruit and vegetable intake." Health Psychology 16(3): 272 - 276.

Rey-Lopez, J., Vicente-Rodrigues, G, Biosca, M, Moreno, L.A. (2008). "Sedentary behavior and obesity development in children and adolescents." Nutr Metab Cardiovasc Dis 18: 242-251.

Reynolds, L. R. a. A., J.W. (2004). "Practical office strategies for weight management of the obese diabetic individual."." Endocrine Practice 10(2): 15309.

Roberts, D., Foehr, U. (2003). Kids & media in America. Cambridge, MA, Cambridge University Press.

Roberts, D. F., Foehr, U.G., & Rideout, V. (2005). Generation M: Media in the Lives of 8-18 year olds. Menlo Park, CA, Kaiser Family Foundation.

Roberts, D. F., Foehr, U.G. (2008). "Trends in Media Use." The Future of Children published by Princeton University 18(1): 11-37.

Robinson, J. P. (1972). Television's impact on everyday life: Some cross-national evidence. Television and social behavior G. A. C. E.A. Rubinstein, & J.P. Murray. Washington D.C., Government Printing Office. 4.

Robinson, M., MPH (1999). "Reducing Children's Television Viewing to Prevent Obesity: A Randomized Controlled Trial." JAMA 282(No. 16): 7.

Robinson, T. N., Hammer, L. D., Killen, J. D., Kramer, H. C., Wilson, D. M., Hayward, C., & Taylor, C. B. (1993). "Does television viewing increase obesity and reduce physical activity? Cross-sectional and longitudinal analyses among adolescent girls." Pediatrics 91: 273-280.

Rolls, B. J., Bell, E.A., Castellanos, V.H., Pelkman, C.L., Thorwart, M.L. (1998). "Energy density of foods has a greater influence on daily energy intake than fat content." FASEB J 12: A347.

Rolls, B. J., Bell, E.A., Thorwart, M.L. (1999). "Water incorporated into a food but not served with a food decreases energy intake in lean women." Am J Clin Nutr 70: 448-455.

Rosenkranz, R. R., Geller, K.S. and Dzewaltowski, D.A. (2007). "Parents Attending a Family Weight Management Program Perceive Similar Home Fruit and Vegetable Accessibility, but Greater Child Proxy Agency and Physical Activity Opportunity." Californian Journal of Health Promotion 5(2): 157-162.

Rosenkranz, R. R., Dzewaltowski, D.A. (2008). "A Model of the Home Food Environment Pertaining to Childhood Obesity." Nutrition Reviews 66(3): 123–140.

Sallis, J. F., Patterson, T.L., Buono, M.J., Atkins, C.J., & Nader, P.R. (1988). "Aggregation of physical activity habits in Mexican-American and Anglo families." Journal of Behavioral Medicine 11: 31-41.

Sallis, J. F., Cervero, R.B., Ascher, W., Henderson, K.A., Kraft, M.K., & Kerr, J. (2006). "An ecological approach to creating active living communities." Annual Review of Public Health 27: 297-322.

Sallis, J. F., Leslie S. Linton, JD, MPH, M. Katherine Kraft, PhD, Carmen L. Cutter, MPH,, P. Jacqueline Kerr, Julie Weitzel, MS, Amanda Wilson, MSRS, Chad Spoon, MRP, Irvin D. Harrison, MA,, et al. (2009). "The Active Living Research Program: Six Years of Grantmaking." American Journal of Preventive Medicine 36(2S): S10 –S21.

Salmon, J., Timperio, A., Telford, A., Carer, A., and Crawford, D. (2005). "Association of Family Environment with Children's Television Viewing and with Low Level of Physical Activity." Obesity Research 13(11).

SAS (Version 9.2). Cary, NC.

Sebastian, R. S., Cleveland, L.E., Goldman, J.D., Moshfegh, A.J. (2007). "Impact of eating frequency by adolescents on food intake and meeting MyPyramid recommendations." The Federation of American Societies for Experimental Biology (FASEB) Journal 21(5).

Shakato, R., Edwards, L., & Grossman, M. (1980). Working Paper: An exploration of the dynamic relationship between health and cognitive development in adolescence. N. B. o. E. Research.

Shamsuddin and Said. (2008). Middle Childhood Children Interaction with home and neighborhood gardens in urban and rural setting. 2nd International Conference on Built Environment in Developing Countries.

Sherry, B. (2005). "Food Behaviors and other strategies to prevent and treat pediatric overweight." International Journal of Obesity 29: S116-S126.

Shoemaker, C. A. (2006). Pilot Study, Gardening and Family Health Behaviors. Manhattan, KS, Kansas State University.

SPSS for Windows, Rel. 18 2001. Chicago: SPSS Inc.

Strauss, R. S., Knight, J. (1999). "Influence of the home environment on the development of obesity in children." Pediatrics 103(6): e85.

Stuart, S. M. (2005). Lifting spirits: Creating gardens in California domestic violence shelters. Urban place: Reconnecting with the natural world. P. F. Barlett. Cambridge, MA, MIT Press: 61-88.

Sullivan, W. C. (2005). Forest, savanna, city: Evolutionary landscapes and human functioning. Urban place: Reconnecting with the natural world. P. F. Bartlett. Cambridge, MA, MIT Press: 237-252.

Taras, H. L., Sallis, J.F., Patterson, T.L., Nader, P.R., Nelson, J.A. (1989). "Television's influence on children's diet and physical activity." Dev Behav Pediatr 10: 176-180.

Taylor, A. F., Kuo, F.E., & Sullivan, W.C. (2002). "Views of nature and self-discipline: Evidence from inner city children." Journal of Environmental Psychology 22: 49-63.

Taylor, W. C., Blair, S.N., Cummings, S.S., Wun, C.C., Malina, R.M. (1999). "Childhood and adolescent physical activity patterns and adult physical activity." Medicine & Science in Sports & Exercise 31(1): 118-123.

Tinsley, B. J., Fella, G.A., & Siegel, N (1987). The influence of maternal health beliefs on preventive health behavior and infant health: Socioeconomic differences. American Public Health Association. New Orleans, LA.

Tinsley, B. J. (1992). "Multiple Influences on the Acquisition and Socialization of Children's Health Attitudes and Behavior: An Integrative Review." Child Development 63(5): 1043-1069.

Troiano, R. and Flegal, K.M. (1996). "Shifts in the Distribution of BMI of Children in the US Population." Obesity Research 4(S1): 68S.

Troiano, R. and Flegal, K.M. (1998). "Overweight children and adolescents: description, epidemiology, and demographics." Pediatrics 101: 497 - 504.

Troiano, R., Berrigan, D, Dodd, KW, Masse, LC, Tilert, T, McDowell, M.(2008). "Physical activity in the United States measured by accelerometer." Medicine & Science in Sports & Exercise 40(1): 181-188.

Trost, S. G. (2005). Chapter 7: Determinants of physical activity in children and youth. Discussion paper for the development of recommendations for children's and youths' participation in health promoting physical activity, Australian Commonwealth.

U.S. Department of Agriculture, A. R. S., Community Nutrition Research Group (2000). Pyramid servings intakes of U.S. children and adults, 1998.

U.S. Department of Health & Human Services (HHS). 2008. 2008 Physical Activity Guidelines for Americans.

Ulrich, R. (1984). "View through a window may influence recovery from surgery." Science 224: 420-421.

Vandewater, E. A., Shim, M., Caplovitz, A.G. (2004). "Linking obesity and activity level with children's television and video game use." Journal of Adolescence 27: 71–85.

Vauthier J.M., L. A., Lecomte E., Artur Y., Herbeth B. (1996). "Family resemblance in energy and macronutrient intakes: The Stanislas Family Study." Int J Epidemiol 25: 1030–1037.

Vereecken, C.A., Maes, L., and De Bacquer, D. (2004). "The influence of parental occupation and the pupils' educational level on lifestyle behaviors among adolescents in Belgium." Journal of Adolescent Health 34(4): 330-338.

Wardle, J., Cooke, L.J., Gibson, E.L., Sapochnik, M., Sheiham, A. Lawson, M. (2003). "Increasing children's acceptance of vegetables: a randomized trial of parent-led exposure." Appetite 40: 155-162.

Weber, C. K., Baranowski, T., Rittenberry, L., Cosart, C., Owens, E., Hebert, D., deMoor, C. (2000). "Socioenvironmental influences on children's fruit, juice, and vegetable consumption as reported by parents: reliability and validity of measures." Public Health Nutrition 3: 345-356.

Whitaker, R., Wright JA, Pepe MS, Seidel KD, Dietz WH (1997). "Predicting obesity in young adulthood from childhood and parental obesity." New England Journal of Medicine 25(336): 869-873.

Williams, T. H., & Handford, A.G. (1986). Television and other leisure activities. The impact of television: A natural experiment in three communities. T. H. Williams. Orlando, FL, Academic Press.

Wood, F. G. (2002). "Ethnic Differences in Exercise among Adults with Diabetes." West J Nurs Res 24(5): 502-515.

Xiang, P., McBride, R., Guan, J., and Solmon, M. (2003). "Children's Motivation in Elementary Physical Education: An Expectancy-Value Model of Achievement Choice." Research Quarterly for Exercise and Sport 74(1): 25 - 35.

Young, E. M., Fors, S.W., Hayes, D.M. (2004). "Associations between perceived parent behaviors and middle school student fruit and vegetable consumption." J Nutr Educ Behav 36(1): 2-8.

Yusuf, H.R., Croft, J.B., Giles, W.H., Anda, R.F., Casper, M.L., Caspersen, C.J., Jones, D.A. (1996). "Leisure-time physical activity among older adults, United States, 1990." Arch Intern Medicine 156: 1321-1326.

Appendix A - Child Questionnaire

Analyzed Items from Child Questionnaire

Physical Activity

Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?

Over a typical or usual week, on how many days are you physically active for a total of at least 60 minutes per day?

0 days, 1 day, 2 days, 3 days, 4 days, 5 days, 6 days, 7 days

Sedentary Behavior

asked twice – YESTERDAY and LAST SATURDAY, how much time did you spend

1. Watching television (not including videos on a VCR or DVD player)
2. Watching movies/videos on a VCR or DVD player
3. Playing video games (like Xbox, Wii, or Playstation, not including games on a computer)
4. Playing on a computer (not including homework)
5. Doing homework (including reading a book or magazine for school or working on a computer)
6. Reading a book or magazine NOT for school (including comic books)
7. Listening to music on CDs, iPods, other MP3 players, or the radio
8. Playing a musical instrument
9. Doing artwork or crafts (like drawing, painting or making things)
10. Playing quiet games indoors (like playing with toys, puzzles or board games)

Screen-Based Behaviors

asked twice – YESTERDAY and LAST SATURDAY, how much time did you spend

Sedentary Items 1-4 (above)

Time Outdoors

asked twice – YESTERDAY and LAST SATURDAY, how much time did you spend

11. Playing outside

Response categories for items 1-11:

none, “15 or more” or, “30 or more” minutes, 1, 2, 3, 4, 5, or “6 or more” hours

Fruit and Vegetable Consumption

What did you do yesterday?

Did you watch television at home yesterday morning? (no, yes)

Did you have anything to eat or drink at home yesterday morning? (no, yes) > What did you have to eat or drink? > Have you written down everything?

In a similar fashion:

Did you have anything to eat or drink on the way to school yesterday morning? " "

Did you have anything to eat or drink at school yesterday morning, before class started? " "

What did you do at morning recess yesterday? (sat around, stood around, walked around, ran around)

Did you have anything to eat or drink at morning eat or drink at morning recess yesterday?

What did you do at lunch recess yesterday?

Did you have anything to eat or drink at lunchtime yesterday?

What did you do after school yesterday?

Did you play outside after school yesterday?

Did you watch television after school yesterday?

Did you have anything to eat or drink on your way home yesterday? Or anything to eat or drink between the end of school and your evening meal?

Did you have an evening meal yesterday?

What did you do after your evening meal yesterday? (If you didn't have an evening meal, write down what you did before you went to bed.)

Did you have anything else to eat or drink after your evening meal yesterday or before you went to bed?

Did you have anything else to eat or drink yesterday that you haven't already put on this form?

Appendix B - Parent Questionnaire

Analyzed Items from Parent Questionnaire

Gardening Classification

During the typical growing season, on average how many hours per week do you spend on light gardening activities? (e.g. watering, weeding, planting, raking, mowing lawn using a riding mower or power mower, etc.) (choose one)

During the typical growing season, on average how many hours per week do you spend on heavy gardening activities? (e.g. digging, using heavy power tools, chopping wood, clearing brush, mowing lawn using a hand mower, etc.) (choose one)

Less than 2 hours per week
2-5 hours per week
5-10 hours per week
10 - 15 hours per week
I do not engage in these activities at all

Physical Activity

How many days per week do you do moderate activities, such as brisk walking, bicycling, vacuuming, gardening or anything else that causes some increase in breathing or heart rate for at least 10 minutes? Do not include physical activity done for work.
Days per week (single digit box)
Mark if 0 days per week and skip to Question 31.

On days when you do moderate activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?
Hours (single digit box)
Minutes (double digit box)

How many days per week do you do vigorous activities, such as running, aerobics, heavy yard work or anything else that causes large increases in breathing or heart rate for at least 10 minutes? Do not include physical activity done for work.
Days per week (single digit box)
Mark if 0 days per week and skip to Question 33.

On days when you do vigorous activities for at least 10 minutes at a time, how much total time per day do you spend doing these activities?
Hours (single digit box)
Minutes (double digit box)

Sedentary Behavior

How many hours each day do you typically spend sitting down while doing things like visiting friends, driving, reading, watching television or working at a desk or computer (including hours at work)?
Hours sitting each day (two digit box)

Screen-Based Behaviors

Over the past month, on average, how many hours per day (outside of work) did you just watch TV or videos?
Hours watching TV or videos each day (double digit box)

Over the past month, on average, how many hours per day (outside of work) did you just use a computer?
Hours using a computer each day (double digit box)

Fruit and Vegetable Consumption

On a typical day, how many servings of fruit do you eat?
0, 1 serving, 2, 3, 4 servings or more

On a typical day, how many servings of vegetables do you eat?
0, 1 serving, 2, 3, 4 servings or more

Height and weight

What is your current height?
Feet (single digit box)
Inches (double digit box)

What is your current weight?
Pounds (triple digit box)