ASSESSMENT OF THE STAGE OF CHANGE FOR INCREASING FRUIT AND VEGETABLE AVAILABILITY AND ACCESSIBILITY IN LOW-INCOME FAMILIES WITH PRESCHOOL AGE CHILDREN

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CHAPTER I

INTRODUCTION

In 2005, a new set of Dietary Guidelines for Americans was released recommending in part that Americans increase their fruit and vegetable consumption (United States Department of Health and Human Services and United States Department of Agriculture [USDHH & USDA], 2005). Recommendations increased from three to five servings per day to four to ten servings per day depending on specified energy levels designed to meet the nutrient needs of people aged two years and older according to their sex, age, and level of activity. The increases were, in part, a result of the Institute of Medicine establishing Adequate Intake (AI) levels for fiber and potassium (Institute of Medicine [IOM], 2002, 2004a), both of which are prevalent in many fruits and vegetables. Epidemiological data indicate that intake of these nutrients may be low enough to be of concern for children and adolescents, as well as adults (USDHH & USDA, 2005; Dwyer, Suitor & Hendricks, 2004; IOM, 2004b). While the newest Dietary Guidelines are in keeping with the related research, they further broaden the gap between fruit and vegetable consumption behaviors and recommendations (Guenther, Dodd, Reedy & Krebs-Smith, 2006; Cook & Friday, 2004).

The health benefits of eating fruit and vegetable are well established (Hyson, 2002; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). Diets rich in fruit and vegetable have been associated with decreased risk for chronic diseases, including cardiovascular disease and hypertension, diabetes, obesity and certain types of cancer. Joshipura and colleagues (2001) used data from the Nurses' Health Study and found that women who consumed diets rich in fruit and vegetable, especially leafy greens and vitamin C-rich fruit and vegetable, had a twenty percent lower risk for cardiovascular disease. Increased intake of vegetables by women was also found to be associated with decreased prevalence of Type 2 diabetes (Williams et al., 1999; Colditz et al., 1992). Multiple studies have found the high fiber and low-energy density of fruit and vegetable to have benefits in weight management (Tohill, Seymour, Serdula, Kettel-Khan & Rolls, 2004; Epstein et al., 2001; Bell & Rolls, 2001). Clearly, the evidence supports a dietary pattern rich in fruit and vegetable can reduce risks for chronic disease and contribute to overall health (USDHHS & USDA, 2005).

Despite the millions of dollars in public and private funds expended for interventions to understand eating behaviors and increase fruit and vegetable intake, nationally conducted food consumption surveys continue to indicate that Americans are falling short of the national nutrition guidelines (Guenther et al., 2006; Cook & Friday, 2004; Serdula et al., 2004). Researchers who studied fruit and vegetable consumption in children and adolescents found availability of and preferences for fruit and vegetable to be consistent predictors of the behavior (Cullen et al., 2003). After studying the development of eating behaviors in children, Birch and Fisher (1998) concluded "the extent to which fruit and vegetable are made available and accessible to children shape

their liking for and consumption of those foods" (p. 542). A parent or primary caregiver's (PPC) role in purchasing, preparing and serving the household's food supply frequently serves as a major determinant to the availability of fruit and vegetable, and in turn the child's development of preferences for the taste of fruit and vegetable (Havas et al., 1998; Parker, 2002; Reicks et al., 1994; Shankar & Klassen, 2001).

In an effort to maintain consistency between federal food assistance program benefits, current nutrition research, and dietary recommendations, the United States Department of Agriculture, Food and Nutrition Service recently charged the Institute of Medicine (IOM) with assessing the supplemental nutrition needs of population subgroups participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and to evaluate the WIC food packages (Institute of Medicine [IOM], 2005). The IOM findings recommended, in part, including cash value vouchers for fresh or processed fruit and vegetable in food packages issued to pregnant and post-partum women and children aged one to five years of age. The move is not only in keeping with current nutrition research but also further reduces economic barriers to fruit and vegetable consumption for low-income children at a critical time when the development of taste preferences and eating behaviors are being formed (Birch & Fisher, 1998). However, it does not address psychosocial factors of the parent or primary caregiver (PPC) that influence their decisions related to assuring that fruit and vegetable are in the home and served to children. Previous research found these factors to include beliefs about the benefits of fruit and vegetable consumption, a person's level of self-efficacy in making the change, and the development of skills needed to perform the behavior (Reicks et al., 1994; Havas et al., 1998; Henry et al., 2003; Birmingham, Shultz & Edlefsen, 2004;

Henry et al., 2006). For the 2005 Dietary Guidelines for Americans and IOM recommendations to be effective in increasing fruit and vegetable consumption it is important for nutrition educators to understand the mediating factors influencing the PPC's role in actually making the fruit and vegetable available to their children, and in-turn develop and deliver tailored nutrition education programs.

Significance of the Study

The aim of our research was to utilize the Transtheoretical Model of Behavior Change to assess the psychosocial factors of decisional balance, self-efficacy and processes of change (Prochaska, Norcross & DiClemente, 1994) used by low-income parents and primary caregivers (PPC) related to increasing availability and accessibility of fruit and vegetable to their preschool age children. The presence of fruit and vegetable during this developmental time is important because it is when food preferences are being formed; and these preferences have potential to impact life-long dietary quality and risk for obesity and diet related chronic disease (Skinner, Ziegler, Pac & Devaney, 2004). Questions addressed by our study included: Are low-income parents in different stages of change for increasing availability and accessibility of fruit and vegetable to children? Are there differences between households in the types and quantities of fruit and vegetable available? Are there differences between households in the factors influencing decisions to serve fruit and vegetable, and if so what are they? Are there differences between households in their confidence for serving fruit and vegetable in different situations, and if so what are the situations? Are there differences between households in their use of processes to serve fruit and vegetable, and which are used most frequently?

The answers to these questions not only contribute to the existing literature, but also provide nutrition educators with a better understanding of the factors influencing and differences between low-income parents who serve adequate amounts of fruit and vegetable and those that fall short. The information can be used to match interventions aimed at increasing availability and accessibility of fruit and vegetable to preschool age children to the stage of readiness of their PPC. The implications for nutrition education are appropriate for use in WIC, EFNEP, Head Start and other nutrition education programs serving low-income families with young children in Oklahoma.

Objectives and Hypotheses

The specific objectives of the study and corresponding hypotheses were:

1. Identify the proportion of the survey population that is in each of the five stages of change for increasing availability of fruit and vegetable to preschool age children.

2. Identify and compare between stages the availability of fruit and vegetable as measured by the number of servings being served to preschool age children and as self-reported in a fruit and vegetable frequency questionnaire.

   H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
   There will be no differences between PPCs in the different stages of change in the number of servings of fruit and vegetable served to preschool age children.

   H_1: $\mu_i \neq \mu_g$ for some i
   There will be differences between PPCs in the different stages of change in the number of servings of fruit and vegetable served to preschool age children.

3. Identify and compare between PPCs in the different stages the factors related to decisional balance for increasing availability of fruit and vegetable to preschool age children.

   H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
   There will be no differences between PPCs in the different stages of change in decisional balance for increasing fruit and vegetable availability to preschool age children.

H_1: $\mu_i \neq \mu_g$ for some *i*
There will be differences between PPCs in the different stages of change in decisional balance for increasing fruit and vegetable availability to preschool age children.

4. Identify and compare between PPCs in the different stages of change the factors affecting level of self-efficacy for increasing availability of fruit and vegetable to preschool age children.

   H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
   There will be no differences between PPCs in the different stages of change in self-efficacy for increasing fruit and vegetable availability to preschool age children.

   H_1: $\mu_i \neq \mu_g$ for some *i*
   There will be differences between PPCs in the different stages of change in self-efficacy for increasing fruit and vegetable availability to preschool age children.

5. Identify and compare between PPCs in the different stages of change the use of processes utilized to serve fruit and vegetable to preschool age children.

   H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$
   There will be no differences between PPCs in the different stages of change in the use of processes for increasing fruit and vegetable availability to preschool age children.

   H_1: $\mu_i \neq \mu_g$ for some *i*
   There will be differences between PPCs in the different stages of change in the use of processes for increasing fruit and vegetable availability to preschool age children.

Assumptions of the Study

Parents and primary caregivers accurately reported their intention to increase availability of fruit and vegetable to their preschool age children.

Parents and primary caregivers accurately scored their beliefs and practices concerning factors related the TTM constructs.

Parents and primary caregivers accurately reported the frequency and serving sizes of fruit and vegetable normally served to preschool age children.

Limitations of the Study

The data collected through the fruit and vegetable frequency questionnaire (FVFQ) and used to measure availability of fruit and vegetable was self-reported. It is commonly accepted that parents will frequently over-report amounts of food served to children (Johnson & Hankin, 2003).

The data was collected during April 2006. As such, respondents may have been in greater anticipation of increased availability of seasonal fruit and vegetable as well as harvests from home gardens. For this reason intention to increase fruit and vegetable consumption may have been biased upward.

The study respondents were all participating in federal nutrition education programs at the time of data collection, creating potential for intent to improve dietary quality and practice of recommended dietary behaviors to be greater than those of the general low-income population. Therefore, generalization of the findings of our study should be limited to PPC who are participating in federal nutrition programs.

In spite of the limitations the findings do have applicability for nutrition education interventions targeting low-income families with young children who are participating in federal nutrition education programs and aimed at increasing fruit and vegetable availability.

Definitions of Terms and Abbreviations

Action stage: A term used in this study to identify parents and primary caregivers (PPC) who were serving five or more servings of fruit and vegetable daily to their preschool age children. It is a combination of PPC who staged as either action or maintenance stage (Prochaska, Norcross & DiClemente, 1994).

Adequate intake (AI): A term defined by the Institute of Medicine as a guide for nutrient intake when a Recommended Dietary Allowance cannot be established (Institute of Medicine, 2002).

At risk for overweight: A term used by the Centers for Disease Control and Prevention to describe children aged two to twenty years who have a BMI-for-age that is between the eighty-fifth and ninety-fifth percentiles when plotted on the CDC growth chart and compared to other children of the same gender and age (CDC, 2007b).

Body mass index (BMI): A measurement defined and used by the Centers for Disease Control as an index of a person's weight in relation to height. It is determined by dividing the weight, in kilograms, by the square of the height, in meters (CDC 2007b).

Centers for Disease Control and Prevention (CDC): A component of the United States Department of Health and Human Services. It utilizes public health strategies to prevent and control infectious and chronic diseases, workplace injuries and hazards and environment health threats (CDC, 2007a).

Decisional balance: A construct of the Transtheoretical Model (TTM) of behavior change that describes a person's perceptions of the positive versus negative aspects of making a specific behavior change. Decisional balance serves as an outcome measure in TTM based interventions aimed at increasing intent for a specified behavior change (Prochaska, Norcross & DiClemente, 1994).

Expanded Food and Nutrition Education Program (EFNEP): A federally funded program administered through the United States Department of Agriculture Cooperative State Research, Education and Extension Service. It is designed to serve low-income populations in developing knowledge, skills, attitudes and changed behavior leading to nutritional well-being (Cooperative State Research Education & Extension Service, 2007).

Farmer's Market Nutrition Program (FMNP): A federally funded program associated with the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). It provides fresh, unprepared, locally grown produce to WIC participants (Food and Nutrition Service [FNS], 2007a).

Food Stamp Nutrition Education (FSNE): A federally funded program targeted to Food Stamp recipients designed to improve nutrition-related skills, especially those related to planning, purchasing and preparing low-cost, nutritional foods (FNS, 2007b).

Fruit and vegetable frequency questionnaire (FVFQ): An instrument used in this study to assess the frequency and typical amounts of fruit and vegetable sub-groups being served to preschool age children by their parent or primary caregiver.

Institute of Medicine (IOM): A non-governmental component of the National Academy of Sciences providing science-based advice and information related to biomedical science, medicine and health to decision makers (IOM, 2007).

Obesity: A term used to describe a physical state characterized by excessively high adipose tissue in relation to lean body tissue. The Centers for Disease Control and Prevention use BMI greater than 30 to identify obesity (CDC, 2007b).

Overweight: A term used by the Centers for Disease Control and Prevention to describe children aged two to twenty years whose BMI-for-age is equal to or above the ninety-fifth percentile when plotted on the CDC growth chart and compared to other children of the same gender and age. Overweight, rather than obesity, is the preferred term for pediatric populations (CDC, 2007b).

Parent/Primary Caregiver (PPC): A term used in this study to describe the person who serves as the main gatekeeper or decision-maker for foods made available to the preschool age child.

Preaction stage: A term used in this study to identify parents and primary caregivers (PPC) who were serving less than five servings of fruit and vegetable daily to their preschool age children and were not considering changing within the next six months. It is a combination of PPC who staged as either precontemplative or contemplative (Prochaska, Norcross & DiClemente, 1994).

Preparation stage: A term used in this study to identify parents and primary caregivers (PPC) who were serving less than five servings of fruit and vegetable daily to their preschool age children. They differed from PPC in the preaction stage in that they intended to increase availability of fruit and vegetable to five servings daily within the next thirty days (Prochaska, Norcross & DiClemente, 1994).

Processes of change: A construct of the Transtheoretical Model (TTM) of Behavior Change. They are covert, cognitive thoughts and overt behaviors that help a person progress from a lower level of readiness to make a behavior change to a higher level. Processes serve as independent variables in TTM based interventions; and should be matched to a person's level of readiness for making a change (Prochaska, Norcross & DiClemente, 1994).

Self-efficacy: A construct of the Transtheoretical Model (TTM) of Behavior Change describing a person's level of confidence in being able to perform a particular behavior in a variety of situations. Self-efficacy serves as an outcome measure in TTM based interventions (Prochaska, Norcross & DiClemente, 1994).

Stages of change (SOC): Stages of change are the major construct of the Transtheoretical Model (TTM) of Behavior Change. The two terms are frequently used interchangeably. There are five well-defined stages that describe a person's intent for making a specific behavior change. The two terms, SOC and TTM, are frequently interchanged (Prochaska, Norcross & DiClemente, 1994).

Transtheoretical Model of Behavior Change (TTM): A theory that uses a combination of constructs from various behavior-change theories to explain how people make

behavioral changes over time by progressing through five well defined stages (Prochaska, Norcross & DiClemente, 1994).

CHAPTER II

REVIEW OF LITERATURE

The food that we eat plays a major role in our health and the prevention of chronic, diet related diseases such as cardiovascular disease, hypertension, diabetes, some cancers and obesity. In 2004, cardiovascular disease was the leading cause of death both nationally and in Oklahoma (Oklahoma State Board of Health [OSBH], 2006). Eight percent of Oklahomans, as compared to seven percent nationally, had been told by their physician they had diabetes (OSBH, 2006). Over sixty percent of both the state and national population were overweight (National Center for Health Statistics [NCHS], 2004). Of greater concern is not only the number of children who are becoming overweight, but also that a disproportionally higher number of these children are in low-income subpopulations (Anderson & Butcher, 2006). The reason for the alarm is the evidence that overweight children are more inclined to become overweight adults (American Academy of Pediatrics [AAP], 2003). Excess adiposity not only increases medical morbidities and psychological stress during childhood (AAP, 2003; Pariskova & Hills, 2001; Mullen & Shield, 2004), it also contributes to the risk of developing diet related, chronic diseases later in life (AAP, 2003; Pariskova & Hills, 2001).

The economic impact of obesity related health care costs is staggering. Based on 1998 National Health Accounts and 1998-2000 Behavioral Risk Factor Surveillance

Survey (BRFSS) data, the annual costs were $78.5 billion nationally and $854 million in Medicare and Medicaid for Oklahomans (Centers for Disease Control [CDC], 2007c). It seems logical that improving dietary behaviors that help maintain healthy weights would also contribute to decreased morbidity and mortality rates attributed to diet related chronic disease.

Obesity Trends

The increasing rates of overweight and obesity have become one of the nation's greatest health care challenges (USDHHS, 2001). The United States Department of Health and Human Services Centers for Disease Control and Prevention (CDC) uses Body Mass Index (BMI) as a measure of overweight and obesity (CDC, 2007b). BMI is a ratio of height to weight. For people twenty years and older overweight is defined as having a BMI greater than or equal to twenty five, while obesity is defined as a BMI greater than or equal to thirty. Because children's body weight and composition varies as they grow and develop, their BMI-for-age is plotted on growth charts and compared to children of the same age and gender. Children, aged two to twenty years, falling between the eighty-fifth percentile and ninety-fifth percentile are considered to be at risk for overweight. Those at or above the ninety-fifth percentile are defined as overweight.

The Pediatric Nutrition Surveillance System (PedNSS) reflects that overweight in children aged two to five years increased from eleven percent in 1995 to fifteen percent in 2004, representing a thirty-four percent increase (PedNSS, 2004). Children at risk for overweight increased from fourteen percent to sixteen percent for the same time period. In older children, aged six to eleven years, the prevalence of overweight has increased

four-fold in the last thirty-five years, increasing from four percent in the early 1970s to over nineteen percent of children as reported in the 2003-2004 National Health and Nutrition Examination Survey (NHANES) (NCHS, 2004). Overweight in youth aged twelve to nineteen years has almost tripled, increasing from six percent in the early 1970s to seventeen percent in 2003-2004. These trends give reason for nutrition professionals and health care providers to investigate factors contributing to overweight, obesity and related health conditions.

Benefits of Fruit and Vegetable Consumption

A combination of epidemiological, observational and experimental research has shown that increased intakes of fruit and vegetable are related to decreased risk of obesity and chronic diseases including cardiovascular disease, hypertension, diabetes and some cancers (Hyson, 2002; Ness & Powles, 1997; Steinmetz & Potter, 1996; Van Duyn & Pivonka, 2000). The best understood explanation of these associations point to the antioxidant nutrients and phytochemicals found in fruit and vegetable that protect against the oxidative stresses associated with cardiovascular disease, cancer and aging processes (Hyson, 2002; Van Duyn & Pivonka, 2000). Epidemiological data from the Nurses' Health study revealed an inverse relationship between intake of vegetables and the development of diabetes (Colditz et al., 1992). A study conducted in England with non-obese participants found those who ate salad and raw vegetables more often had a lower incidence of type 2 diabetes (Williams et al., 1999). Multiple studies found the high fiber and low energy density of fruit and vegetable to be associated with benefits in weight management (Van Duyn & Pivonka, 2000; Epstein et al., 2001; Tohill et al., 2004; Bell &

Rolls, 2001). A review of research conducted by the CDC suggests that these characteristics provide for high satiety and a feeling of fullness that helps to limit energy intake (CDC, 2005). This was demonstrated by Epstein and colleagues who investigated the effects of eating patterns using families consisting of at least one obese parent and a non-obese child (Epstein et al., 2001). Families were randomly assigned to one of two behavioral-based weight management programs. One group was encouraged to increase fruit and vegetable consumption while the second focused on decreasing high-fat and high-sugar food, with no calorie restrictions for children in either group. At the end of one year, parents who intentionally increased fruit and vegetable had a significantly greater weight loss than the parents who intentionally decreased energy-dense foods. Further, the parents and children who increased fruit and vegetable consequently decreased high-fat and high-sugar foods. In contrast, the second group who decreased high-fat, high-sugar foods, had not increased fruit and vegetable consumption. The findings suggest that targeting parents and focusing on behaviors that increase fruit and vegetable consumption can simultaneously reduce intake of energy-dense, low-nutrient foods by the family.

In summary, although it is the composition of fruit and vegetable and the number of active compounds they contain that provides protective factors against disease, it is the level of consumption of fruit and vegetable that provides the strongest relationship between diet and disease (AAP, 2003).

Fruit and Vegetable Consumption Recommendations and Trends

Less than half of all Americans are eating enough fruit and vegetable to realize the health benefits of these foods (Guenther et al., 2006). The Dietary Guidelines for Americans provides dietary health information based on the most recent scientific evidence (USDHHS & USDA, 2005). The guidelines are appropriate for healthy Americans aged two years and older, and are intended to provide the nutrients needed for normal growth and development during childhood and to help people of all ages reduce risk of chronic disease. Unlike previous editions, the 2005 edition provides twelve food intake patterns based on specific age, gender and activity levels. The suggested quantities of nutrient-dense foods to consume from each food group are based on Dietary Reference Intakes established by the Institute of Medicine (IOM, 2002, 2004a). For example, the recommended calories for moderately active male children aged two to five years ranges from 1,000 to 1,400 calories. The recommendation for fruit intake for this calorie level ranges from 1 to 1½ cups; vegetable intake also ranges from 1 to 1½ cups. The standard reference used for Nutrition Fact labeling on food products is a 2,000 calorie diet for which the fruit intake recommendation is 2 cups and vegetable intake is 2½ cups. Further guidance defines a serving of fruit and vegetable as one-half cup of cooked or raw, chopped fruit and vegetable. A serving of dried fruit and vegetable is one-fourth cup, and a serving of raw leafy greens is two cups.

Nationally conducted food consumption surveys consistently indicate fruit and vegetable consumption practices fall short of the recommended quantities. Cook and Friday (2004) used food intake data from the National Health and Nutrition Examination Surveys (NHANES) conducted between 1999 and 2002 to estimate the number of

Pyramid servings being consumed. Their report reflected that all individuals two years of age and over were eating 3.2 servings daily of vegetables. For male and female children aged two to five years the number of vegetable servings averaged 2.2 servings daily. It should be noted that vegetables consisted of all subgroups including vegetable chips. Fruit consumption, including fruit juice, for all individuals over the age of two was 1.6 servings daily, with 2.4 servings daily for children aged two to five years. Overall, fruit and vegetable intake was about one-half the quantities recommended by the 2005 Dietary Guidelines for Americans. Guenther and colleagues (2006) used the same data to determine the proportion of subpopulations by age meeting the 2005 Dietary Guidelines fruit and vegetable recommendations. They estimated slightly less than half (48 percent) of children two to three years met the fruit and vegetable recommendation. The subpopulation with the lowest percentage of adequacy was males fourteen to eighteen years (0.7 percent). For all other age groups less than twenty percent met their age and gender specific recommendations.

The trends are no better in Oklahoma. The Behavioral Risk Factor Surveillance System (BRFSS) was established by the Centers for Disease Control and tracks health risks of United States residents by state. The BRFSS data reported in 2005 reflected that 84.3 percent of Oklahomans *failed* to consume five servings of fruit and vegetable each day. When the data was grouped by income level, 84.9 percent of lower-income Oklahomans (those earning less than $15,000 annually) were eating less than five servings of fruit and vegetable per day, compared to 79 percent nationally (BRFSS, 2005). This data ranks Oklahoma 50th in the nation in terms of fruit and vegetable consumption (BRFSS, 2005; Oklahoma State Department of Health [OSDH], 2006). The

trends in fruit and vegetable consumption leave no doubt of the need for effective nutrition and health initiatives that will positively influence the consumption of these health promoting foods.

Determinants of Fruit and Vegetable Consumption

Availability is a major determinant in the consumption of fruit and vegetable and it is influenced by a number of factors. Reicks, Randall and Haynes (1994) conducted focus groups with low-income mothers of young children to identify their attitudes and perceptions about fruit and vegetable consumption. The responses, cited as barriers to including fruit and vegetable in the diet, were grouped into three categories. The first category addressed income specific environmental restraints, including access, cost, availability and storage space. The comments of the focus group members reinforced the premise that adherence to dietary recommendations for fruits, vegetables, and grains is problematic for low-income populations. The second category included influences related to the food, such as taste, appearance, convenience and health. Participants shared that easy, quick recipes to improve the taste of vegetables would be helpful in improving consumption. Social and psychological dimensions comprised the third category. These factors included the mother's role as gatekeeper in purchasing, preparing and serving foods; ages and developmental stages of children; and role modeling of the adult male in the home.

In other related studies, Havas et al. (1998) looked at the factors associated with fruit and vegetable consumption in women participating in WIC and determined that self-efficacy, attitudes, and cost were the most significant predictors of fruit and vegetable

consumption. Parker (2002) conducted semi-structured group and individual interviews with low-income women in Oklahoma. The women shared that expense and family preferences were barriers to purchasing fruit and vegetable. Limiting food waste was another major consideration for low income households when making food purchasing decisions (Parker, 2002; Shankar & Klassen, 2001). To limit food waste, women only purchased food acceptable to the family and avoided purchasing foods that were highly perishable, especially fresh fruit and vegetable. Similar barriers were found by Birmingham, Shultz and Edlefsen (2004) who studied factors related to the frequency with which fruit and vegetable were served to children and consumed by mothers in low-income households. Taste preferences and lack of interest in trying new fruit and vegetable were significantly related to the frequency with which they were served and consumed. The cost and convenience of preparing fruit and vegetable was more negatively related with the mother's intake as compared to the frequency they served fruit and vegetable to their children. Furthermore, fruit and vegetable intakes were lower in households reporting food insecurity. The women in Parker's (2002) study reported that monies available toward the end of the pay period or food benefit allocation period, when food supplies were low, were used for purchasing staples such as bread, milk, meat and cheese to stretch the remaining food items rather than purchasing fruit and vegetable. James, Nelson, Ralph and Leather (1997) found that low-income households were efficient in making food purchases in that they purchase less-expensive, higher energy foods that satisfy hunger. These foods were typically high in fat and sugar. Accordingly, less money was spent on nutrient dense foods, especially fruits, vegetables and whole grains. As the evidence points out, availability and accessibility of foods are heavily

influenced by cost, convenience and preferences; which consequently limits fruit and vegetable in low income households.

Availability and accessibility are key factors in not only the consumption of fruit and vegetable, but also in the development of taste preferences for these foods (Birch & Fisher, 1998). Low availability of nutrient dense foods and ready availability of high-fat, sweet and salty foods can result in the development of food intake patterns that are low in fruit and vegetable consumption.

Infants are born with a predisposition for sweet foods and develop a disposition for salty foods by about 4 months (Birch, 1998). During the first five years of life, children learn their hierarchy of food preferences through associative learning and imitation of parents and caregivers (Birch, 1998). In researching the development of eating behaviors in children, Birch and Fisher (1998) found that the food environment the parent provides shapes children's food preference and acceptance patterns. Early, frequent exposure to fruit and vegetable in a pleasant setting is an important factor in helping children accept and prefer these foods (Birch and Fisher, 1998). Research conducted by Kratt, Reynolds and Shewchuk (2000) concluded that homes in which fruit and vegetable were more available had a stronger set of motivating factors for consumption of these foods than homes with lower availability. For example, parents had higher intake and provided more positive influences compared to households where children consumed less fruit and vegetable. Findings from a study conducted with elementary school age students also revealed that both availability and accessibility were significantly correlated with fruit, juice and vegetable consumption by children (Cullen et

al., 2003). Succinctly stated, children like and eat what is familiar to them, and what is familiar is what is available in their environment (Birch & Fisher, 1998).

In addition to availability, Nicklas et al. (2001) reported that food modeling by parents and caregivers and their feeding practices played an important role in the development of food preferences of two to five year olds. Children and toddlers were more likely to try and accept new foods when they were able to follow the example of parents and caregivers. Findings from the *Feeding Infants and Toddlers Study (FITS)* (Skinner et al., 2004) indicated meals and snacks for the age group frequently do not contain fruit and vegetable; and therefore do not provide opportunity for young children to observe modeling of healthy eating behaviors. After evaluating food records revealing parental feeding practices and meal and snack patterns of toddlers, the researchers concluded that many toddler meals and snacks did not meet the recommendations of Five a Day for Better Health. Forty to fifty percent of toddlers had no fruit or fruit juice for breakfast; fifty percent did not have fruit for lunch; and sixty percent had no fruit at dinner. Furthermore, fruit was not common at snacks throughout the day. The availability of vegetables was similar to fruits. More than fifty percent of toddlers had no vegetables for lunch and more than thirty percent had no vegetables for dinner. Vegetables that were eaten most often included corn, French fries and green beans. Less than five percent of the food records included vegetables for breakfasts or snacks. The lack of opportunity for children to observe modeling of healthy food behaviors, along with the body of research associating availability of foods with the development of food preferences, helps to explain the poor consumption of fruit and vegetable by children.

Fruit and Vegetable Intervention Projects

To change the established consumption behaviors, researchers and educators conducted an array of extensive nutrition education and intervention projects providing varying results and perspectives. In a 2004 study, Horodynski, Hoerr and Coleman pilot tested and evaluated the effects of a nutrition education intervention titled *Nutrition Education Aimed at Toddlers*. It was hypothesized that increasing caregivers' knowledge of feeding toddlers and enhancing their attitudes about toddler feeding would result in improved feeding practices of caregivers and dietary intake of toddlers. Six months after participating in the nutrition education program, three-fourths of the caregivers in both the intervention and control groups had accurate knowledge concerning the feeding of toddlers. Furthermore, attitudes concerning toddler feeding were positive with little variability between the two groups. In contrast, the food intake of both the mothers and infants was poor, with only nine percent of the toddlers eating at least one serving of food from each of the five food groups. The researchers concluded that knowledge alone is insufficient to change eating habits, and recommended studying other avenues to enhance feeding practices of toddlers. Kumanyika (2001) and Glanz et al. (1995) suggested approaches that modify the environment in which food choices are made and policy changes to support the environmental changes may be more effective than interventions that depend upon individual cognitions to bring about sustainable behavior change.

One such program is the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) Farmers' Market Nutrition Program (FMNP) (USDA, 2003). Participation is left to the discretion of each state agency administering the federally funded program. Participants are issued FMNP coupons in addition to the standard WIC

food package. These coupons can be used to buy fresh, unprepared fruits, vegetables and herbs from farmers or farmers' markets that have been approved by the state agency to accept FMNP coupons.

Several studies have examined the effects of the WIC FMNP. A study of the Connecticut Farmers' Market (Anliker, Winne & Drake, 1992) found subjects who received coupons were significantly more likely to use the farmers' markets than control subjects who did not receive coupons. There was no evidence of an effect on fruit and vegetable consumption. In contrast, an evaluation of the Michigan Farmers' Market Program (Anderson et al., 2001) demonstrated low-income populations were more likely to increase fruit and vegetable consumption when affordability was increased through the issuance of coupons. The Michigan project was comprised of three interventions. The first group received both the coupons and an education intervention addressing purchasing and benefits of consuming fruit and vegetable. The second group received only the nutrition education, while the third group received only the coupons. Consistent with Horodynski et al.'s (2004) research, the education component itself had no significant direct effect on consumption changes, but did result in a significant change in attitudes about fruit and vegetable. The coupon intervention was associated with significant increases in fruit and vegetable consumption. A combination of the two interventions resulted in the greatest impact. Researchers noted that participants completing the post intervention questionnaire were more likely to have transportation to the farmers' markets.

Herman, Harrison and Jenks (2006) provided supplemental financial support to WIC households specifically for the purpose of purchasing fresh fruit and vegetable. The

purpose of the study was to determine if WIC participants would use the funds to increase purchases of fruit and vegetable, and if so, what fruit and vegetable were purchased. Two intervention groups and one control group participated over a six month period. One intervention group redeemed vouchers at a full-service grocery store while the second shopped at a year-round farmers' market. Purchases were determined by voucher redemption rates. Based on pre/post and intermittent 24-hour dietary recalls, ninety percent of the study participants increased intake of fruit and vegetable. The most frequently purchased items were oranges, apples, bananas, peaches, grapes, tomatoes, carrots, lettuce, broccoli, and potatoes. A limitation of the study was the subsidy of $40 per month was greater than what is feasible in the federally funded WIC program. Although the study demonstrated that participants would use the full amount of the subsidy, it does not demonstrate that lesser amounts proposed by the IOM recommendation (IOM, 2005) would be considered worthwhile. The study was not designed to determine if the practice of purchasing increased quantities of fruit and vegetable was sustained after the intervention or eligibility period for benefits ended.

The most recent research interest for healthy eating behaviors looked at the association between home/locally produced fruit and vegetable and consumption by preschool age children and their parents (Nanney, Johnson, Elliott & Haire-Joshu, 2007). The study was a cross-sectional design conducted in rural Missouri with parents who were enrolled in parent education programs. Researchers used telephone interviews to determine the frequency at which parents and their child ate home/locally grown fruit and vegetable and classified them into one of three groups consisting of always/almost always, sometimes, and rarely/never. These groups served as the independent variables.

Dependent variables were intake patterns of parents and children and characteristics of the food environment, including parental role-modeling, availability and accessibility of healthful foods, frequency of fast food meals, and weekly grocery expenses. Parents who always/almost always ate home/locally grown produce were significantly more likely to eat five servings of fruit and vegetable daily; and the same held true for their children. There were no significant differences between the groups in the number of fast food meals eaten or the amount spent on weekly groceries. The findings led the researchers to conclude promotion of home and community gardens as a viable strategy to increase fruit and vegetable consumption.

Other nutrition education interventions and research have utilized the Transtheoretical Model (TTM) of Behavior Change, often referred to as Stages of Change, to study factors effecting fruit and vegetable consumption. (A thorough discussion of the theory is in the next section.) Anliker, Damron, Ballesteros, and Langenberg (1999) used TTM to develop *Get Clued in to Fruit and vegetable Guidebook* for use with the Maryland Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The primary purpose of the project was to increase WIC participants' fruit and vegetable consumption by helping them move through the stages of change. The guidebook was distributed to participants and used in a series of three bimonthly nutrition sessions scheduled at WIC voucher pick-up times. Because of scheduling constraints, participants were not grouped by stage of change. An advantage of this method allows people at higher levels to share their ideas and experiences with those at lower levels, reinforcing their own positive behaviors. The first lesson used the consciousness awareness process of change by addressing the importance of eating fruit

and vegetable. Activities included a self-assessment of fruit and vegetable consumption and setting a personal goal for increasing consumption. The second section addressed barriers to and strategies for reaching their goals identified in the first lesson. The last section addressed action and maintenance stages by discussing possible causes of relapse, ways to maintain goal behaviors, and self-reward systems. Evaluation of the project revealed that participants who read the guidebook or attended the classes were significantly more likely than other respondents to increase fruit and vegetable consumption. In addition, intervention participants had significantly greater movement across the stages of change than did control group participants.

Henry et al. (2003) matched decision-making factors affecting the purchase and preparation of fruit and vegetable to stage of change. Their methodology consisted of collecting verbalized data as low-income, African-American mothers with young children shopped and prepared foods in their homes. The two factors that varied by stage of change were preferences and specific meal planning needs. Women in the later stages used meal-planning skills to successfully incorporate fruit and vegetable into meals. The researchers concluded that interventions focusing on the behaviors of purchasing and preparing fruit and vegetable and tailored on the stages of change could contribute to greater changes in intake.

In a follow-up study Henry, Reimer, Smith and Reicks (2006) used the identified purchasing and preparation issues to develop a survey regarding decisional balance, processes of change, and self-efficacy. The purpose was to determine the relationship between stage of change and TTM constructs influencing low-income, African-American mothers' fruit and vegetable consumption. The three major findings included 1) people

in later stages used more processes, or strategies, to increase fruit and vegetable consumption; 2) recognition of the health benefits of eating fruit and vegetable was stronger in the later stages; and 3) the degree of self-efficacy was strongly and consistently associated with a higher consumption of fruit and vegetable in the target population. In conclusion, stage of change differentiated levels of decisional balance, self-efficacy and processes used by people at various stages of change for increasing fruit and vegetable consumption.

The findings and conclusion of Henry et al.'s (2006) second project are supported by the work of Nothwehr, Snetselaar, Yang and Wu (2006) who examined the use of behavioral strategies for healthy eating across stages of change. They found a positive linear trend and concluded that the use of experiential and behavioral strategies consistently increase across groups and those behavioral strategies are helpful in distinguishing readiness to change. Researchers at the University of Nebraska-Lincoln examined the stages of change in relation to decisional balance and self-efficacy for fruit and vegetable consumption in young adults (Ma et al., 2002). They also found self efficacy increased across the stages and consumption of fruit and vegetable followed the trend. In addition, as stages advanced the perceived importance of eating fruit and vegetable increased and disadvantages decreased. In conclusion, the study lends evidence to the applicability of TTM for evaluating the factors related to fruit and vegetable consumption in young adults.

TTM based interventions and education components use a combination of theoretical constructs that customize the message to meet a population subgroup's readiness to change by addressing the advantages and disadvantages of making the

behavior change and building needed skills for performing the new behavior. Using TTM to build individual skills and readiness in combination with environmental and policy interventions may provide the broad base needed for increasing fruit and vegetable availability to young children in low-income households; thus increasing consumption in the youngest generation and ultimately reflect a positive change in national consumption trends.

Transtheoretical Model of Behavior Change

The Transtheoretical Model of Behavior Change provides a framework for understanding a person's intention for making a healthy behavior change and how they act upon that intention (Prochaska, Norcross & DiClemente, 1994). It recognizes that for any given change individuals are at different levels of motivational readiness; and the process of changing occurs over a period time. Developed by psychologists James Prochaska, John Norcross, and Carlo Diclemente (1994), it is the result of an analysis of eighteen psychotherapy systems that identified common processes of change. It postulates that interventions designed to promote healthy behavior changes are most effective when they are matched to the person's stage or readiness to change. TTM is transtheoretical in that it integrates key constructs of multiple behavior change theories into one to facilitate progression from one stage of change to the next (Prochaska, Norcross & DiClemente, 1994; Velicer, Prochaska, Fava, Norman & Redding, 2004). Moving from lower to higher stages is dependent on three constructs; 1) belief that the benefits, or positive aspects, of the specific behavior change outweigh the disadvantages, or negative aspects, which is referred to as decisional balance; 2) the perceived level of

self-confidence, or self-efficacy, in having the ability to make the change; and 3) using a wide range of strategies, or processes.

TTM is based on the premise that behavioral change follows a series of predictable, well-defined stages facilitated by activities, referred to as processes of change, that are associated with each stage (Prochaska, Norcross & DiClemente, 1994). There are five stages of change including precontemplation, contemplation, preparation, action, and maintenance. As illustrated in Figure 2.1, the first three stages are characterized by intent to change behavior, while the latter three, again including preparation, are characterized by behavior change (Velicer et al., 2004).

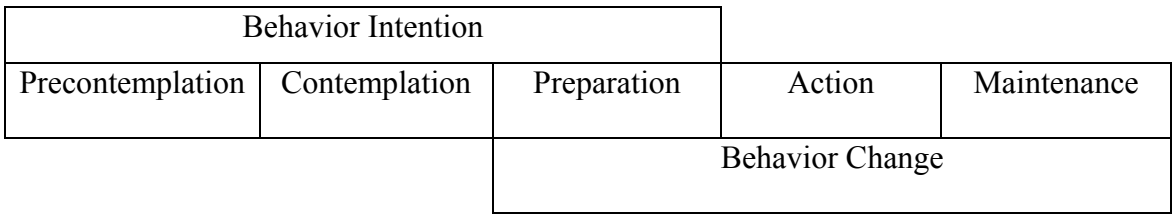

Figure 2.1 Five stages of change representative of the Transtheoretical Model (Prochaska, Norcross & DiClemente, 1994)

Precontemplation is the stage in which people do not intend to make changes in the foreseeable future, usually measured as the next six months (Prochaska, Norcross & DiClemente, 1994). People do not recognize their behavior as detrimental to themselves or others because they fail to acknowledge, are uninformed, or under-informed of the consequences of their behavior. People may also be in the stage because they have tried to change a particular behavior in the past with little or no success. As a result, they may have become demoralized and have a very low self-efficacy in regards to resolving the problem behavior. They refuse to read, discuss, or think about the problem and in short,

are resistant to change. When others around them try to address the issue, the response is defensiveness and placement of responsibility for the behavior is on external factors such as genetics, society or family. Interventions utilizing cognitive or experiential processes, rather than action oriented processes are most effective for this stage.

People in the contemplation stage have indefinite intention to take action with in the next six months (Prochaska, Norcross & DiClemente, 1994). The stage is characterized by awareness of the problem and, unlike precontemplation, an eagerness to discuss the behavior and possible change. There is an acute awareness of the positive aspects of the change, but the negative aspects, perceived as the amount of energy, time, and other resources required to make the change continue to have greater influence in their decision making. This is referred to as decisional balance and helps to explain why people do or do not become motivated to change. Prochaska identified the phenomenon when comparing profiles of fifteen different behaviors for the relationship of positive and negative aspects of the change to each of the five stages of change (Prochaska, Norcross & DiClemente, 1994). He realized perceived pros of changing increased with movement from precontemplation to contemplation, and that cons of change decreased as movement progressed from contemplation to action. The shift between the perceived importances of the positive over the negative aspects is derived from accepted models of decision making (Greene et al., 1999), and is essential for moving beyond contemplation into action oriented stages.

Preparation is the pivotal stage in which people plan for sustainable changes to be made in the immediate future, usually defined as one month. During preparation there continues to be an evaluation of pros and cons. For some people preparation will consist

of developing a plan for action while others will begin to make a series of small changes (Finckenor & Bredbenner, 2000). Most important for moving from preparation into the action stage is a public commitment to change (Prochaska, Norcross & DiClemente, 1994). People in this stage are most receptive to action-oriented behavior change programs.

The action stage occurs when behavior change becomes overt and a preset criterion for performance is being met. Examples of diet and health related criteria include increasing vegetable servings to two and one-half cups per day, using only reduced or low-fat milk products, or walking briskly for thirty minutes each day. It is also the stage at which relapse is most probable, therefore requiring a great deal of effort and commitment (Prochaska, Norcross & DiClemente, 1994).

Maintenance is the extension of action into a long-term behavior. It requires continued effort and commitment to perpetuate the change and avoid relapse. Prochaska contends that maintenance is a critically important stage that can be as brief as six months to a lifetime (Prochaska, Norcross & DiClemente, 1994). For changes in dietary behaviors, Bowen, Meschke and Tomoyasu (1994) have suggested maintenance of the changed behavior for two years as an appropriate criterion for defining sustainable change. The reason for the extended period is that dietary behaviors are more complex and consist of more variables than do more dichotomous addictive behaviors. Dietary changes frequently involve changing multiple behaviors, such as meal planning, purchasing and preparing foods; as well as affecting multiple people who live within the household.

The key to successful use of TTM is identifying the particular stage of change and applying the process or matched treatment that has been found to be most effective for the stage (Prochaska, Norcross & DiClemente, 1994). Prochaska defines processes of change as any covert or overt activity utilized to initiate or help modify thinking, feeling, or behavior (Prochaska, Norcross & DiClemente, 1994). They serve as the variables that people apply or practice. There are nine processes, each representing a category of similar intervention activities or techniques designed to facilitate behavior change and progression through the stages (Finckenor & Bredbenner, 2000). They serve as the independent variables and provide important guides for intervention programs (Velicer et al., 2004).

The processes can be divided into two categories, experiential and behavioral (Velicer et al., 2004). The experiential processes focus on cognitive thoughts, feelings, and experiences, and are used more frequently during the early stages of change. Behavioral processes focus on behaviors and reinforcement. Because they are action oriented they are effective in the action and maintenance stages of change (See Figure 2.2, page 33).

Consciousness raising is used to increase the level of knowledge or awareness of the problem behavior. Interventions using this process include feedback, education, confrontation, interpretation, and media campaigns (Velicer et al., 2004). Although it is the most widely used process and used by the majority of the major therapies, it is most effectively used in the precontemplation and contemplation stages (Prochaska, Norcross & DiClemente, 1994).

Social liberation uses the external environment to start or continue the behavior

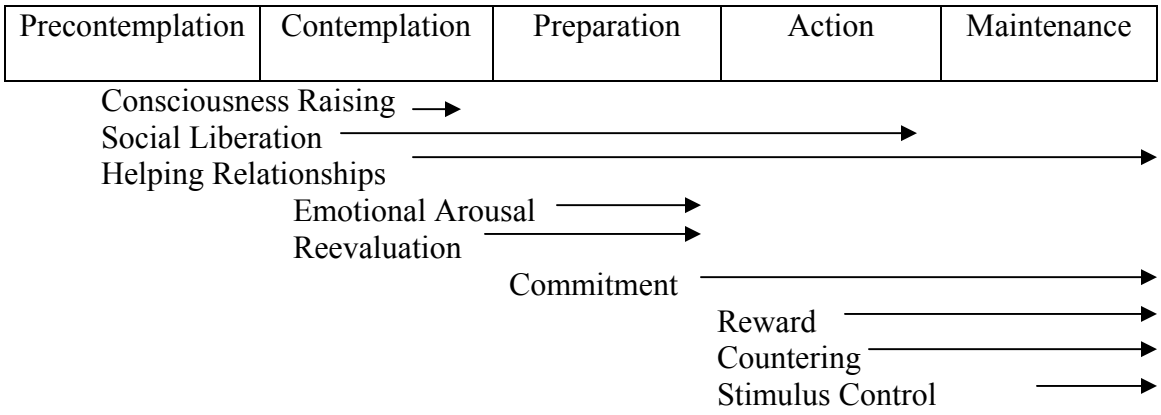

Figure 2.2 Theoretical progression of the processes of change (Prochaska, Norcross & DiClemente, 1994)

change. Because the processes are external, they will be perceived differently based on the stage of change a person is in (Prochaska, Norcross & DiClemente, 1994). Some people will be resistant while others will find it to be empowering. Examples include no smoking zones, the inclusion of fruit and vegetable into the WIC supplemental food package and addition of salad bars to school nutrition programs. These opportunities are especially helpful to populations that are relatively deprived or oppressed (Velicer et al., 2004) and are best matched to precontemplation, contemplation, preparation, and action (Finckenor & Bredbenner, 2000).

Helping relationships are useful in all stages and consist of the openness, caring, support, and assistance of significant people in the person's life. The process is used frequently in behavior change treatment programs and is also of significant importance to self-changers. Self-changers have found the process most beneficial during contemplation, preparation, and action (Prochaska, Norcross & DiClemente, 1994). Techniques include support groups, rapport building, counselor calls, and buddy systems (Velicer et al., 2004).

Emotional arousal, sometimes referred to as dramatic relief, is similar to consciousness raising but works on a deeper emotional level. This process is occasionally the result of real-life tragedies. Other techniques include role playing, personal testimonies, dramatic films, explicit public-service announcements or media campaigns, (Prochaska, Norcross & DiClemente, 1994). It enables people to become aware of their defenses against change (Prochaska, Norcross & DiClemente, 1994) and is best matched to the contemplation and preparation stages (Finckenor & Bredbenner, 2000).

Reevaluation uses both cognitive and affective appraisal of what life holds without and with behavior change (Velicer et al., 2004; Finckenor & Bredbenner, 2000), not only for themselves but also for other people in their life. It allows for a comparison of the unhealthy behavior to one's personal value system (Prochaska, Norcross & DiClemente, 1994). The result is both a belief and attitude that the behavior change is advantageous, shifting the decisional balance in favor of the behavior change. Techniques include empathy training, documentaries, and family interventions (Velicer et al., 2004). The process is best matched with the contemplation and preparation stages (Finckenor & Bredbenner, 2000).

Commitment is a process used after a person has made the decision and accepts responsibility for the behavior change. While the first phase of commitment is private, it is the second phase, going public or sharing the decision to change that is the most powerful (Prochaska, Norcross & DiClemente, 1994). Commitment is most effective in the preparation, action, and maintenance stages (Finckenor & Bredbenner, 2000).

Rewards, such as self-praise or gifts, recognize and reinforce desirable behavior. Other techniques include contingency contracts and group recognition (Velicer et al.,

2004). Prochaska notes that in some regions and cultures people may have a negative reaction to the reward process because they feel they are being rewarded for modifying behaviors that should have not been acquired (Prochaska, Norcross & DiClemente, 1994). Rewards are most effective in the action and maintenance stages (Finckenor & Bredbenner, 2000).

Countering is the process of substituting healthy behaviors for unhealthy ones. An example is using the stairs rather than the elevator, or exercising when the urge to snack prevails. Since all behavior is conditional, the challenge is to find a counter activity that is appealing (Prochaska, Norcross & DiClemente, 1994). Developing the skill of countering increases self-efficacy and reduces the temptation of relapse (Velicer et al., 2004). The process is most effective in the later stages of change.

Stimulus control is also action oriented in that it restructures the environment to reduce the risk of problem-behavior (Prochaska, Norcross & DiClemente, 1994). Examples include purchasing fruit and vegetable for snacking rather than cookies or chips, or placing art displays in stair wells to encourage physical activity. Environmental control differs from countering in that it changes the stimuli while countering changes the individual's response to the stimuli (Prochaska, Norcross & DiClemente, 1994). As with countering, environmental control is effective in the action and maintenance stages.

Prochaska (2004) believes that TTM can be used to develop interventions for the general population, including dietary behaviors. It is feasible because most people in group settings who need to change a behavior are in a preaction stage, and preaction stages share many of the same characteristics (Prochaska, 2004). Finckenor and

Bredbenner (2000) found the most cost effective way to provide matched treatments for group settings is to design group intervention programs that are oriented to the preaction stages. This method improves both the recruitment and retention of self-changers, and therefore long-term success (Prochaska, 2004; Finckenor & Bredbenner, 2000).

Summary

Closing the gap between food behaviors and federal intake recommendations is challenging at best. A variety of epidemiological, observational and experimental research supports the contention that diets rich in fruit and vegetable are associated with reduced risk for chronic disease and have characteristics beneficial for maintaining healthy weight (Hyson, 2002; Van Duyn & Pivonka, 2000). In contrast, national food consumption surveys reflect that most Americans, including preschool age children, fail to meet the dietary recommendations established to promote health (Cook & Friday, 2004; Guenther et al., 2006; Serdula et al., 2004).

A broad general theme of the determinants that help nutrition and health care professionals better understand and explain the gap between recommendations and actual intake is availability and accessibility of fruit and vegetable. Factors that influence availability and accessibility include environmental constraints such as limited resources for purchasing fruit and vegetable and psychosocial factors such as low self-efficacy, perceived health benefits, and practices used to increase fruit and vegetable intake. The importance of fruit and vegetable being available in households where preschool age children reside is related to the child's development of taste preferences for these foods

(Birch, 1998; Birch & Fisher, 1998) and the influence it can have on their lifelong food intake behaviors (Skinner et al., 2004).

Interventions designed to impact awareness and knowledge have not been effective in changing behaviors and researchers have recommended approaches be broadened (Kumanyika, 2001; Glanz et al., 1995). Interventions designed to change the environment by increasing availability of fruit and vegetable have shown mixed results (Anliker, Winne & Drake, 1992; Anderson et al., 2001; Herman, Harrison & Jenks, 2006). TTM shows promise for increasing fruit and vegetable consumption in that it combines multiple constructs derived from a variety of theoretical models and matches them to the target population's stage of readiness to make a behavior change. Further, there is a growing body of evidence that TTM is appropriate for assessing a population's stage of readiness for dietary change and designing nutrition education interventions matched to the mediating factors characterizing the stage (Henry et al., 2006; Nothwehr et al., 2006, Ma et al., 2002). Because parents and primary caregivers (PPC) have a strong influence on the development of food preferences; and because these preferences develop very early in life (Birch, 1998), it is logical that interventions designed to increase the fruit and vegetable consumption in young children should target the parent/caregiver and be comprised of multiple strategies tailored to match their perceptions and the psychosocial factors mediating the change.

The cited research has addressed the appropriateness of using TTM and its constructs in various populations in relation to fruit and vegetable consumption. While this information is beneficial for designing interventions to encourage PPC to increase availability of fruit and vegetable, there has been little if any research conducted in

Oklahoma to assess low-income PPC's intent to increase availability of fruit and vegetable to their preschool age children. The current literature provides evidence that diets rich in fruit and vegetable contribute to good health but that most people are not eating enough fruit and vegetable to realize the benefits. For this trend to change it is essential for fruit and vegetable to be available to young children when taste-preferences and food behaviors are being formed. Since children are dependent on their parents and caregivers to provide fruit and vegetable, it is essential that the nutrition community understand to the fullest extent possible the factors influencing parent and caregivers' decisional balance, self-efficacy and use of strategies to make fruit and vegetable available to their children. This information will contribute to the existing body of knowledge and will be of assistance as interventions and programs are designed to support federal nutrition recommendations and initiatives promoting fruit and vegetable consumption in children.

CHAPTER III

METHODOLOGY

The purpose of the study was to utilize TTM for assessing the stage of change, level of self-efficacy, processes of change, and decisional balance of low-income parents and caregivers for making fruit and vegetable available and accessible to their preschool age children. This was achieved using a cross-sectional, quantitative design. The sample size estimation (Warde, 1990; Malec, 1993) of three hundred was based on a 95 percent confidence interval, a 5 percent margin of error, and previous research that found approximately 75 percent of the population to be in preaction stages (Eivens, 2005). The Oklahoma State University Institutional Review Board reviewed and approved the protocol February 20, 2006 (Appendix A).

Sampling Procedures

The target population for the study was low-income parents and primary caregivers (PPC) of preschool children aged one to five years residing in Oklahoma. Low-income was defined as being at or below 185 percent of the federal poverty level. The survey population consisted of PPC of children aged one to five years enrolled in federal assistance nutrition education programs, including the Special Supplemental

Nutrition Program for Women, Infants and Children (WIC), the Expanded Food and Nutrition Education Program (EFNEP), or the Food Stamp Nutrition Education Program (FSNE) referred to as Oklahoma Nutrition Education (ONE); and being a parent or primary caregiver of a child aged one to five years. These programs have income eligibility criteria meeting our definition of low-income. The convenience sample was recruited from three independent WIC clinics and eight EFNEP/ONE units. Two of the WIC clinics were located in urban areas while the third was located in a rural community. Two of the EFNEP/ONE units were in urban counties and six were comprised of multiple rural counties, representing 51 percent (39 of 77) of the state's counties. Subjects were enrolled in and attending nutrition education classes offered through these programs. Duplicate responses were eliminated by excluding those that were marked yes to having completed the survey at another location.

Data Collection and Instrumentation

Data were collected through survey instruments completed by subjects attending nutrition education sessions during the month of April, 2006. Surveys were administered to the subjects by trained nutrition educators indigenous to the targeted population. The educators were available for questions and clarification while the surveys were being completed. Training for the data collection was conducted in March, 2006. A train-the-trainer session was conducted with EFNEP/ONE area coordinators, who in turn trained the paraprofessionals. WIC nutrition paraprofessionals were trained in individual sessions. Informed consent information (Appendix B) was provided to the subjects both verbally and in writing. A written script was provided to the nutrition professionals for

the purpose of explaining consent to participate in the study (Appendix C). Consent was implied by submission of a completed survey.

Low respondent burden was important in the design of the survey. Factors included length and time to complete, minimal response choices, and easy reading level. A stage of change instrument validated by Cynthia Eivens (2005) as part of a multi-state research project, NC 219R, was used with minor modifications. Selection of questions was based on psychosocial factors related to fruit and vegetable consumption in low-income households identified in previous research (Reicks, Randall & Haynes, 1994; Havas, 1998; Parker, 2002; Shankar & Klassen, 2001). The wording of some questions was slightly modified to better reflect a family situation. The resulting survey consisted of six parts including socio-demographics, staging algorithm, pros and cons (decisional balance scales), confidence (self-efficacy scales), strategies (processes), and a fruit and vegetable frequency questionnaire (FVFQ). An expert panel of four WIC registered dietitians, one WIC paraprofessional, and university nutritional sciences faculty reviewed the survey for content validity. Modifications, based on the expert panel's input, included reduction in the number of responses in the confidence (self-efficacy) section, reduction in the number of fruit and vegetable items in the FVFQ from twenty-six items to eight, and reduction in the number of processes questions from thirty to thirteen. It should be noted that legumes were not included in the vegetable food list because they were a food item already included in the WIC supplemental food package. Juice was included to more accurately assess the type of fruit being served. Processes of change were selected based on factor analysis loadings from Eiven's (2005) validation process and suitability of the process for family situations. Overall format, clarity of instructions,

and time to complete the survey were tested during July 2005 with low-income residents attending group parenting/nutrition education classes conducted in a county Cooperative Extension office. Further revisions to the survey were made based on feedback from the county extension educator and the researcher's review of the returned surveys. Assessment of income status was changed from income categories to asking if the subject participated in WIC, EFNEP, or ONE. All three nutrition programs have low-income eligibility requirements and participants met for inclusion criteria. Arrows were added to the stage of change algorithm to guide subjects' responses. Clarity in responding to the pros and cons questions was added by bolding the statement "If you disagree with a statement, or are not sure of how to answer it, the statement is probably not important to you". The food frequency questionnaire was changed from a table format completed by the subject to two-part questions for each fruit and vegetable group.

Demographic**s.** Two questions were asked to assure respondents met the definition of the survey population. Subjects answered yes or no to "Are you the parent or main caregiver of a child that is one to five years old?", and marked the public assistance nutrition education program (WIC, EFNEP or ONE) in which they were currently participating. More than one program could be marked indicating possible duplicates in the survey population. To correct for duplicates, subjects marked yes or no to the question "If you marked more than one, have you filled out this survey somewhere else?" Other demographic information collected was race, ethnic background, age, gender, education and employment status.

Intention to Serve Fruit and Vegetable**.** This section assessed the subject's stage of change to increase availability and accessibility of fruit and vegetable. The assessment

included using a two-stage algorithm based on number of servings and intention. Subjects were first asked to circle the number of servings, ranging from zero to nine, of fruit and vegetable they usually served their family each day. Subjects who served four or less servings were classified by stage: if they did not plan to serve more fruit and vegetable (precontemplation), were planning to serve more in the next six months (contemplation), or were planning to serve more in the next thirty days (preparation). Those who were serving five or more servings each day were classified by stage: if they had been serving that amount for less than six months (action) or if they had been serving that amount for more than six months (maintenance).

Pros and Cons**.** This section measured the subject's perceptions of the advantages and disadvantages, or decisional balance, of serving more fruit and vegetable to their children. Six questions (three pros and three cons) were measured on a five-point response Likert scale where 1 = not important in deciding to serve more fruit and vegetable and 5 = extremely important in deciding to serve more fruit and vegetable. Pro items included protecting the family from diseases like cancer and heart disease, keeping the family from getting sick with colds and infections, and helping family members have a healthy weight. Con items included barriers such as expense, time to prepare, and more trips to the grocery store.

Confidence**.** This section measured self-efficacy in the parent/caregiver's ability to serve fruit and vegetable under different situations. Five questions addressed preparing meals at home, eating meals away from home, using tasty recipes, having limited money to buy food, and having limited time. The items were measured with a four-point Likert scale where 1 = not at all confident and 4 = very confident.

Strategies for Serving More Fruit and Vegetable. This section measured processes used by parents and caregivers in different stages of intent to serve more fruit and vegetable to children. Experiential processes included looking for tips to add fruit and vegetable to meals, noticing more ready-to-eat fruit and vegetable in the grocery store, noticing more fruit and vegetable where the family eats out, role-modeling fruit and vegetable eating, awareness that fruit and vegetable are advantageous to family health, feeling bad when realizing that not enough fruit and vegetable were being served, and commitment to serving more fruit and vegetable. Behavioral processes included serving fruit and vegetable instead of junk foods, having easy access to fruit for snacks, talking to other people about eating more fruit and vegetable, reminders to serve two vegetables with main meals, serving fruit instead of sweets for dessert, and feeling pleased when others provided praise for serving fruit and vegetable. Use of these strategies was measured with a five-point Likert scale where 1 = not at all to 5 = all of the time.

Fruit and Vegetable Frequency Questionnaire (FVFQ). The FVFQ had a three-fold purpose. First, it was used to objectively assess the accuracy of the number of fruit and vegetable servings reported in the staging algorithm section of the survey. Second, the self-reported data was used to determine if PPC were serving adequate amounts of fruit and vegetable when compared to the 2005 Dietary Guidelines recommendations for fruit and vegetable based on a 1200 calorie diet. Third, it was used to identify differences between stages in the amount of fruit and vegetable made available to children by their PPC.

Fruit and vegetable were divided into eight sub-groups including 100% juice, whole fruit, lettuce salad, starchy vegetables, dark green vegetables, orange vegetables,

tomatoes or salsa, and other vegetables. Legumes were not included because they were a food item already widely available to the target population through the WIC supplemental food package. Subjects were asked to select from seven frequency choices to indicate how often each sub-group of fruit and vegetable was served. Response choices ranged from never to two or more times a day. If the foods were served, subjects were asked for "how much was usually served to your one to five year old." Three serving size response options included small, medium and large. Medium serving sizes were consistent with standard amounts referenced in the Dietary Guidelines (USDHHS & USDA, 2005). Visual aids were available as references to assist subjects with determining serving sizes.

For the purpose of statistical analysis and determining if adequate amounts of vegetables were being made available, the categories of salad, tomato/salsa and other vegetables were combined and referred to as total vegetables. To evaluate availability of fruit and vegetable by demographic characteristic, juice and whole fruit were combined and referred to as total fruit. Adequate amounts of vegetable sub-groups were defined by dividing the weekly recommended servings of each group (USDHHS & USDA, 2005) by seven days to determine the daily recommendation. This procedure was consistent with that used by Guenther et al. (2006) in determining the proportions of the American population meeting the recommended amounts of fruit and vegetable.

Statistical Analysis

Analyses were performed using SPSS 14.0 for Windows. Frequencies of all variables were run to detect questionable data, which were ascertained to be either entry

errors and were corrected, or verified as correct. Descriptive analysis defined the survey population's demographic characteristics and the proportion of subjects in each stage of change. A paired t-test was used to examine the relationship between fruit and vegetable servings reported for staging and the servings reported by the FVFQ. Using the demographic characteristics of geographical local, employment status and educational level as independent variables, one-way analyses of variance (ANOVA) were used to test for differences in the number of fruit and vegetable servings. The decisional balance con and pro item scores were summed to achieve pro and con scales, and converted to T-scores. The scores of the five self-efficacy items were summed to achieve a self-efficacy scale. One-way analyses of variance were used to identify differences among stages for the decisional balance and self-efficacy scales, as well as the scores for the individual decisional balance and self-efficacy items. Cronbach's Alpha was used to measure the internal reliability of the items measuring decisional balance and self efficacy. Multivariate analysis of variance (MANOVA) was conducted to evaluate differences among stages of change on the use of the processes of change. When appropriate, Tukey HSD post hoc tests were used to identify pair-wise significance between stages. Discriminate function analyses were conducted to clarify interpretation of the major dimensions of the self-efficacy and processes of change constructs. The significance level for all analyses was set at $P < 0.05$.

CHAPTER IV

FINDINGS

A total of 274 of 330 (83 percent) surveys were returned, of which 238 (86.9 percent) were complete and eligible for analysis. Nineteen (6.9 percent) of the returned surveys did not meet inclusion criteria, fifteen (5.5 percent) were incomplete responses, and two (0.7 percent) indicated they were duplicate responses.

Demographics

Demographic characteristics of the study participants are summarized in Table 4.1 (page 49). Females represented 97.1 percent of the eligible respondents. The average age of the respondents was twenty-seven years, ranging from eighteen to sixty-one years. All eligible subjects were the parent or primary caregiver (PPC) of a child one to five years of age and enrolled in a federal nutrition education assistance program, thus meeting the low-income inclusion criteria. About 52 percent were participants in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) program, 3.4 percent participated in Expanded Food and Nutrition Education Program (EFNEP), 14.7 percent participated in the Oklahoma Nutrition Education (ONE), and almost 30 percent participated in a combination of WIC and either EFNEP or ONE. Average length of participation in WIC was three years, two months. Length of

Table 4.1 Demographic characteristics of low-income parents/caregivers. n = 238.

Demographic Characteristic	n	%	Mean ± SD
Gender			
Female	231	97.1	
Male	7	2.9	
Age			
Mean age in years	238	100.0	27.6 ± 7.7 years
Nutrition Education*			
WIC	124	52.1	38.4 ± 27.7 months
WIC & EFNEP	53	22.3	
ONE	35	14.7	3.3 ± 2.3 months
WIC & ONE	18	7.6	
EFNEP	8	3.4	3.7 ± 2.8 months
Residential Locale			
Rural	133	55.9	
Urban	105	44.1	
Race/Ethnicity			
White	130	54.6	
Black or African American	51	21.4	
American/Alaskan Indian	30	12.6	
Hispanic	24	10.1	
Asian or Pacific Islander	3	1.3	
Education			
High school or GED	119	50.0	
Some college or college graduate	65	27.3	
Less than high school	51	21.4	
Non-response for item	3	1.3	
Employment			
Do not work outside the home	132	55.5	
Full time (32 hours or more/week)	65	27.3	
Part time (Less than 32 hours/week)	37	15.5	
Non-response for item	4	1.7	

*WIC – Special Supplemental Nutrition Program for Women, Infants and Children
EFNEP – Expanded Food and Nutrition Education Program
FSNE – Food Stamp Nutrition Education

participation in EFNEP and ONE was 3.7 and 3.3 months, respectively. Slightly more than half of the subjects, 55.9 percent, resided in rural areas of the state with the balance, 44.1 percent, residing in the urban regions. Race and ethnic groups were disproportionably represented in the sample, but the percentages were compared to and found to be reflective of statewide participation in the federal food stamp assistance

program (Oklahoma State Department of Human Services [OSDHS], 2006). Over half of the subjects, 54.6 percent, were white, 21.4 percent were African American, 12.6 percent were American or Alaskan Indian, 10.1 percent reported Hispanic ethnicity, and 1.3 percent were Asian or Pacific Islander. Fifty percent had a high school education or General Equivalency Diploma (GED), 21.4 percent reported less than a high school education, and 27.3 percent reported having some college or being a college graduate. The majority of subjects, 55.5 percent, reported not working outside of the home while 15.5 percent worked part time and 27.3 percent reported working full time.

Staging of Subjects

Use of the two-stage algorithm to categorize subjects into five stages of change placed 24 subjects (10 percent) in the precontemplation stage, 78 subjects (33 percent) in contemplation, 69 subjects (29 percent) in preparation, 8 subjects (3 percent) in action, and 59 subjects (25 percent) in the maintenance stage. Table 4.2 (below) summarizes the results of the staging algorithm.

Table 4.2 Results of staging algorithm.

Stage of Change	**n**	**%**
Precontemplation	24	10
Contemplation	78	33
Preparation	69	29
Action	8	3
Maintenance	59	25
Total	238	100

To achieve a more equal distribution of groups for statistical analysis and to better reflect the stages of the target population, the precontemplation and contemplation stages

and action and maintenance stages were collapsed to form three stages of change, consisting of precontemplation/contemplation, hereafter referred to as preaction; preparation; and action/maintenance, hereafter referred to as action. This move is supported by work conducted by Ma, Betts and Horacek (2001), who examined the appropriateness of the theoretical five-stages for use in dietary behaviors, specifically fruit and vegetable consumption. Their findings suggested that a three-stage pattern may be more representative of the temporal process for changing fruit and vegetable dietary patterns.

In summary, low-income PPCs were in different stages of change for increasing availability (as measured by number of servings served) of fruit and vegetable to their pre-school age children. The majority of parents (72 percent) surveyed reported serving less than five servings of fruit and vegetable daily. Of these, almost two thirds (62 percent) reported intention to serve more fruit and vegetable within the next month to six months. Slightly more than one-fourth (27 percent) of the total respondents reported serving five or more servings of fruit and vegetable to their preschool age children, with 25 percent of the total having done so for six months or longer.

Fruit and Vegetable Availability

Availability and accessibility of fruit and vegetable were measured by the number of servings served by PPC to their pre-school age children as reported in the fruit and vegetable frequency questionnaire (FVFQ). The survey used two measures to determine the number of servings. The first was the staging algorithm asking for the number of fruit and vegetable servings PPC served to their family each day. The second was an

eight item FVFQ from which data was transformed to servings per day using USDA Dietary Guidelines (USDHHS & USDA, 2005) standard serving sizes. The algorithm measure resulted in a mean of 3.6 servings per day while the FVFQ data resulted in a calculation averaging 3.7 servings daily. The means of the two measures were compared using a paired sample T-test. The analysis reflected no significant difference ($P = .725$).

Table 4.3 (below) presents a summary of the mean servings of total fruit and total vegetable served to children by the PPC's demographic characteristics. The mean

Table 4.3 Total juice and fruit and total vegetables: mean servings served to children by the PPC's demographic characteristics.

Demographic Factor	n	Total juice & fruit servings Mean ± SD	*P* Value	Total vegetable servings Mean ± SD	*P* Value
All subjects	238	2.0 ± 1.4		1.7 ± 1.3	
Race/ethnicity			0.079		0.852
White	128	2.2 ± 1.6		1.6 ± 1.1	
Black or African Amer.	51	1.8 ± 1.4		1.8 ± 1.6	
Amer./Alaskan Indian	30	1.5 ± 1.0		1.7 ± 1.7	
Hispanic	24	1.8 ± 0.9		1.5 ± 1.3	
Asian	3	2.2 ± 1.8		1.1 ± 0.4	
Geographical locale			0.271		0.070
Urban	105	1.9 ± 1.4		1.5 ± 1.3	
Rural	131	2.1 ± 1.5		1.8 ± 1.4	
Education			0.035*		0.168
Less than high school	51	1.8 ± 1.4 [a]		1.4 ± 1.1	
High school/GED	118	1.9 ± 1.4 [a]		1.7 ± 1.3	
Some college/college graduate	64	2.4 ± 1.5 [b]		1.9 ± 1.6	
Employment			0.553		0.183
Employed full/part time	101	2.1 ± 1.5		1.8 ± 1.3	
Do not work outside home	129	2.0 ± 1.4		1.6 ± 1.4	

Values with different superscript letters were significantly different at $P < .05$.
* Mean difference significant at $\alpha = .05$

number of servings of total fruit served to children was 2.0 servings and the mean of total vegetables served was 1.7 servings, totaling an average of 3.7 servings of fruit and vegetable available to low-income preschool age children per day. There were no significant differences among PPC of different race/ethnicity and the amount of fruit and vegetable they served their children. Parents in rural areas served slightly more fruit and vegetable when compared to those living in urban residences, but the differences were not significant. PPC who were employed full or part-time served slightly more fruit and vegetable, but not significantly more, than PPC who did not work outside the home. PPC who were college graduates or had some college education served significantly more total fruit (P = .035) each day when compared to PPC with lower levels of education. Further investigation revealed servings of whole fruit, rather than juice, accounted for the significant variance. PPC who had graduated from college or had some college credit served 1.2 servings whole fruit daily compared to PPC with a high school or less education who were serving 0.7 serving whole fruit daily (P = .003).

Just as demographic characteristics, with the exception of education, did not account for significant differences in availability of fruit and vegetable; neither were they associated with the stage of change. Using race, geographical location, education and employment as fixed factors and stage of change as the dependent variable, the analyses of variance did not reveal any significant differences between categories within each demographic characteristic.

Evaluation of fruit and vegetable availability by stage of change was conducted for total fruit and vegetable, as well as the separate items of juice, whole fruit and vegetable sub-groups as identified in the USDA Dietary Guidelines for Americans

(USDHHS & USDA, 2005). The vegetable survey items of lettuce salad, tomatoes/salsa and other vegetables were combined and referred to as other vegetables, resulting in four vegetable sub-groups; dark-green, orange, starchy and other. To determine if the amounts of fruit and vegetable available to children were adequate, the numbers of servings reported in the FVFQ were compared to the 2005 Dietary Guideline recommendations for a 1200 calorie diet (USDHHS & USDA, 2005). This is the calorie level for moderately active (30 to 60 minutes physical activity/day), children aged two to three years, which represents the middle of the age range in our study's population of interest. Table 4.4 (page 55) summarizes the servings of juice, whole fruit and vegetable served to children by the PPC's stage of change.

There were significant differences among the stages for the total amount of fruit and vegetable available to children. The average amount served by PPC in all stages was 3.7 servings, which was 1 serving less than the recommendation of 4.7 servings, excluding legumes (USDHHS & USDA, 2005). PPC in the preaction stage were serving 3 servings daily, which was significantly less ($P < .001$) than the number of servings served by PPC in the preparation and action stages of 4.1 and 4.3 servings, respectively.

The average amount of total fruit served by PPCs in all stages was 2.0 servings which met the USDA recommendation of 2 servings per day (USDHHS & USDA, 2005). However, there were significant differences among the stages for the number of total fruit servings ($P < .001$). PPC in the preaction stage served 1.5 serving which was significantly less ($P = .013$) than PPC in preparation and action stages, who were serving 2.2 and 2.4 servings, respectively. The difference in availability of total fruit was due to whole fruit servings rather than 100% juice. Figure 4.1 (page 56) illustrates the

Table 4.4 Fruit and vegetable sub-groups: mean servings by stage of change.

Food Item	Stage of Change	n	Mean Servings ± SD	*P* Value Between stages	Rec. Servings /Day/ 1200 calories
Total fruit & vegetable (excluding legumes)	Preaction	100	3.0 ± 2.0 [a]	0.001*	
	Preparation	69	4.1 ± 2.7 [b]		
	Action	65	4.3 ± 2.2 [b]		
	Total	234	3.7 ± 2.3		4.7
Total fruit	Preaction	100	1.5 ± 1.2 [a]	0.001*	
	Preparation	69	2.2 ± 1.6 [b]		
	Action	65	2.4 ± 1.4 [b]		
	Total	234	2.0 ± 1.4		2.0
100% juice	Preaction	100	0.9 ± 0.9	0.102	
	Preparation	69	1.2 ± 1.0		
	Action	65	1.2 ± 0.9		
	Total	234	1.1 ± 0.9		
Whole fruit	Preaction	100	0.6 ± 0.6 [a]	0.001*	
	Preparation	69	1.0 ± 0.8 [b]		
	Action	65	1.2 ± 0.8 [b]		
	Total	234	0.9 ± 0.8		
Total vegetables (excluding legumes)	Preaction	100	1.4 ± 1.2 [a]	0.036*	
	Preparation	69	1.9 ± 1.5 [b]		
	Action	65	1.8 ± 1.2 [ab]		
	Total	234	1.7 ± 1.3		2.7
Starchy vegetables	Preaction	100	0.5 ± 0.6	0.880	
	Preparation	69	0.5 ± 0.4		
	Action	65	0.5 ± 0.5		
	Total	234	0.5 ± 0.5		0.7
Dark green vegetables	Preaction	100	0.2 ± 0.4 [a]	0.006*	
	Preparation	69	0.4 ± 0.4 [ab]		
	Action	65	0.5 ± 0.5 [b]		
	Total	234	0.3 ± 0.4		0.4
Orange vegetables	Preaction	100	0.2 ± 0.2	0.149	
	Preparation	69	0.2 ± 0.3		
	Action	65	0.3 ± 0.3		
	Total	234	0.2 ± 0.3		0.3
Other vegetables	Preaction	100	0.5 ± 0.5 [a]	0.005*	
	Preparation	69	0.8 ± 1.0 [b]		
	Action	65	0.6 ± 0.5 [ab]		
	Total	234	0.6 ± 0.7		1.3

Values with different superscript letters were significantly different at $P < .05$.
* Mean difference significant at $\alpha = .05$

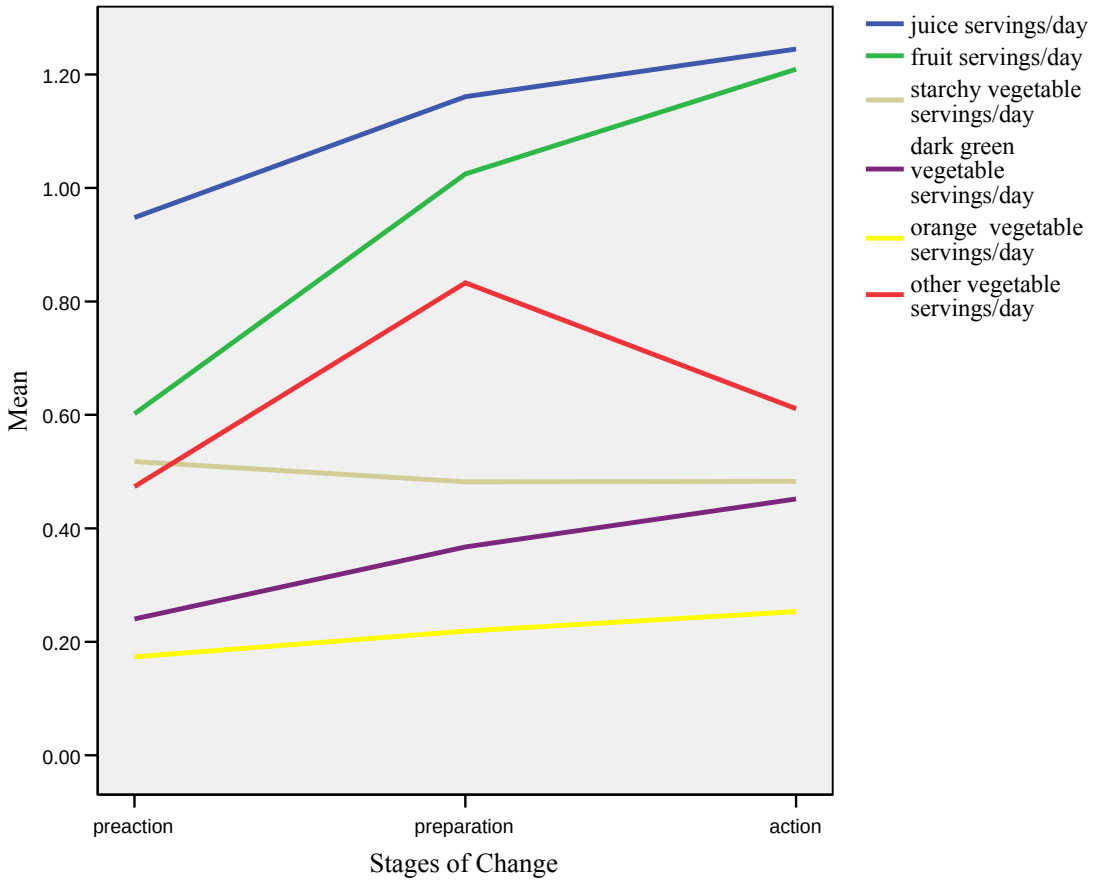

Figure 4.1 Fruit and vegetable servings: mean number of servings served to preschool age children by stage of change.

differences in 100% juice and whole fruit availability by stage of change. PPC in all groups were serving appropriate amounts of juice (AAP, 2001) and there was no significant difference between groups ($P = .102$). In contrast, PPC in the preparation and action stages served almost twice the amount of whole fruit as PPC in the preaction stage, resulting in a significant difference between stages ($P < .001$).

Average vegetable availability was measured at 1.4 servings for PPCs in the preaction stage, increased to 1.9 servings in the preparation stage, and dropped slightly to 1.8 servings in the action stage. The differences between the stages was significant ($P =$

.036), with the significant difference being between the preaction and preparation stages (P = .045). None of the average servings of fruit and vegetable served by PPCs in each of the stages met the recommendation of 2.7 servings (legumes excluded) (USDHHS & USDA, 2005).

Figure 4.1 (page 56) illustrates the vegetable sub-group servings by stage of change. The other vegetable sub-group accounted for the drop in availability of total vegetables between the preparation and action groups from 0.8 servings to 0.6 servings, respectively. While this difference was not significant, PPC in the preparation stage served significantly more (P = .004) other vegetables than PPC in the preaction stage, who were serving an average of 0.5 serving daily. The average number of other vegetable servings served by PPCs in each stage fell below the recommended amount of 1.3 servings per day (USDHHS & USDA, 2005).

There were significant differences between the stages (P = 0.006) in the availability of dark-green vegetables, with the significance being between preaction and action stages (P = 0.006). PPCs in the preaction stage served an average of 0.2 serving daily compared to the preparation and action stages who were serving an average of 0.4 and 0.5 serving, respectively. PPCs in the preparation and action stages were serving sufficient amounts of dark green vegetables to meet the recommendation of 0.4 serving daily (USDHHS & USDA, 2005).

There were no significant differences between the stages in the amount of starchy and orange vegetables being made available. The number of servings of starchy vegetables was constant across stages at 0.5 serving each day, which was less than the recommended daily amount of 0.7 serving (USDHHS & USDA, 2005). There was an

insignificant but small increase in availability of orange vegetables across the stages. PPC in the preaction and preparation stages were short a slight 0.1 serving of the 0.3 recommendation, while PPC in the action stage were serving the recommended number of daily servings.

In summary, preschool age children of PPC in preparation and action stages had significantly greater availability and accessibility of fruit and vegetable than children of PPC in preaction stages. The findings result in a statistical decision to fail to accept the second objective's null hypothesis in favor of the alternate. When fruit and vegetable items were evaluated separately, whole fruit, dark green vegetables and other vegetables accounted for the variance in availability.

Decisional Balance

Decisional balance was measured using six items. Three items measured negative aspects, or cons, of serving more fruit and vegetable; and three measured the positive aspects, referred to as pros, of serving fruit and vegetable. The lower the score the less importance the item had in the PPC's decision to serve fruit and vegetable. The Cronbach's Alpha coefficient for the con scale items was $r = 0.69$, and $r = 0.86$ for the pro scale items.

Decisional balance con and pro item scores were converted to T-scores, and each set was averaged to derive the respective pro and con scales. Results are reported in Table 4.5 (page 59). PPC in the preaction stage had a higher T-score for the con scale when compared to the pro scale, while the reverse was true for PPC in the preparation and action stages. The point at which the pro scale score surpassed the con scale score

Table 4.5 Decisional balance scales: mean scores by stage of change.

Decisional Balance Scales	Stage of Change	n	Mean T-Scores ± SD	*P* Value
Con Scales	Preaction	102	51.9 ± 9.7	.037*
	Preparation	69	48.8 ± 9.7	
	Action	67	48.3 ± 10.4	
	Total	238	50.0 ± 10.0	
Pro Scales	Preaction	102	48.2 ± 9.8	.061
	Preparation	69	51.3 ± 9.3	
	Action	67	51.3 ± 10.1	
	Total	238	50.0 ± 10.0	

Scale: 1 = not important; 2 = slightly important; 3 = somewhat important; 4 = very important; 5 = extremely important

Values with different superscript letters were significantly different at $P < .05$.

* Mean difference significant at $\alpha = .05$

occurred prior to the preparation stage. This reversal of scores is illustrated in Figure 4.2 (page 60).

Using stage of change as the fixed variable and the con and pro scale T-scores as dependent variables, an analysis of variance resulted in a small but significant difference between stages for the con scales ($P = 0.037$), but not for the pro scale ($P = 0.061$). For the con scale, the preaction stage had a decisional balance mean score of 51.9 compared to preparation and action mean scores of 48.8 and 48.3, respectively. A Tukey post hoc test resulted in no significant differences between any two stages for the con variable.

To further investigate the negative and positive items influencing decisional balance for serving fruit and vegetable, the con and pro items were evaluated using one-way analyses of variance. The results are reported in Table 4.6 (page 61). The three con items measured factors related to time and expense associated with purchasing and preparing fruit and vegetable. As with the con scale, mean scores for each con item

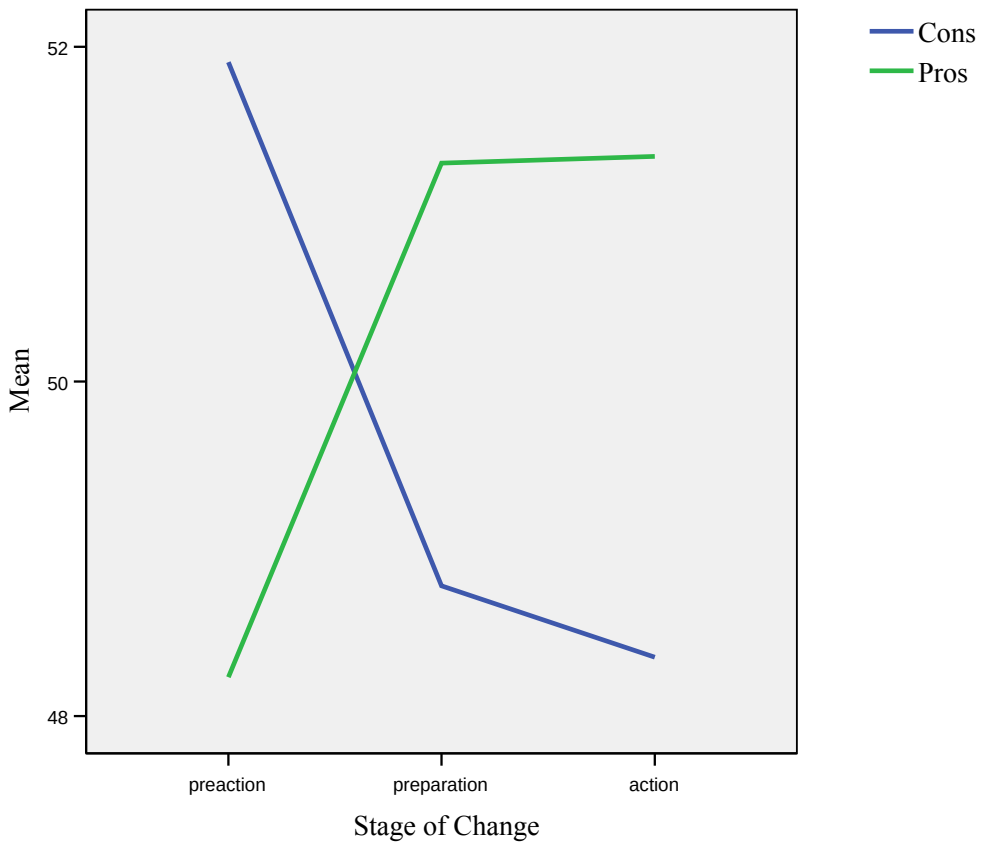

Figure 4.2 Decisional balance: mean pro and con scale scores by stage of change

were highest for the preaction stage and decreased sequentially across the preparation and action stage. The one-way analyses of variance tests of the con items indicated stages differed significantly on "fruit and vegetables take too much time to prepare" (P = .004). The negative aspect was significantly more important to PPC in the preaction stage (P = .036). It should be noted that although there were significant differences among the stages, this negative aspect was least important in the decision to serve fruit and vegetable for all stages. In contrast, "fruit and vegetable can be expensive" had the highest mean for each stage with no significant difference in importance among the

Table 4.6 Decisional balance items: mean scores by stage of change.

Decisional Balance Items	Stage of Change	n	Mean Score ± SD	*P* Value
Con items				
Fruit & vegetable can be expensive	Preaction	102	3.0 ± 1.3	.409
	Preparation	69	2.9 ± 1.4	
	Action	67	2.7 ± 1.4	
	Total	238	2.9 ± 1.3	
Fruit & vegetable take too much time to prepare	Preaction	102	2.2 ± 1.2 [a]	.004*
	Preparation	69	1.7 ± 1.0 [b]	
	Action	67	1.8 ± 1.0 [b]	
	Total	238	2.0 ± 1.1	
Buying fruit & vegetable may mean more trips to the store	Preaction	102	2.5 ± 1.3	.200
	Preparation	69	2.3 ± 1.3	
	Action	67	2.1 ± 1.3	
	Total	238	2.3 ± 1.3	
Pro items				
Fruit & vegetable protect against diseases like cancer & heart disease	Preaction	102	4.3 ± 0.9	.096
	Preparation	69	4.5 ± 0.7	
	Action	67	4.5 ± 0.8	
	Total	238	4.4 ± 0.8	
Fruit & vegetable can keep my family from getting sick with colds and infections	Preaction	102	4.2 ± 0.8 [a]	.020*
	Preparation	69	4.5 ± 0.8 [b]	
	Action	67	4.5 ± 0.8 [b]	
	Total	238	4.4 ± 0.8	
Fruit & vegetable can help my family have healthy weights	Preaction	102	4.2 ± 0.8	.441
	Preparation	69	4.2 ± 1.0	
	Action	67	4.4 ± 0.8	
	Total	238	4.3 ± 0.8	

Scale: 1 = not important; 2 = slightly important; 3 = somewhat important;
4 = very important; 5 = extremely important
Values with different superscript letters were significantly different at $P < .05$.
* Mean difference significant at $\alpha = .05$

stages ($P = .409$). The number of trips to shop for fruit and vegetable was rated as slightly important overall with no significant difference between the stages ($P = .200$). Figure 4.3 (page 62) depicts the relationship of the mean scores for each of the con items.

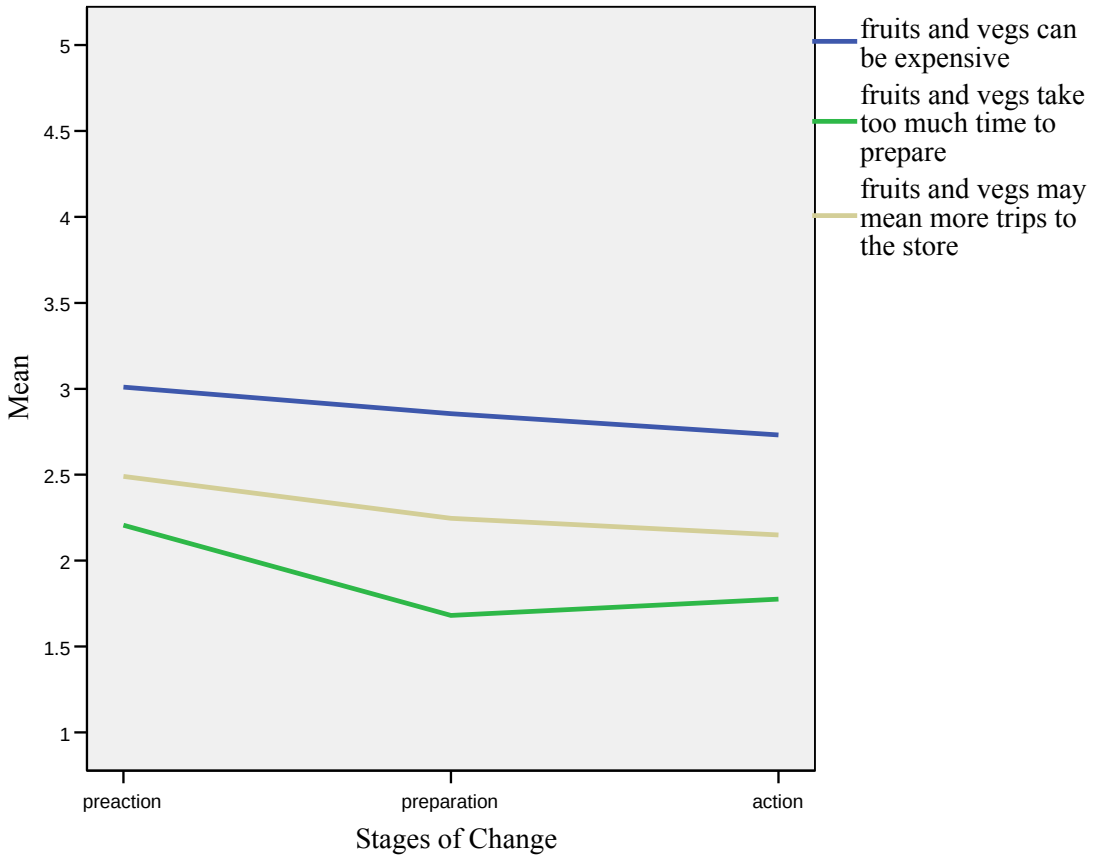

Figure 4.3 Decisional balance: mean con item scores by stage of change.
Scale: 1 = not important; 2 = slightly important; 3 = somewhat important; 4 = very important; 5 = extremely important

The pro items measured acute and chronic health prevention benefits and ability of fruit and vegetable to maintain healthy weights. Figure 4.4 (page 63) illustrates the mean scores by stage for the pro items. Each of the stages had similar scores for the three items, and all were very important in the PPC's decision to make fruit and vegetable available to their children. In contrast to the con items, pro item means were lowest for the preaction stage and increased slightly across the stages. The one-way analyses of variance of the pro items revealed a small but significant increase (P =.020)

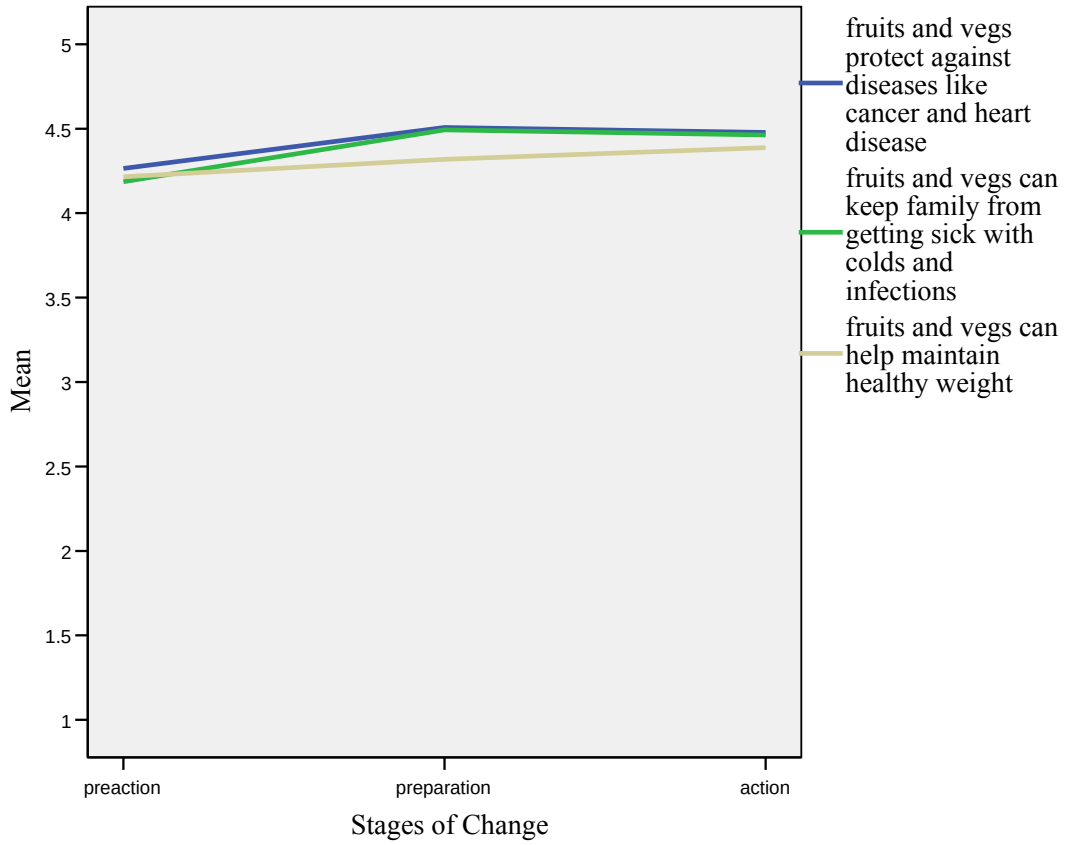

Figure 4.4 Decisional balance: mean pro item scores by stage of change.
Scale: 1 = not important; 2 = slightly important; 3 = somewhat important; 4 = very important; 5 = extremely important

in the importance of "fruit and vegetable can keep my family from getting sick with colds and infections." The importance was greater for PPC in the preparation stage when compared to PPC in the preaction stage (P = .036), but not when compared to the action stage.

In summary, there were small but significant differences among PPC in the stages of change for decisional balance related to increasing fruit and vegetable availability to their preschool age children. The findings result in a statistical decision to fail to accept the third objective's null hypothesis in favor of the alternate. Specifically, the negative

aspects associated with making fruit and vegetable available accounted for the differences. The negative item that differentiated PPC in the preaction stage from PPC in the preparation and action stages was time related to preparing fruit and vegetable. Furthermore, the negative aspects were more important to PPC in the preaction stage, while the positive aspects of serving fruit and vegetable were more important to PPC in the preparation and action stages.

Self-Efficacy

The theoretical construct of self-efficacy was measured using a series of five items. The Cronbach Alpha coefficient for the items was measured at r = 0.80. When the item scores were summed and averaged, self-efficacy was lowest for the preaction stage and increased significantly as intent to serve fruit and vegetable increased ($P < .001$). Table 4.7 (page 65) summarizes the changes for both overall self-efficacy and the mean scores for the individual items measuring the construct.

A review of the scores for the individual items revealed PPC were confident in serving meals at home and in preparing tasty, easy recipes using fruit and vegetable, with confidence increasing from preaction to action. Self-efficacy was lower when meals were eaten away from home, money was insufficient to purchase food and time was limited. Specific to stage, PPC in the preaction and preparation stages had the lowest confidence in their ability to serve fruit and vegetable when money was low for buying food; while PPC in the action stage had the least confidence for serving fruit and vegetable when eating meals away from home. These relationships are illustrated in Figure 4.5 (page 66).

Table 4.7 Self-efficacy items: mean scores by stage of change.

Self-Efficacy Scale & Items	Stage of Change	n	Mean Score ± SD	*P* Value*
Self-Efficacy Scale	Preaction	102	2.6 ± 0.6 [a]	.001*
	Preparation	69	2.8 ± 0.6 [b]	
	Action	67	3.1 ± 0.6 [c]	
	Total	238	2.8 ± 0.6	
Serving fruit & vegetable when preparing meals at home	Preaction	102	3.0 ± 0.8 [a]	.001*
	Preparation	69	3.3 ± 0.8 [b]	
	Action	67	3.5 ± 0.6 [b]	
	Total	238	3.2 ± 0.7	
Serving fruit & vegetable when eating meals away from home	Preaction	102	2.4 ± 0.8	.070
	Preparation	69	2.6 ± 0.9	
	Action	67	2.7 ± 0.9	
	Total	238	2.5 ± 0.9	
Preparing tasty, easy recipes using fruit & vegetable	Preaction	102	2.8 ± 0.9 [a]	.001*
	Preparation	69	3.1 ± 0.9 [b]	
	Action	67	3.4 ± 0.7 [b]	
	Total	238	3.0 ± 0.8	
Serving fruit & vegetable when low on money for buying food	Preaction	102	2.4 ± 0.9 [a]	.001*
	Preparation	69	2.4 ± 0.8 [a]	
	Action	67	2.9 ± 0.9 [b]	
	Total	238	2.5 ± 0.9	
Serving fruit & vegetable when not enough time to prepare fruit & vegetable	Preaction	102	2.5 ± 0.9 [a]	.001*
	Preparation	69	2.8 ± 0.8 [b]	
	Action	67	3.0 ± 0.7 [b]	
	Total	238	2.7 ± 0.8	

Scale: 1 = not at all confident; 2 = somewhat confident; 3 = confident; 4 = very confident

Values with different superscript letters were significantly different at $P < .05$.

* Mean difference significant at $\alpha = .05$

The one-way analyses of variance resulted in significant differences in four of the five items ($P < 0.001$); with the item reflecting non-significant differences being "serving fruit and vegetable when eating meals away from home." Of the four with significant differences, PPC in preparation and action stages were significantly more confident than preaction PPC when preparing meals at home; preparing tasty, easy

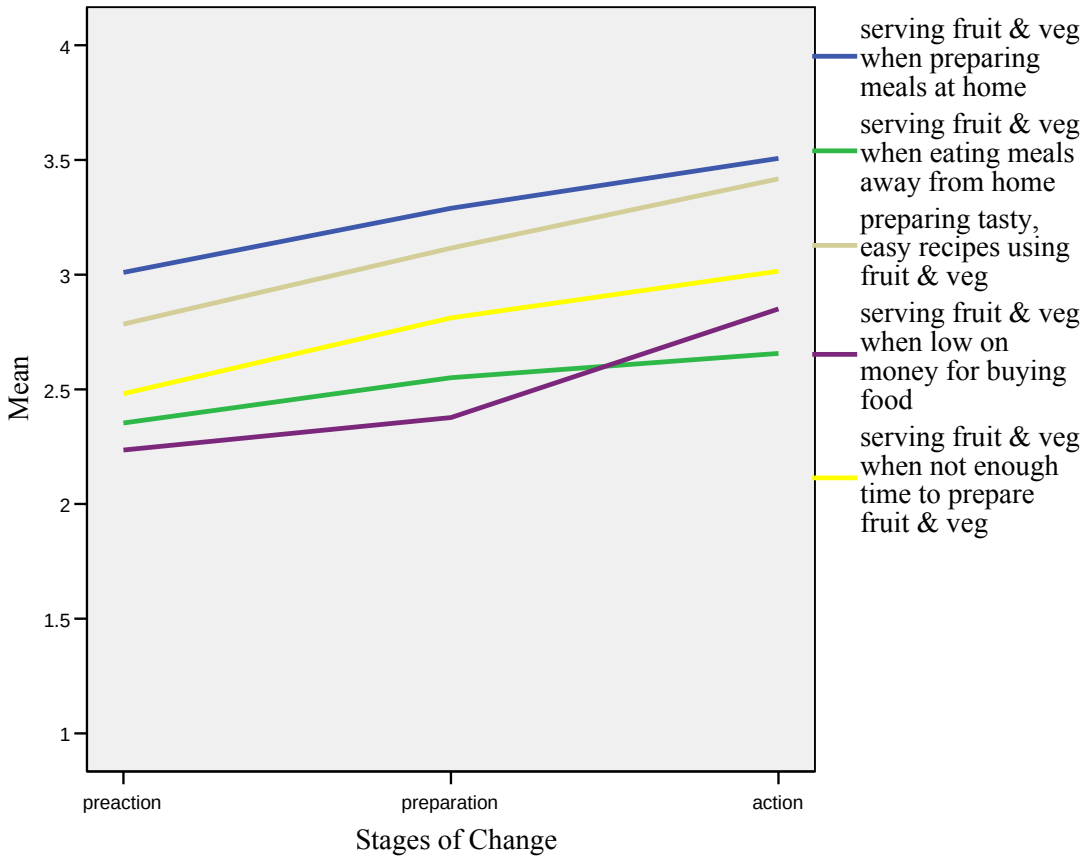

Figure 4.5 Self-efficacy: mean item scores by stage of change
Scale: 1 = not at all confident; 2 = somewhat confident; 3 = confident; 4 = very confident

recipes using fruit and vegetable; and when time was limited. For the item measuring confidence in "serving fruit and vegetable when low on money for buying food", PPC in the preparation stage had confidence levels more like PPC in the preaction stage rather than the action stage.

A discriminate function analysis of the items resulted in two extracted functions, with the first accounting for 90.8 percent of the variance between groups. The item with the highest correlation (r = .841) with the function and best defining the differences in self-efficacy between the stages was confidence in preparing tasty, easy recipes using

fruit and vegetable. An analysis of variance using the discriminate function score as the dependent variable resulted in significant differences between each combination of stages (P = .013).

In summary, there were significant differences among PPC in the stages of change for self-efficacy in serving fruit and vegetable to their preschool age children in a variety of situations. Confidence in preparing easy and tasty recipes best described differences between PPC in each of the stages. The findings result in a statistical decision to fail to accept the fourth objective's null hypothesis in favor of the alternate. Specific to individual self-efficacy items, PPC in the preparation and action stages had more self-efficacy than PPC in the preaction stage. An exception was when money was low to buy food, and then PPC in preparation stage had self-efficacy levels similar to the preaction rather than action stage.

Processes of Change

Table 4.8 and Table 4.9 (pages 68 and 69) report the mean scores by stage of change for each of the thirteen items used to measure the use of experiential and behavioral processes of change evaluated in our study. The use of the experiential processes of reevaluation and social liberation and the behavioral processes of stimulus control and countering were measured using two items each. Use of all processes increased across the stages with one exception; the experiential process of reevaluation, defined as self-image and measured by "feeling bad for not serving enough fruit and vegetable." The process was used "sometimes" by PPC in the preaction stage and declined in use as stage advanced and more fruit and vegetable were served.

Table 4.8 Experiential processes of change: mean scores for frequency of use by stage of change.

Experiential Processes of Change	Stage of Change	n	Mean Score ± SD	*P* Value
Consciousness Raising (self motivation-look for tips on adding fruit & vegetable to meals)	Preaction	102	2.8 ± 1.0 [a]	.001*
	Preparation	69	3.6 ± 1.2 [b]	
	Action	67	3.5 ± 1.0 [b]	
	Total	238	3.1 ± 1.1	
Social Liberation (changing availability-notice grocery stores have more ready-to-eat fruit & vegetable)	Preaction	102	3.4 ± 1.0	.054
	Preparation	69	3.6 ± 1.2	
	Action	67	3.8 ± 0.9	
	Total	238	3.6 ± 1.1	
Social Liberation (changing availability-notice more healthy vegetables at places where family eats out)	Preaction	102	2.9 ± 1.0 [a]	.001*
	Preparation	69	3.1 ± 1.2 [ab]	
	Action	67	3.5 ± 1.1 [b]	
	Total	238	3.1 ± 1.1	
Reevaluation (role modeling-eat fruit & vegetable because it sets a good example for children)	Preaction	102	3.6 ± 0.9 [a]	.002*
	Preparation	69	3.9 ± 1.0 [b]	
	Action	67	4.0 ± 0.8 [b]	
	Total	238	3.8 ± 1.0	
Emotional Arousal (health outcomes-think if family ate more fruit & vegetable they would have fewer health problems)	Preaction	102	3.6 ± 1.0 [a]	.022*
	Preparation	69	3.9 ± 1.1 [ab]	
	Action	67	4.0 ± 0.9 [b]	
	Total	238	3.8 ± 1.0	
Reevaluation (self image-feel bad when you realize you were not serving your family enough fruit & vegetable)	Preaction	102	3.3 ± 1.0	.173
	Preparation	69	3.0 ± 0.9	
	Action	67	3.0 ± 1.2	
	Total	238	3.1 ± 1.1	
Commitment (self motivation-serve more fruit & vegetable because your have decided that you would)	Preaction	102	3.2 ± 0.9 [a]	.002*
	Preparation	69	3.7 ± 0.9 [b]	
	Action	66	3.7 ± 0.9 [b]	
	Total	237	3.5 ± 0.9	

Scale: 1 = not at all; 2 = hardly ever; 3 = sometimes; 4 = often; 5 = all the time
Values with different superscript letters were significantly different at $P < .05$.
* Mean difference significant at $\alpha = .05$

Table 4.9 Behavioral processes of change: mean scores for frequency of use by stage of change.

Behavioral Processes of Change	Stage of Change	n	Mean Score ± SD	*P* Value
Countering** (sub snacks-choose to serve fruit & vegetable for snacks instead of junk foods)	Preaction	102	3.5 ± 1.0 [a]	.001*
	Preparation	69	3.8 ± 0.8 [b]	
	Action	67	4.2 ± 0.7 [b]	
	Total	238	3.8 ± 0.9	
Stimulus Control (sub snacks-leave a bowl of fruit out for snacks)	Preaction	102	3.1 ± 1.1 [a]	.001*
	Preparation	69	3.1 ± 1.2 [a]	
	Action	67	3.8 ± 1.0 [b]	
	Total	238	3.3 ± 1.1	
Helping Relations (social support-talk to other people about serving your family more fruit & vegetable)	Preaction	102	2.6 ± 1.1 [a]	.002*
	Preparation	69	2.7 ± 1.2 [ab]	
	Action	67	3.2 ± 1.1 [b]	
	Total	238	2.8 ± 1.1	
Stimulus Control (planning-give yourself a reminder to serve two vegetables with main meals)	Preaction	102	2.6 ± 1.2 [a]	.001*
	Preparation	69	3.1 ± 1.1 [b]	
	Action	67	3.4 ± 1.2 [b]	
	Total	238	3.0 ± 1.2	
Countering (sub snacks-serve fruit instead of sweets for dessert)	Preaction	102	3.1 ± 1.0 [a]	.001*
	Preparation	69	3.3 ± 0.9 [a]	
	Action	67	3.7 ± 0.9 [b]	
	Total	238	3.3 ± 1.0	
Rewards (social support-feel pleased when other people said you were being a good parent or caregiver because you served family fruit & vegetable)	Preaction	102	3.2 ± 1.1 [a]	.001*
	Preparation	69	3.6 ± 1.2 [b]	
	Action	67	4.0 ± 1.0 [b]	
	Total	238	3.5 ± 1.2	

Scale: 1 = not at all; 2 = hardly ever; 3 = sometimes; 4 = often; 5 = all the time
Values with different superscript letters were significantly different at $P < .05$.
* Mean difference significant at $\alpha = .05$
** Best defines differences in stages

PPCs in the preaction and preparation stages used two experiential processes most frequently; emotional arousal, defined as health outcomes; and reevaluation, defined as role modeling. PPCs in the action stage used the behavioral process of countering, defined as substituting fruit and vegetable for snacks, most frequently. The process used least often was helping relationships, which was used "hardly ever" by PPCs in the preaction and preparation stages and "sometimes" by PPCs in the action stage.

The differences in use of processes were significant as tested by an omnibus multivariate analysis of variance ($P < .001$). The Cronbach's alpha coefficient for the processes was r = 0.88. The univariate analyses of variance reflected use of each process was significantly different among stages with the exception of two; social liberation defined as noticing changing availability in grocery stores ($P = .054$), and reevaluation defined as self image or feeling bad when not serving enough fruit and vegetable ($P = .173$). Three experiential processes and three behavioral processes were used significantly more often by PPC in the preparation stage compared to the preaction stage. The experiential processes included consciousness raising accomplished by looking for tips to add fruit and vegetable to meals; reevaluation accomplished by role modeling the eating of fruit and vegetable to set a good example for children; and commitment to serving more fruit and vegetable. The behavioral processes were countering defined as substituting fruit for low-nutrient foods at snacks; stimulus control defined as planning meals to include vegetables; and rewards defined as social support and praise. PPCs in the action stage used all but two experiential processes significantly more frequently than the preaction stage; and they used two behavioral processes, stimulus control and

countering, both associated with serving fruit instead of sweets for snacks and desserts, significantly more often than PPCs in the preparation stage.

A discriminate function analysis was conducted to facilitate interpretation of the use of processes that best differentiated the stages. Two functions were extracted, with the first accounting for 75.9 percent of the variance between the stages. The second function was not significant. The item having the highest correlation (r = .68) was the behavioral process of countering by substituting fruit or vegetable for less nutritious snacks. An analysis of variance using the function as the dependent variable revealed significant differences ($P < .001$) between PPCs in each stage of change in the use of behavioral processes; with PPCs in the action stage using behavioral processes most frequently and use declining as intention to increase fruit and vegetable availability decreased.

In summary, use of the processes of change increased significantly as stage progressed and availability of fruit and vegetable increased, with use of behavioral processes best differentiating the stages. PPC in the preparation and action stages used both experiential and behavioral processes significantly more often than PPC in preaction stages; while PPCs in the action stage used behavioral processes significantly more often than PPCs in the preparation stage. The findings result in a statistical decision to fail to accept the fifth objective's null hypothesis in favor of the alternate. There are significant differences between the stages of change in the use of processes by PPC for increasing fruit and vegetable availability to preschool age children.

CHAPTER V

DISCUSSION, CONCLUSIONS AND IMPLICATIONS

In light of increased dietary intake recommendations and pending changes to federal food assistance programs aimed at increasing fruit and vegetable consumption, our interest was in determining the intent of low-income parents and caregivers of preschool age children for increasing availability of fruit and vegetable, and identifying differences between those who were serving more fruit and vegetable from those who were not. We utilized the Transtheoretical Model (TTM) of Behavior Change constructs to identify factors influencing stage of change including decisional balance, level of self-efficacy, and processes utilized by PPC in different stages of change; and an eight item fruit and vegetable frequency survey to determine the types and number of servings of fruit and vegetable being served each day. Our findings lend evidence that low-income PPC of preschool age children are indeed in different stages of change for increasing availability of fruit and vegetable to their preschool age children. These differences are not a manifestation of demographic characteristics but rather related to differences in psychosocial factors as measured by TTM constructs.

The TTM constructs of decisional balance and self-efficacy are used as measurements of a person's movement toward making a behavior change, and serve as dependent variables in interventions utilizing TTM (Prochaska, Norcross & DiClemente,

1994). The processes of change facilitate movement through the stages by supporting a positive, cognitive shift in decisional balance and by increasing self-efficacy in performing the behavior (Velicer et al, 2004). Our study supports that people who have a positive decisional balance and higher levels of self-efficacy for making fruit and vegetable available to their children employee a wider variety of experiential and behavioral processes, are in higher stages of change and are serving more fruit and vegetable to their children. For example, PPC in the preaction stage were making available 2.9 servings of fruit and vegetable daily to their preschool age children. They had a decisional balance weighted by the negative aspects related to the cost and time to prepare fruit and vegetable. In addition, they had lower self-efficacy, compared to PPC in the preparation and action stages, for preparing fruit and vegetable at home that their families would eat. In contrast, PPC in the next higher stage of preparation were serving an average of one additional serving (4.1 serving versus 2.9 servings) of fruit and vegetable to their preschool age children each day. While cost, and to a lesser degree time, were important to their decisions for serving fruit and vegetable, the health benefits provided by these foods outweighed the negative aspects; thus providing for a shift in decisional balance. PPC in the preparation stage also had higher self-efficacy than PPC in the preaction stage, with the exception of when money was limited for purchasing food. They used more processes of change, with the pivotal difference being their use of the experiential process of commitment to serve more fruit and vegetable to their children. With commitment their increased intent to serve more fruit and vegetable became overt and was demonstrated by their more frequent use of behavioral processes.

PPC in the action stage were serving 4.2 servings of fruit and vegetable which was less than our study's criteria for performing the desired behavior of making available five or more servings daily. However, as with PPC in the preparation stage, PPC in the action stage had a positive decisional balance and were confident in their ability to prepare tasty and easy fruit and vegetable their family would eat. In addition, they frequently used of a wide variety of both experiential and behavioral processes. The positive decisional balance, confidence, commitment and persistent behaviors of PPC in the action stage to make the recommended amounts of fruit and vegetable available and accessible to their children each day may have resulted in an overestimation of the servings reported in the staging algorithm, thus providing an explanation for the discrepancy between the action stage criteria of making available five or more servings of fruit and vegetable each day to their children and the lesser amount of 4.2 servings reported in the FVFQ. Despite this discrepancy, the attributes measured by TTM constructs are useful in better understanding differences in the availability of fruit and vegetable in low-income households.

Fruit and Vegetable Availability

Our findings revealed a relationship between increased availability of fruit and vegetable to low-income, preschool age children and a positive decisional balance, higher level of self-efficacy, and increased use of a wide repertoire of processes by their PPC. This is evidenced in that PPC in the preparation and action stages were making significantly more fruit and vegetable available than PPC in the preaction stage. Earlier research has found that psychosocial factors and uses of fruit and vegetable influence

differently the decision to include or exclude the foods in snacks and meals (Trudeau, Kristal, Li, & Patterson, 1998). Our findings suggest that fruit is more available to preschool age children than are vegetables.

PPC in each of the stages were serving about the same amount of 100% fruit juice in the recommended amount of six ounces (AAP, 2001). This may reflect the large proportion of the study participants who were enrolled in the WIC program and received 100% juice as part of the supplemental food package. In keeping with American Academy of Pediatrics recommendations (AAP, 2001), WIC nutrition education messages place a strong emphasis on limiting juice consumption in preschool age children to six ounces daily (Oklahoma State Department of Health [OSDH] WIC Service, 2007).

Whole fruits accounted for the greatest amount of variance between stages in the availability of total fruit. The significant difference between PPC in preaction and those in preparation and action stages in the number of whole fruit servings may be related to cost, which emerged as a factor describing differences in stages both in the decisional balance and self-efficacy constructs. This is further evidenced by our finding that parents with higher educational levels served significantly more whole fruit than those with less education, pointing to the fact that perceived cost may be a barrier in whole fruit availability. Although all the participants in our study were low-income, it is generally accepted that people with higher educational levels generally have higher incomes (Ashenfelter & Rouse, 1999). Nutrition educators have an opportunity to address food resource management and planning of purchases to help assure that whole fruits are available at the end of pay periods or food benefit issuance cycles when funds are

insufficient to purchase foods. For example, nutrition education messages should not be limited to use of fresh fruits, but also include purchasing and uses of canned and frozen varieties. These food items are less perishable and can extend availability and accessibility between food purchasing occasions (Parker, 2002).

Overall, the average amount of vegetable made available by PPC in all stages fell short of the Dietary Guideline recommendations (USDHHS, USDA, 2005). Although the amount of starchy and other vegetables available to children was less than the recommended amounts, they were the primary source of vegetables. Parker (2002) identified family preference, versatility, cost and shelf life as major factors influencing food purchases made by low-income women. Starchy vegetables meet these criteria (Reed, Frazão & Itskowitz, 2004); and potatoes, particularly, can be prepared in a variety of ways. One note of concern is that potatoes frequently are served fried (Reed et al., 2004; Skinner et al., 2004). In response, nutrition education efforts should offer recipes for potatoes that are acceptable to families with young children and have less added fat than fried preparation methods.

In summary, greater efforts should be made to increase the variety of vegetables served and emphasize the benefits of whole fruit over fruit juice.

Theoretical Constructs

An essential element for effectively using TTM based interventions in changing dietary behaviors is placement of individuals or sub-groups of the population into the correct stage (Prochaska, 2004). Using the two-stage algorithm, 43 percent of the participants on our study staged in the precontemplation and contemplation (referred to as

preaction) stages; 29 percent staged as preparation; and 27 percent staged in the action and maintenance (referred to as action) stages. The proportions are consistent with Prochaska's (2004) assertion that most people who need to change a behavior are in preaction stages. However, the ratio of study participants who staged in the precontemplation stage compared to contemplation stage (10 percent versus 33 percent, respectively) was of interest. People in the contemplation stage acknowledge they need to make a change but are not yet ready or able, compared to precontemplaters who are not cognizant of a need for behavior change. The larger number in the contemplation stage may be explained in that all study participants were enrolled in nutrition education programs. Furthermore, the percentage was consistent with those observed in two other studies in which the study participants were enrolled in nutrition programs. The first was conducted with low-income, African-American women of whom 40 percent were enrolled in WIC or had children receiving free or reduced price school meals (Henry et al., 2006). The second study was also with African-Americans self-enrolled in a program designed to increase fruit and vegetable consumption (Resnicow, McCarty & Baranowski, 2003). It would seem logical that persons who self-enroll in food assistance and nutrition education programs recognize the importance of improving dietary quality and have demonstrated their intent to make changes by enrolling in the program to seek support.

Decisional balance describes the relationship of the importance of positive and negative aspects of a behavior in the decision to make a behavior change. Typically, the negative aspects outweigh the positive in the early stages of a behavior change and reverse in later stages (Greene et al., 1999). The crossover usually occurs as subjects

move from contemplation to preparation stages. TTM refers to this milestone as 'tipping the decisional balance scale,' (Prochaska, Norcross & DiClemente, 1994) and is essential to advancing through the preaction stages. This phenomenon held true in our study. The importance of the health benefits of serving fruit and vegetable was important to all stages, but only enough to outweigh the negative aspects for PPC in the preparation and action stages. The negative aspect best describing differences in decisional balance between stages was time related to preparing fruit and vegetable. Furthermore, all PPC reported expense to be somewhat important in their decision making. Hence, expense and time emerged as the negative aspects overpowering the positive aspects of serving fruit and vegetable for PPC in the preaction stage. The observation is congruent with our finding that PPC in both the preaction and preparation stages were significantly less self-efficacy than PPC in the action stage to serve fruit and vegetable when money was low. Based on these two findings and supported by previous research (Havas, 1998; Parker, 2002), it can be concluded that cost and time are powerful determinants for low-income PPC in preaction stages when making decisions to increase availability of fruit and vegetable to their children.

The positive health aspects of fruit and vegetable consumption should be emphasized to help shift decisional balance toward the positive side. All PPC were influenced by the protection fruit and vegetable provide against chronic disease, but it appeared that PPC in preaction stages placed slightly less importance, compared to PPC in the preparation and action stages, in the benefit fruit and vegetable provide in protecting families against acute illnesses such as colds and infections. Because almost one-half of the responding PPC worked outside the home, this aspect may be especially

influential if presented in the context that healthier children can result in fewer days of work missed.

Another observed difference among PPC in different stages of change was the significantly lower level of self-efficacy reported by the preaction stage for serving fruit and vegetable in different situations compared to those in the preparation and action stages. Our finding is in agreement with previous research that found self-efficacy positively related with fruit and vegetable consumption (Henry et al., 2004; Ma et al., 2002). Once a positive decisional balance is achieved, self-efficacy is essential for movement to a higher stage because it provides confidence that use of behavioral processes will bring about desired outcomes (Prochaska, Norcross & DiClemente, 1994). In our study, limited money, time and confidence to prepare fruit and vegetable acceptable to families presented as factors limiting self-efficacy for PPC in preaction stages. The family's acceptance of fruit and vegetable is important because it influences the food items that are purchased, especially when resources are insufficient to meet needs, thus affecting availability. A major consideration of low-income households in making food purchasing decisions is limiting food waste (Parker, 2002; Shankar & Klassen, 2001); therefore they only purchase foods acceptable to their families and limit highly perishable items, such as fresh fruit and vegetable. When fruit and vegetable are not available to young children during the developmental periods when food preferences are being formed, a cyclical pattern of poor eating habits begins (Birch, 1998; Birch & Fisher, 1998).

A recent study that evaluated the influence of family resources on food preparation revealed a negative relationship between time spent preparing food and the

amount of time working outside the home, regardless of income (Mancino & Newman, 2007). Although employment in our study was not related to fruit and vegetable availability, employment does limit time for food preparation; and time does appear to have a relationship with decisional balance and self-efficacy in serving fruit and vegetable. It is logical then that efforts focusing on building self-efficacy in serving quick and easily prepared fruit and vegetable would assist PPC in moving from preaction into sequentially higher stages.

Having fruit and vegetable when eating meals away from home was a factor in which PPC in all stages had limited self-efficacy, and was the situation in which PPC in the action stage had the least confidence. The popularity of eating meals away from home has approximately doubled since the 1970s, and has negatively influenced the quality of children's diets (Lin & Guthrie, 1999). Our study did not gather information about the nature of these meals such as frequency, location, time of day and foods eaten. Additional research is needed to learn about the meals low-income families with young children eat away from home and their influence on availability of fruit and vegetable.

We found that PPC in preparation and action stages, compared to preaction stages, were using both experiential and behavioral processes more frequently in their efforts to serve fruit and vegetable. The finding is consistent with previous research positively associating use of a variety of processes with higher stages of change (Nothwehr et al., 2006). Velicer et al. (2004) explained that use of processes is the mechanism by which people move toward a positive decisional balance and increase self-efficacy. It is evident from the data we collected that the greater use of processes by preparation and action stages supports their higher levels of self efficacy. Therefore, it

seems logical that nutrition education efforts aimed at matching processes to stage and supporting their use should in turn increase self-efficacy, facilitate movement to higher stages, and ultimately increase availability of fruit and vegetable to preschool age children. In our study, the processes that were being used more often by PPC in preparation stages compared to preaction stages included the experiential processes of consciousness raising by looking for tips for adding fruit and vegetable to meals; parental reevaluation of the importance of role modeling eating fruit and vegetable; and commitment to serving more fruit and vegetable. Behavioral processes included stimulus control by planning main meals to include at least two vegetables; countering behaviors by serving fruit and vegetable for snacks instead of less nutritious foods; and rewards gained through social support for serving adequate amounts of fruit and vegetable. Differences between preparation and action stages were limited to the use of behavioral processes, specifically countering healthy behaviors for less healthy behaviors and stimulus control in the environment, both achieved by substituting fruits for less nutritious snacks and desserts and which involve a degree of planning. The aim then of nutrition education and intervention efforts should be to utilize processes of change as independent variables to address factors to shift decisional balance to a positive perspective and that increase self-efficacy. For example, because PPC in the preaction stage have are not thinking about making changes in the immediate future, interventions should emphasize experiential processes that create heightened awareness of economical, quick and easy tips for adding fruits and vegetable to meals and snacks, as well as the immediate health benefits these foods can provide. As intent of the PPC increases,

intervention strategies should move from an emphasis on experiential to behavioral processes to help build self-efficacy in making the change.

The discriminate function analysis of the processes of change revealed use of behavioral processes was the substantive descriptor for differences among PPC in the use of processes. Countering healthy behaviors for less healthy behaviors accounted for the greatest amount of variance. In our study this behavior was measured by choosing to serve fruit and vegetable to children rather than less nutritious foods for snacks. Helping parents change the dietary quality of children's snacks to include fruit and vegetable is important, because in the last two decades the prevalence of snacks consumed throughout the day has almost doubled from less than once per day to 1.6 snacks per day (Lin, Frazão & Guthrie, 1999). Thus, snacks have become increasingly important in the overall nutritional quality of children's diets. The process of countering can be utilized in nutrition education with displays and demonstrations of differences in nutrient contribution and cost between common, low-nutrient snack foods and a variety of fruit and vegetable snacks; thus increasing the PPC's ability to assess and evaluate the snack foods available in their home and identify changes to which they are willing to commit.

The ratio of PPC in action to maintenance stages (3 percent to 25 percent) indicated that once self-confidence had been established through successful use of experiential and behavioral processes to overcome cost and preparation constraints, PPC were able to sustain serving more fruit and vegetable servings to their children. However, the FVFQ revealed that PPC in action stages have opportunity to further increase availability of vegetables to meet dietary recommendations. In designing nutrition education for PPC in action stages, it should be considered that they have strong

intent and interest in serving adequate amounts of fruit and vegetable to their children, as evidenced by their response to the staging algorithm. Furthermore, they place greater value in the health benefits of fruit and vegetable compared to the negative aspects; have greater confidence in their ability to serve fruit and vegetable to their children in a variety of situations compared to PPC who are making lesser quantities available; and use a wider variety of processes to perform the behavior. As with designing interventions for preaction stages, nutrition education for PPC in action stages should address issues of value to them and relevant to their situation. Review of the data for the action stage indicated they have low confidence for providing fruit and vegetable when eating meals away from home; and cost, as with all stages, was somewhat important in their decision making. In addition, they were serving less than recommended amounts vegetables in the other sub-group. Their strengths were in their confidence in serving fruit and vegetable when preparing meals at home and in preparing recipes acceptable to their families. Therefore, opportunity exist for increasing their repertoire for variety of vegetables by focusing on behavioral strategies such as tasting and cooking sessions focusing on low-cost and easily prepared recipes, community and/or home gardening programs and awareness of availability of local produce sources (Nanney, Johnson, Elliot, & Haire-Joshu, 2007).

In summary, low-income PPC of pre-school age children were in different stages of change for making available fruit and vegetable, with the majority of the PPC being in preaction stages. PPC in the preaction stage based their decisions more heavily on the negative aspects of serving fruit and vegetable, primarily cost and time to prepare, than did PPC in preparation and action stages, whose decisions were more heavily influenced

by the immediate health benefits provided by fruit and vegetable. PPC in the action and preparation stages had greater confidence in their ability to serve fruit and vegetable in different situations. Their higher level of self-efficacy was facilitated by more frequent use of a variety of processes, especially the behavioral process of countering by substituting fruit and vegetable for less nutritious foods. As such, the constructs of TTM have practical applications for use in nutrition education efforts designed to increase fruit and vegetable availability to low-income preschool age children.

Conclusions

Our study supports the usefulness of TTM in identifying differences between PPC who are making larger amounts of fruit and vegetable available to their young children and those who are not. PPC recognized the importance of making fruit and vegetable available to children; however, those in precontemplation and contemplation stages are impeded by perceived barriers, primarily cost and the time to prepare tasty and easy fruit and vegetable their families will eat. Helping families build confidence in preparing economical, quick and easy fruit and vegetable acceptable to their families and building skills for substituting fruit and vegetable for less nutritious foods in meals and snacks should provide positive outcomes in assisting families in increasing availability of fruit and vegetable. Federal food assistance programs should continue funding current and new initiatives that reduce economic barriers of fruit and vegetable availability and accessibility as well as funding programs that provide nutrition education to build skills and support families in their efforts to improve dietary quality.

Implications for Nutrition Education

Transtheoretical Theory of Behavior Change posits that interventions should be matched to the persons or sub-population's stage of change. Our study found almost half (43 percent) of the low-income PPC with preschool age children who responded were in preaction stages, with the majority being in the contemplation stage, for increasing fruit and vegetable availability. Therefore, efforts should be made to help PPC shift their decisional balance toward the positive side by using experiential processes that emphasize the health benefits provided by fruit and vegetable and sharing ideas for adding economical, tasty and easy to prepare fruit and vegetable to family meals and snacks. Techniques for individual sessions may utilize motivational interviewing (Miller & Rollnick, 2002) in which the nutrition educator provides opportunity for the PPC to identify barriers and strategies that are appropriate for their particular situation and to which they are committed to trying. The nutrition educator may find it helpful to provide ideas that have worked with other low-income parents with young children. As commitment to trying ideas for increasing fruit and vegetable availability is made, nutrition education should turn to focusing on behavioral processes used by PPC in preparation stages to increase self-efficacy and facilitate movement to a higher stage of change. Our study found the most used behavioral process to be countering behaviors by substituting fruit and vegetables for less healthy snacks. The ideas should be budget friendly, quick and easy to prepare and appealing to families.

Nutrition education for low-income populations is being increasingly conducted in group sessions (Kaiser, McMurdo & Joy, 2007). Using a learner-centered approach (Norris, 2003) based on the TTM can be effective for providing nutrition education

(Prochaska, 2004). Because most of the participants will be in preaction stages, sessions should be matched to their particular attributes (Finckenor & Bredbenner, 2000). PPC in later stages can provide proven ideas and tips for increasing fruit and vegetable availability and accessibility. Group lessons can be effective in that they provide a safe environment for the PPC in early stages from which they can gain ideas and positive perceptions from their peers for increasing fruit and vegetable availability. In addition, the group setting provides PPC in preparation and action stages with opportunity to utilize the behavioral process of rewards gained through social support and recognition for their success.

Because the average number of servings of fruit served to children were in keeping with the Dietary Guidelines (USDHHS & USDA, 2005), and average number of servings of vegetable fell short of the recommendations, nutrition educators should focus more heavily on messages aimed at increasing vegetable variety and availability, especially for PPC in action stages. Utilizing cooking demonstrations and interactive classes using an array of economical, quick and easy recipes should capitalize on the strong interest and positive attitudes of PPC in the preparation and action stages to further increase availability of vegetables. Conducting these experiences at a time when family members can be present to help prepare and taste the recipes in a safe environment should also be considered.

Implications for Research

It is recommended that the findings of this study describing the stage of change of low-income PPC with preschool age children be used to develop a stage-based nutrition

education model aimed at increasing fruit and vegetable availability. Subsequently research should be conducted to determine if the provision of a stage-based nutrition education intervention changes fruit and vegetable availability and accessibility and ultimately fruit and vegetable consumption by preschool age children.

Our study was limited to the assessment of the current stage of change of low-income PPC, the majority of which participated in the WIC program, for increasing availability and accessibility of fruit and vegetable to their preschool age children. Proposed rules have been posted and are currently under consideration by USDA for the addition of fruit and vegetable to the supplemental WIC food benefit package (United Stated Department of Agriculture, Food and Nutrition Service, 2006). A policy change of this nature has potential to amend the perceived affordability of fruit and vegetable by low-income PPC, thus altering their stage of change. It is recommended that this study be repeated after the proposed policy change has become effective and implemented to measure the affect of the intervention on the stage of change of low-income parents for increasing availability and accessibility of fruit and vegetable to their preschool age children.

Previous research suggests that availability of fruit and vegetable is influenced by frequency of family meals (Gillman et al., 2000). However, our study did not address this factor. Therefore, future research is needed to determine if stage of change for increasing fruit and vegetable availability is associated with the frequency and composition of family meals in low-income families with preschool age children. The findings would contribute to the existing knowledge and benefit nutrition and health educators in assisting families in preparing and planning meals that provide amounts and

varieties of fruit and vegetable to enable young children to develop healthy food preferences and meet dietary recommendations for consumption.

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APPENDICES

APPENDIX A

Oklahoma State University Institutional Review Board

Date:	Monday, February 20, 2006
IRB Application No	HE0643
Proposal Title:	Assessing Stage of Change for Increasing Fruit and Vegetable Consumption in Low Income Families with Preschool Age Children
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 2/19/2007

Principal Investigator(s

Deana Hildebrand
1217 Pine Ridge Circle
Edmond, OK 73034

Nancy Betts
301 HES
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Sue C. Jacobs, Chair
Institutional Review Board

Oklahoma State University Institutional Review Board

Date	Tuesday, January 23, 2007	**Protocol Expires:**	**1/22/2008**
IRB Application No:	HE0643		
Proposal Title:	Assessing Stage of Change for Increasing Fruit and Vegetable Consumption in Low Income Families with Preschool Age Children		
Reviewed and Processed as:	Exempt **Continuation**		

Status Recommended by Reviewer(s): **Approved**

Principal Investigator(s) :

Deana Hildebrand
1217 Pine Ridge Circle
Edmond, OK 73034

Nancy Betts
301 HES
Stillwater, OK 74078

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

Signature :

Sue C. Jacobs, Chair, Institutional Review Board

Tuesday, January 23, 2007
Date

APPENDIX B

Fruit and Vegetable Survey
Participant Informed Consent Information Sheet

Project: We would like to invite you to be part of a research project that will tell us more about how families with young children think about eating more fruits and vegetables. The name of the project is *Assessing Stage of Change for Increasing Fruit and Vegetable Consumption in Low-Income Families with Preschool Age Children.*

Investigators: This research is being carried out by Deana Hildebrand, a graduate student at Oklahoma State University; and Nancy Betts; PhD, RD, Oklahoma State University.

Purpose: You are being asked to participate because you have a child that is between the ages of 1 year and 5 years, and receive nutrition education through WIC, EFNEP, or ONE programs.

Your thoughts are important because they will help nutrition educators know more about why families with young children do or don't eat fruits and vegetables. The information will be used to plan nutrition education.

Procedures: You will be asked questions about what you think when deciding or not deciding to eat and serve your family fruits and vegetables.

Answering the questions will take about 7 to 10 minutes. If there is a part of the survey or a question you do not understand you may ask for help.

Risks of Participation: There are no known risks associated with this project which are greater than those you normally have in daily life.

Benefits: People who have answered these questions before said it helped them better understand their own thoughts and why they may or may not eat more fruits and vegetables.

Confidentiality: You will not be asked to put your name on the survey. We will not be able to identify your individual responses. The surveys will be kept in a locked file while data is being entered and analyzed. Information will be maintained for a period of two years and then destroyed.

The information obtained in this study may be published in scientific journals or presented at scientific meetings, but only group information will be shared. No one will know that you completed a survey or how you answered.

The Oklahoma State University Institutional Review Board has the authority to inspect consent records and data files to be sure the rules are followed.

Contacts: If you have any questions about this project contact Deana Hildebrand at 405-340-9160, or Dr. Nancy Betts at 405-744-5040. For information on subject's rights, contact Dr. Sue Jacobs, IRB Chair, 415 Whitehurst Hall, 405-744-1767.

Participant Rights: Your participation is voluntary. If you decide not to complete the survey, you will not lose any of your normal WIC or food stamp benefits.

If you would like to participate please complete the attached survey. You may keep this information sheet for future reference.

After you complete the survey please give it to the WIC clinic staff or Nutrition Education Assistant.

Thank you for your time.

APPENDIX C

Script for Surveyor for Explaining Agreement to Participate

Project: We would like to invite you to be part of a research project that will tell us more about what families with young children think about eating more fruits and vegetables. The name of the project is *Assessing Stage of Change for Increasing Fruit and Vegetable Consumption in Low-Income Families with Preschool Age Children.*

Investigators: This research is being carried out by Deana Hildebrand, a graduate student at Oklahoma State University; and Nancy Betts; PhD, RD, Oklahoma State University.

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Answering the questions will take about 7 to 10 minutes. If there is a part of the survey or a question you do not understand you may ask for help.

Risks of Participation: There are no known risks associated with this project which are greater than those you normally have in daily life.

Benefits: People who have answered these questions before said it helped them better understand their own thoughts and why they may or may not eat more fruits and vegetables.

Confidentiality: You will not be asked to put your name on the survey. We will not be able to identify your individual responses. All information will initially be kept in a locked file while data is being entered and analyzed. Information will be maintained for a period of two years and then destroyed.

The information obtained in this study may be published in scientific journals or presented at scientific meetings, but only group information will be shared. No one will know that you completed a survey or how you answered.

The Oklahoma State University Institutional Review Board and have the authority to inspect consent records and data files to be sure the rules are followed.

Contacts: If you have any questions about this project contact Deana Hildebrand at 405-340-9160, or Dr. Nancy Betts at 405-744-5040. For information on subject's rights, contact Dr. Sue Jacobs, IRB Chair, 415 Whitehurst Hall, 405-744-1767.

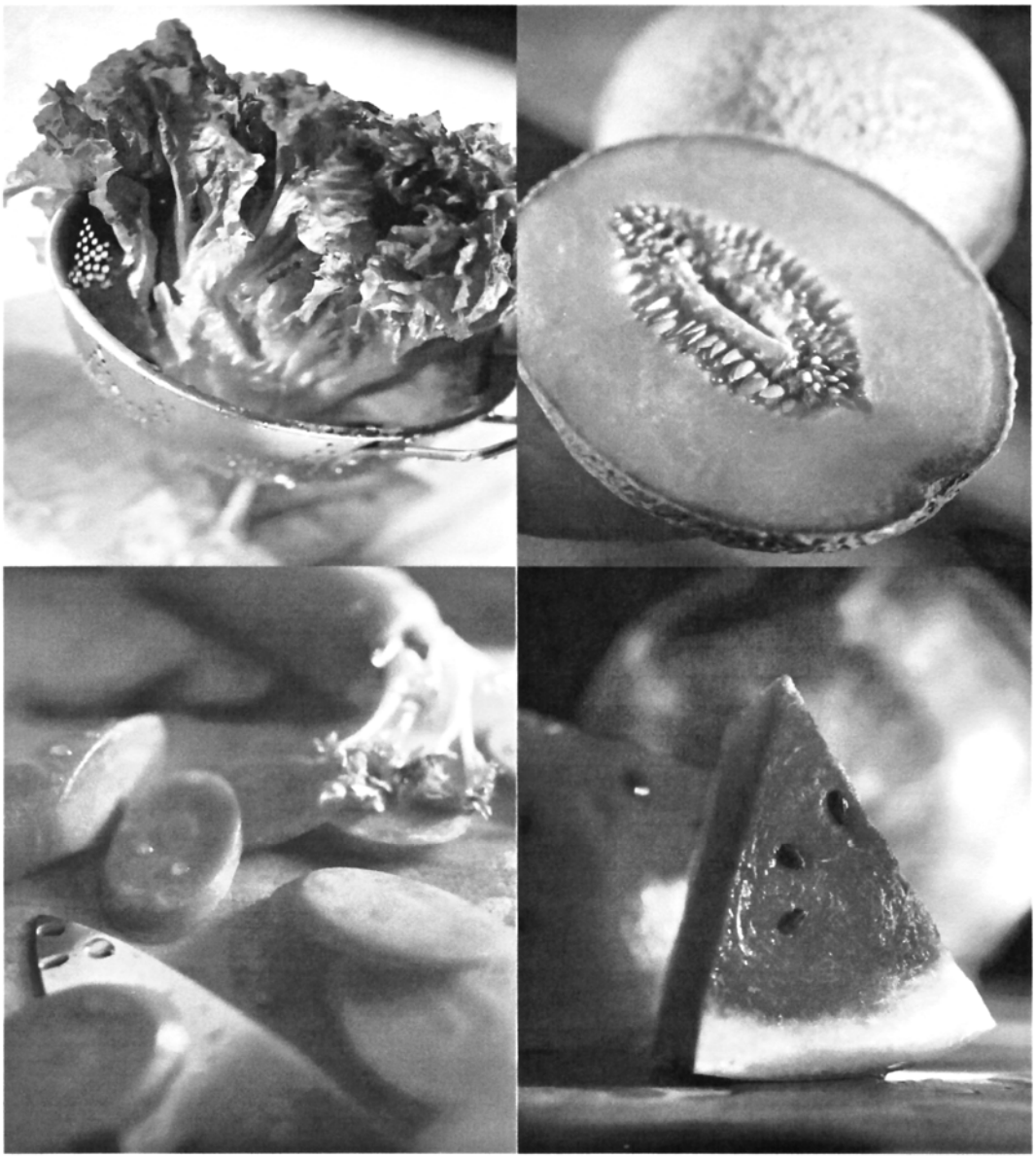
Participant Rights: Your participation is voluntary. If you decide not to complete the survey, you will not lose any of your normal WIC or food stamp benefits.

If you would like to participate please complete the attached survey. You may keep the informed consent information sheet if you desire.

After you complete the survey please return it to me.

Appendix D

Fruit and Vegetable Survey



FRUIT AND VEGETABLE SURVEY

These questions are about you and your family. Please answer the questions in each box.

Are you the parent or main caregiver of a child that is 1 to 5 years old?

_____ Yes _____ No

Which of the following nutrition education programs does your family participate in? You may mark more than one.

_____ WIC (Women, Infants & Children) How long? _____ years

_____ EFNEP (Expanded Food & Nutrition Education Program) How long? _____ months

_____ ONE (OK Nutrition Education) How long? _____ months

If you marked more than one, have you filled out this survey somewhere else?

_____ Yes _____ No

Which race best describes you?
Place an "X" by the best answer.

_____ American Indian or Alaskan Indian

_____ Asian

_____ Black or African

_____ Native Hawaiian or Other Pacific Islander

_____ White

What is your ethnic background?

_____ Hispanic or Latino

_____ Not Hispanic or Latino

How old are you?

_____ years

What is your gender?

_____ male _____ female

How many years of school have you completed? Place an "X" by the best answer.

_____ Less than 12 years

_____ High school graduate or GED

_____ Some college or college graduate

How many hours do you work outside the home each week for paid wages or salary?

Place an "X" by the best answer.

_____ Less than 32 hours a week (part-time)

_____ 32 hours or more a week (full-time)

_____ I do not work outside the home.

Intention to Serve Fruits and Vegetables

The next few questions ask about the number of servings of fruit and vegetables you serve your family each day, and if you plan to serve more fruits and vegetables to your family in the future.

Keep in mind that 1 serving is:
- 1 piece of raw fruit,
- ½ cup of cooked or raw, cut-up fruit or vegetables (about the size of a tennis ball),
- 1 cup of salad,
- ¾ cup of 100% fruit or vegetable juice.

Instructions:
Answer question 1. Depending on your answer, go to question 2 or 3.

1. **How many servings of fruits and vegetables do you usually serve your family each day? Think about each of your meals and snacks as you add up the servings. Include the meals you eat away from home.**

   Circle the best answer.

0	1	2	3	4	5	6	7	8	9
Zero	One	Two	Three	Four	Five	Six	Seven	Eight	Nine

If you answered 0, 1, 2, 3, or 4 servings of fruits and vegetables, go to question 2.
If you answered 5 or more servings of fruits and vegetables, go to question 3.

Mark the best answer.

2. **Do you plan to start regularly serving your family 5 or more servings a day?**

   _____ **No**, I *do not* plan to serve more fruits and vegetables each day in the next 6 months.

   _____ **Yes**, I *do* plan to serve more fruits and vegetables each day in the NEXT 6 MONTHS.

   _____ **Yes**, I *do* plan to serve more fruits and vegetables each day in the NEXT 30 DAYS.

3. **How long have you been serving your family 5 or more servings of fruits and vegetables each day?**

   _____ Less than 6 months

   _____ 6 months or more

Pros and Cons

How many fruits and vegetables you serve your family depends upon how important the pros (**benefits**) and cons (**hassles**) are to you.

Instructions:
Think about how important each of the following statements is to you. **If you disagree with a statement, or are not sure of how to answer, the statement is probably not important to you.**

Circle the best answer.

1. **Fruits and vegetables can be expensive.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

2. **Vegetables and fruits help protect your family from diseases like cancer and heart disease.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

3. **Sometimes it takes too much time to prepare fruits and vegetables.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

4. **Eating fruits and vegetables can help keep your family from getting sick with colds and infections.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

5. **Buying fruits and vegetables may mean more trips to the store.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

6. **Eating fruits and vegetables can help your family members have a healthy weight.**

1	2	3	4	5
Not important	Slightly important	Somewhat important	Very important	Extremely important

Confidence

This part looks at **HOW CONFIDENT** you are about serving fruits and vegetables to your family in different situations. Being confident means that you know that you can do something.

Circle the best answer.

1. How **CONFIDENT** are you that you are able to serve your family vegetables and fruits when **you are preparing meals at home?**

1	2	3	4
Not at all confident	Somewhat confident	Confident	Very confident

2. How **CONFIDENT** are you that you are able to serve your family vegetables and fruits when **you are eating meals away from home?**

1	2	3	4
Not at all confident	Somewhat confident	Confident	Very confident

3. How **CONFIDENT** are you that you can **prepare tasty, easy recipes using fruits and vegetables?**

1	2	3	4
Not at all confident	Somewhat confident	Confident	Very confident

4. How **CONFIDENT** are you that you are able to serve your family fruits and vegetables when **you may be low on money for buying food?**

1	2	3	4
Not at all confident	Somewhat confident	Confident	Very confident

5. How **CONFIDENT** are you that you are able to serve your family fruit and vegetables when **you do not have enough time to prepare fruits and vegetables?**

1	2	3	4
Not at all confident	Somewhat confident	Confident	Very confident

Strategies for Serving More Fruits and Vegetables

These statements are about your thoughts, feelings, and experiences over the **past month** about serving fruits and vegetables to your family. They can affect what you choose to serve when it comes to fruits and vegetables.

Circle the best answer.

Over the past month, when you thought about what to serve your family, **HOW OFTEN** did you:

1. Look for tips on how to add more vegetables and fruits to meals?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

2. Notice that grocery stores have more ready-to-eat fruits and vegetables?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

3. Notice there are more healthy vegetables than before at the places where your family eats out?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

4. Eat fruits and vegetables because it set a good example for your children?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

5. Think that if your family ate more fruits and vegetables they would have fewer health problems?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

6. Feel bad when you realized that you were not serving your family enough fruits and vegetables?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

7. Serve more fruits and vegetables because you have decided that you would?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

8. Choose to have or serve fruits and vegetables for snacks instead of junk foods?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

9. Leave a bowl of fruit out for snacks?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

10. Talk to other people about eating and serving your family more fruits and vegetables?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

11. Give yourself a reminder to serve two vegetables with main meals?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

12. Serve fruit instead of sweets for dessert?

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

13. Feel pleased when other people said you were being a good parent or caregiver because you served your family fruits and vegetables.

1	2	3	4	5
Not at all	Hardly ever	Sometimes	Often	All of the time

Fruit and Vegetable Food Frequency

This section is about the different **fruits and vegetables you usually serve your family**.

Please think about all the fruits and vegetables that you normally serve. Include:
- raw and cooked,
- eaten as snacks and at meals,
- eaten at home and away from home (restaurants, friends, take-out), and
- eaten alone and mixed with other foods.

*Circle how many times you usually serve each food and, if you serve the fruit or vegetable, how much you **usually** have.*
Choose the best answer for each question. Mark only one answer for each question.

1. How often do you serve **100% fruit juice** such as orange, apple, grape, or grapefruit juice? Do not count fruit drinks like Kool-Aid, Sunny DeLite, lemonade, Hi-C, cranberry juice drink, Tang, and Twister. Include 100% juice you drink at all mealtimes and between meals.

Never (Go to question 2)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

1a. Each time you serve **100% juice**, how much do you usually serve your 1 to 5 year old?

Small serving (½ cup or less)	Medium serving (¾ cup)	Large Serving (1 cup or more)

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2. How often do you serve **fruit**? Count any kind of fruit – fresh, canned, frozen, and dried. **Do not count juices.** Include fruit you serve at mealtimes and for snacks.

Never (Go to question 3)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

2a. Each time you serve **fruit**, about how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup or ½ piece of fresh fruit)	Medium serving (½ cup or 1 piece of fresh fruit)	Large Serving (more than ½ cup or more than 1 piece of fresh fruit)

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3. How often do you serve **lettuce salad (with or without other vegetables)**?

Never (Go to question 4)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

3a. Each time you serve **lettuce salad**, how much do you usually serve your 1 to 5 year old?

Small serving (less than 1 cup)	Medium serving (about 1 cup)	Large Serving (more than 1 cup)

4. How often do you serve **starchy vegetables such as potatoes, corn, and peas**?

Never (Go to question 5)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

4a. Each time you serve **starchy vegetables such as potatoes, corn, and peas**, how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup)	Medium serving (about ½ cup)	Large Serving (more than ½ cup)

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5. How often do you serve **dark green vegetables such as broccoli, spinach, kale, or other greens**?

Never (Go to question 6)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

5a. Each time you serve **dark green vegetables such as broccoli, spinach, kale, or other greens,** how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup)	Medium serving (about ½ cup)	Large Serving (more than ½ cup)

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6. How often do you serve **orange vegetables such as carrots, sweet potatoes, pumpkin, and winter squash?**

Never (Go to question 7)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

6a. Each time you serve **orange vegetables such as carrots, sweet potatoes, pumpkin, and winter squash,** how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup)	Medium serving (about ½ cup)	Large Serving (more than ½ cup)

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7. How often do you serve **tomatoes or salsa**?

Never (Go to question 8)	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

7a. Each time you serve **tomatoes or salsa**, how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup)	Medium serving (about ½ cup)	Large Serving (more than ½ cup)

8. How often do you serve other **vegetables such as okra, peppers, cabbage, and summer squash**?

Never	1-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	1 time a day	2 or more times a day

8a. Each time you serve **other vegetables such as okra, peppers, cabbage, and summer squash**, how much do you usually serve your 1 to 5 year old?

Small serving (less than ½ cup)	Medium serving (about ½ cup)	Large Serving (more than ½ cup)

for your time in completing the survey.

VITA

Deana A. Hildebrand

Candidate for the Degree of

Doctor of Philosophy

Thesis: ASSESSMENT OF THE STAGE OF CHANGE FOR INCREASING FRUIT AND VEGETABLE AVAILABILITY AND ACCESSIBILITY IN LOW-INCOME FAMILIES WITH PRESCHOOL AGE CHILDREN

Major Field: Human Environmental Sciences (emphasis in Nutritional Sciences)

Biographical:

Education: Bachelor of Science, Vocational Consumer Home Economics Education, University of Central Oklahoma, Edmond, Oklahoma, May 1978. Master of Science, Nutrition and Food Management, University of Central Oklahoma, May 1988. Completed the requirements for the Doctor of Philosophy degree at Oklahoma State University, July, 2007.

Experience: Vocational Consumer Home Economics, secondary school teacher, 1978 to 1980. Oklahoma Department of Education, Child Nutrition Services, Program Coordinator, 1988 to 1998. Edmond Public Schools, Child Nutrition Services Director, 1998 to 2002. Oklahoma State Department of Health, WIC Service, Education and Training Coordinator, 2002 to 2006. Oklahoma State University, Department of Nutritional Sciences, Extension Nutrition Assistant Specialist, 2006 to current.

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Name: Deana A. Hildebrand Date of Degree: July, 2007

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: ASSESSMENT OF THE STAGE OF CHANGE FOR INCREASING FRUIT AND VEGETABLE AVAILABILITY AND ACCESSIBILITY IN LOW-INCOME FAMILIES WITH PRESCHOOL AGE CHILDREN

Pages in Study: 113 Candidate for the Degree of Doctor of Philosophy

Major Field: Human Environmental Sciences (emphasis in Nutritional Sciences)

Scope and Method of Study: In light of increased dietary intake recommendations and pending changes to federal food assistance programs aimed at increasing fruit and vegetable consumption, our interest was in determining the intent of parents and caregivers of preschool age children for making available more fruit and vegetable, and identifying differences between those already serving adequate amounts and those who were not. Data for the cross-sectional, quantitative study came from 238 low-income parents/primary caregivers of preschool age children. We utilized the Transtheoretical Model of Behavior Change to assess the psychosocial factors of decisional balance, self-efficacy and processes influencing availability and accessibility of fruit and vegetable. A two-stage algorithm was used for staging respondents into stages of change, and an eight item fruit and vegetable frequency survey was used to determine the availability of fruit and vegetable accessible to children. Analyses of variance were used to compare differences between stages on each of the constructs and fruit and vegetable availability.

Findings and Conclusions: Our findings lend evidence that low-income PPC of preschool age children were in different stages of change for increasing availability of fruit and vegetable to their preschool age children. Children of PPC in preparation and action stages had significantly greater availability of whole fruit, dark green vegetables and other vegetables. Availability of 100% juice, orange vegetables and starchy vegetables was similar for all stages. PPC in preaction stages had a negative decisional balance related to cost and time to prepare fruit and vegetable compared to PPC in preparation and action stages. Self-efficacy, especially preparing fruit and vegetable acceptable to families, increased as stage and availability increased. PPC in action stages more frequently employed a variety of strategies to make fruit and vegetable available, particularly the behavioral process of countering by serving fruit and vegetable for snack instead of less nutritious foods. As such, the constructs of TTM have practical applications in nutrition education efforts aimed at increasing fruit and vegetable availability and accessibility in low-income households with preschool age children.

ADVISER'S APPROVAL: Nancy M. Betts, PhD., RD