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# Evaluation of a Nutrition Program Targeting Child Care Centers

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EVALUATION OF A NUTRITION PROGRAM TARGETING  
CHILD CARE CENTERS

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EVALUATION OF A NUTRITION PROGRAM TARGETING

CHILD CARE CENTERS

by

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DISSERTATION

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## **Abstract**

Color Me Healthy (CMH) is an interactive nutrition program designed for preschool aged children in child care settings. The current study examined if CMH increases the consumption of fruit and vegetables. Child care centers were randomly assigned to one of two conditions; children (n=165) in ten centers received CMH and children (n=98) in seven centers acted as controls. Consumption of fruit and vegetable snacks was assessed at baseline, one week post-intervention and 3 months post-intervention. Hierarchical linear modeling determined that group assignment was the only significant predictor of fruit and vegetable consumption. Children who were exposed to the CMH program consumed significantly more fruit and vegetable snack at post-intervention assessments. The current findings suggest that CMH may be used in child care settings for developing healthy eating habits.

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# **Chapter 1: Evaluation of a Nutrition Program Targeting Child Care Centers**

## **1.1 Obesity Epidemic**

During the past thirty years the prevalence of overweight and obese individuals in the United States has steadily increased among all age groups and ethnic groups (Nation At Risk, 2005). Results from the 1976 – 1980 National Health and Nutrition Examination Survey (NHANES) indicated that 47.0 percent of adults were overweight or obese. Results from the 2003 – 2004 NHANES indicated that 66.2 percent of adults were overweight or obese. (National Center for Health Statistics [NCHS], 2008).

The increase in the prevalence of overweight children is alarming. Data from the 1966 – 1970 NHANES survey reveal that 4.2 percent of children ages six to eleven years old were overweight and 4.6 percent of children ages 12 to 19 were overweight (NCHS, 2008). Data from the 2003 – 2004 NHANES reveal that 18.8 percent of children ages six to eleven are overweight and 17.4 percent of children ages 12 to 19 were overweight (NCHS, 2008). Additionally, children are becoming overweight at an earlier age. Approximately one out of every four preschool children are either overweight or at risk of being overweight (Hedley, et al., 2004). The prevalence of overweight children ages 2 to 5 in the United States has increased from 7 percent in 1992, to 16.4 percent in 2006 (CDC, 2008, Pediatric Nutrition Surveillance System [PedNSS], 2007). Currently, in Idaho 12.4 percent of children between the ages of two and five are overweight (PedNSS, 2007). Children who are overweight are much more likely to become obese adults (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Whitaker et al. (1997) found that 52 percent of obese children between the ages of three and six were also obese at age 25. Moreover, children from low income families and ethnic minority groups are at higher risk of becoming obese (Paxon, Donahue, Orleans, & Grisso, 2006). In 2004, the Institute of Medicine

issued a report calling the prevention of childhood obesity a national priority (Koplan, Liverman, Kraak, 2005).

Until 1980 the prevalence of overweight and obese individuals remained fairly stable. Several factors may have contributed to the current obesity epidemic, such as increased television viewing, increased video game usage, increased prevalence of fast food restaurants, increased sugary and fat laden food items, decreased physical activity in dual career parents, increased amount of food consumed away from home, increased amount of pre-prepared foods, and reduction in access to fruits and vegetables, (Anderson & Butcher, 2006; Paxon, Donahue, Orleans, & Grisso, 2006). Moreover, low nutrition foods and beverages have become more accessible, affordable, and appealing compared to healthy food items (Paxon, Donahue, Orleans, & Grisso, 2006).

## **1.2 Consequences of Childhood Overweight and Obesity**

Many obesity related disease that used to be present only in adults are now present among children (Daniels, 2006), such as high blood pressure, hardening of the arteries, type 2 diabetes, nonalcoholic fatty liver disease, and sleep apnea (Daniels, 2006). Daniels (2006) comments that the increasing prevalence of these conditions in children, may cause children to live shorter lives than their parents. It is estimated that two to four percent of the pediatric population has high blood pressure, which is a risk factor for heart attack and stroke (Daniels, 2006). Hardening of the arteries begins with fatty streaks on the artery's interior walls, which leads to fibrous plaque build up. It is estimated that 50 percent of the pediatric population has fatty streaks and eight percent has fibrous plaque, which can block blood flow to the heart and brain (Daniles, 2006). Type 2 diabetes is a condition where the body either makes too little insulin or cannot properly use the insulin it makes, which elevates blood sugar levels (Daniels,

2006). Previously, type 2 diabetes was called “adult-onset diabetes” and was associated with obesity. With the prevalence of obese children increasing, type 2 diabetes is occurring in children as young as eight years old (Daniels, 2006). Nonalcoholic fatty liver disease is associated with obesity in adults (Daniels, 2006). As obesity develops, fat deposits in the liver which can lead to cirrhosis and liver failure. It is estimated that 50 percent of obese children have nonalcoholic fatty liver disease (Daniels, 2006). The health consequences associated with obesity have serious economic impact in the health care system. Data from the 1998 Medical Expenditure Survey estimated the medical costs attributed to overweight and obesity at \$78.5 billion (Finkelstein, Fiebelkorn, & Wang, 2003; CDC, 2008). Approximately half of these expenditures were paid by Medicaid or Medicare (Finkelstein, Fiebelkorn, & Wang, 2003; CDC, 2008). For example in Idaho, BRFSS data from 1998 -2000 indicate that Medicare and Medicaid expenditures for overweight and obesity related issues were \$227 million dollars (Finkelstein, Fiebelkorn, & Wang, 2004; CDC, 2008).

### **1.3 Fruits and Vegetables**

The epidemic of childhood obesity is a complex problem. Lack of healthy eating and physical activity contribute to the development of obesity (Grunbaum, Kann, Kinchen, Ross, Hawkins, Lowry, et al, 2004). Few children and adolescents have healthy eating and physical activity habits that decrease their risk of becoming overweight. Many children have eating patterns that are not consistent with the recommendations for a healthy diet; children eat too many fatty foods, sugar-sweetened beverages, and not enough fruit and vegetables (Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Ludwig, Peterson, & Gortmaker, 2001).

Consuming a diet high in fruits and vegetables is associated with lower risks for numerous chronic diseases, including cancer and cardiovascular disease (Ness & Fowles, 1997;

Block, Patterson, & Subar, 1992). Previous research has found that a diet rich in fruits and vegetables reduces the risk of cancers of the mouth, larynx, esophagus, stomach, and lung (National Cancer Institute (NCI), 2008). A diet rich in fruits and vegetables may also reduce the risk of cancers of the colon, pancreas, and prostate (NCI, 2008).

Fruits and vegetables are also a good source of vitamins and minerals that help protect against chronic diseases (Fruits and Veggies: More Matters (FVMM), 2008). The key nutrients found in fruits and vegetables include calcium, fiber, folate, iron, magnesium, potassium, vitamin A, and vitamin C. Table 1 displays fruits and vegetables that are sources for these latter vitamins and minerals. A diet high in fruits and vegetables also reduces calorie intake. Previous weight loss studies have found that increasing consumption of fruits and vegetables is associated with weight loss (Epstein, Gordy, Raynor, et al, 2001; Dolecek, Stamler, Caggiula, et al, 1997; Fitzwater, Weinsier, Woolridge, et al, 1991).. Fruits and vegetables are low in calories and provide a feeling of satiety. Thus, fruits and vegetables are a recommended substitute for high calorie- high fat food items.

#### **1.4 Recommended Amounts of Fruits and Vegetables**

In January 2005, the Dietary Guidelines for Americans changed the recommended amount of fruits and vegetables from 5 to 9 *servings* of fruits and vegetables to new guidelines recommending 2 to 6.5 *cups* of fruits and vegetables a day (CDC, 2008). Thus, the new guidelines provided the quantity, measured in cups, of fruits and vegetables that an individual should consume per day. This change was in response to consumer research which found that cups is an easy measurement to understand and is a motivating tool to help consumers visualize the recommended amounts of fruits and vegetables (CDC, 2008). In March 2007, the Fruits and Veggies- More Matters (FVMM) campaign replaced the 5-A-Day campaign (CDC, 2008).

FVMM is a partnership between the Center for Disease Control and Prevention, Department of Health and Human Services, National Cancer Institute, and Produce for Better Health Foundation (CDC, 2008).

The recommended amount of fruits and vegetables depends on age and physical activity level. Low activity level is defined as 30 minutes or less of moderate or vigorous physical activity (i.e., brisk walking, jogging, biking, aerobics) most days of the week (USDA, 2008). Moderate activity level is defined as 30 to 60 minutes of moderate to vigorous physical activity most days of the week (USDA, 2008). High activity level is defined as more than 60 minutes of moderate to vigorous physical activity most days of the week (USDA, 2008). In general, individuals who are highly active need to consume slightly more fruits and vegetables than individuals who are not as active. Among preschool age children who are less active the recommended amount is 1 cup of fruit per day and 1.5 cups of vegetables per day. Among preschool children who are moderately active the recommended amount is 1.5 cups of fruit per day and 2 cups of vegetables per day. Among preschool age children who are highly active the recommended amount is 1.5 cups of fruit per day and 2.5 cups of vegetables per day (FVMM, 2008).

The majority of children do not consume the recommended amounts of fruits and vegetables (NCI, 2008). In 2003-2004, individuals aged two and older had, on average, 1.0 cup of fruit per day and 1.6 cups of vegetables per day (NCI, 2008). Additionally, the amount consumed often consists of starch filled potatoes or sugar sweetened fruit juices. A previous study found that French fries constituted nearly 25% of all of the vegetables that were consumed by children and adolescents (Krebs-Smith, Cook, Subar, Cleveland, Friday, & Kahle, 1995). Parents and child care providers often view fruit juice as nutritious. Most fruit juices are

conveniently packaged, taste sweet to children, and are marketed as healthy, thus making them easily over consumed by toddlers and preschool age children. Since juice is viewed as nutritious child care providers and parents may not set limits on juice consumption (Story, Kaphingst, & French, 2006). A cross-sectional study found that children, ages two to five, who drank twelve ounces (1.5 cups) or more of fruit juice per day were more likely to be obese than those children who drank less juice (Dennison, Rockwell, & Baker, 1997). The American Academy of Pediatrics (AAP) recommends that children between the ages of one and five drink less than four to six ounces (0.50 to 0.75 cups) of fruit juice per day. (AAP Committee on Nutrition, 2001). Whole fruit is always encouraged over fruit juice. Whole fruit has the benefit of fiber and also takes longer for children to eat (Story, Kaphingst, & French, 2006).

### **1.5 Child Care Settings**

The reliance on external child care has significantly increased over the past three decades (Story, Kaphingst, & French, 2006). The increase in utilization of child care is associated with the changing trends of maternal employment. From 1970 to 2000, the number of mothers in the workforce rose from 38% to 68% (Child Health USA, 2002). Today, 60% of mothers with preschool age children are in the workforce; 70% work full time and 30% work part time (Child Health USA, 2002). The number of child care facilities has also increased over the past three decades. It is estimated that the number of child care facilities increased from 25,000 in 1977 to 116,000 in 2004 (Hestelle & Koch, 2003). Additionally, 41% of preschool age children are in child care for 35 hours or more each week (Capizzano & Adams, 2002). Thus, parents and child care providers now share responsibility during developmentally important years.

Child care settings have been relatively overlooked in the fight against childhood obesity and provide an underutilized opportunity to teach children healthy behaviors (Story, Kaphingst,

and French, 2006). Very few studies have evaluated the efficacy of nutrition and physical activity programs in child care settings, indicating a need to develop and evaluate effective strategies to change children's health habits (Story, Kaphingist, & French, 2006).

### **1.6 Previous Programs to Increase Fruit and Vegetable Consumption**

A review of nutrition programs among preschool age children suggested that nutrition programs among this age group should include the following: 1) involvement of parents/families, either as major recipients of the program or in conjunction with classroom curriculum; 2) targeting preschool children's behaviors; 3) use of developmentally appropriate learning experiences; 4) include food based activities that allow children to taste fruit and vegetables, prepare nutritious snacks, and even plant a fruit and vegetable garden; 5) include activity based teaching activities that can include art projects, singing songs about healthy foods, role playing eating healthy foods, stories, and puppets (Contento, Balch, Bronner, Lytle, Maloney, Olson, et al. 1995). The review states that a nutrition program is more likely to be utilized if the program becomes integrated into early childhood curriculum, staff are adequately trained and are confident in their abilities to implement the program, and the program is easy to understand and includes all of the materials needed to implement the program (Contento, Balch, Bronner, Lytle, Maloney, Olson, et al. 1995). The review also recommended that curricula and materials for preschool age children be evaluated (Contento, Balch, Bronner, Lytle, Maloney, Olson, et al. 1995).

A previous study conducted by Perry, Bishop, Taylor, Murray, Mays, Dudovitz, et al. (1998) assessed the efficacy of an intervention that intended to increase fruit and vegetable consumption among elementary school students. The intervention was conducted in 20 elementary schools located in St. Paul Minnesota, 10 schools received the intervention and 10

acted as controls. The intervention targeted children in the fourth and fifth grades. The intervention was titled “5-A-Day Power Plus” and consisted of four components: classroom curriculum, parent involvement/education, school food changes, and industry involvement. The classroom curriculum consisted of sixteen 40 - 45 minute classroom sessions that were implemented twice a week over an eight week period. The classroom curriculum included snack preparation and taste testing. The fourth grade parent component consisted of five activity packets that children brought home. The fifth grade parent component consisted of four snack packs that students brought home. The snack packs were prepared by food service personnel at the school and consisted of fruit and vegetable items that children were supposed to prepare at home as a family snack. The food service component in the “5-A-Day Power Plus” intervention consisted of food service personnel attending a two hour training session that introduced the curriculum and also reviewed the personnel’s role in the intervention, such as the taste testing of fruits and vegetables in the classroom and preparing snack packs for the fifth grade parent activity. (Perry, Bishop, Taylor, Murray, Mays, Dudovitz, et al., 1998).

To evaluate the efficacy of the “5-A-Day Power Plus” program the researchers conducted a process and outcome evaluation. To determine if the program changed children’s fruit and vegetable consumption all of the fourth and fifth grade children completed a nine item questionnaire that measured fruit and vegetable consumption and demographic variables at baseline and one year follow-up. Additionally, a random sample of 24 students from each classroom completed a 24-hour dietary recall and their food consumption was also observed in the lunchroom. The 24-hour recall and observation occurred on the same day. The lunchroom observation was conducted by trained observers who watched the students from a distance. The observers recorded the portion size served to the child and the amount the child consumed. From

these observations the amount of fruit and vegetable consumed was calculated. Additionally, the parents of the 24 children who were randomly selected from each classroom were telephoned and asked a series of brief questions regarding the child's fruit and vegetable consumption and the parent's fruit and vegetable consumption.

A total of 1612 children completed the nine item questionnaire, 441 children completed the 24 hour recall and lunchroom observation at baseline and one year follow up, and 384 parents completed the brief telephone survey. Data from the nine item questionnaire indicated that children in the intervention group reported consuming significantly more servings of fruits and vegetables each day compared to control children ( $M_{\text{intervention}} = 4.14$ ,  $M_{\text{control}} = 3.33$ ,  $p = 0.00$ ). Data from the 24 hour recalls determined that children in the intervention group consumed significantly more servings of fruit compared to the control children ( $M_{\text{intervention}} = 2.75$ ,  $M_{\text{control}} = 2.13$ ,  $p = 0.02$ ). There was not a significant difference in the amount of vegetables consumed on the 24 hour recall. Lunchroom observations determined that children who received the intervention consumed significantly more servings of fruit compared to the control children ( $M_{\text{intervention}} = 0.74$ ,  $M_{\text{control}} = 0.44$ ,  $p = 0.00$ ). There was a significant difference in the amount of vegetables consumed between intervention and control children during lunchroom observation. There was a significant gender differences in the amount of vegetable consumed; girls consumed significantly more vegetables from baseline to follow-up compared to boys ( $p < 0.05$ ). The parent survey indicated no significant difference between intervention and control groups for the amount of fruit and vegetables consumed in the home. (Perry, Bishop, Taylor, Murray, Mays, Dudovitz, et al., 1998).

The authors of the "5-A-Day Power Plus" program concluded that fruit consumption may have increased among intervention children due to the availability, ease, and attractiveness of

fruit compared to vegetables. During lunch time fresh fruit was also offered as an alternative to desert. Thus, children had an additional opportunity to eat fruit. The authors also commented that the non-significant results among parents indicate the need for developing new methods for involving parents (Perry, Bishop, Taylor, Murray, Mays, Dudovitz, et al., 1998).

A study conducted by Gorelick and Clark (1985) investigated the effectiveness of a nutrition program for preschool program. The program was designed to increase knowledge about nutrition among preschool age children in child care centers. Program content focused on the Dietary Guidelines for Americans developed by the U.S. Department of Health and Human Services. The program consisted of 12 interactive classroom activities, such as learning about how food grows, preparing food items, preparing nutritious snacks, and trying nutritious food items. To evaluate the program the researchers implemented the program in 20 classrooms, consisting of 187 preschool children. The 20 classrooms were randomly assigned to one of four groups, two intervention groups and two control conditions. Among the interventions groups, one group received pre-and post-testing and the other received only the post test. Among the control condition, one group received pre and post testing and the other group received only the post test. This experimental design allowed the researchers to assess pre-testing effects. Lessons were taught to the children twice a week over a six week period. Post-tests were administered three to four weeks after completion of the program. Assessments consisted of children properly identifying fruit and vegetable items, classifying food items as fruits or vegetables, and selecting nutritious food items. Children who received the nutrition program could identify significantly more fruit ( $p < 0.01$ ), vegetables ( $p < 0.01$ ), and nutritious food items ( $p < 0.05$ ) compared to children in the control condition. There were no significant differences in post-test scores among the two intervention groups. Similarly, there were no significant differences between

intervention and control children's ability to classify food items as fruits or vegetables. The researchers commented that this activity was particularly difficult for the children and may not be developmentally appropriate. The researchers concluded that an interactive nutrition curriculum can positively influence preschool age children's knowledge concerning fruits and vegetables (Gorelick & Clark (1985)

A study conducted among Head Start centers in New York and Maryland assessed the efficacy of a nutrition education program targeting parents (Koblinsky, Guthrie, & Lynch, 1992). Six New York Head Start centers and five Maryland Head Start centers participated in the evaluation. Three New York centers and two Maryland centers were randomly assigned to receive the nutrition education program and three centers in both states were assigned to a control condition. The parent nutrition education program was a 13 week program that consisted of weekly nutrition newsletters and four nutrition workshops. The 13 weekly newsletters covered the following topics: 1) feeding a preschooler, 2) food groups, 3) healthy snacks, 4) vitamin-C rich foods, 5) vitamin-A rich foods, 6) vitamin and iron supplements for children, 7) money saving hints for food shopping, 8) buying fruits, vegetables, and grains, 9) buying dairy products and protein food items, 10) reading food labels, 11) using unit prices, 12) preparing meals and snack with less salt and sugar, 13) preparing meals and snacks with less fat. Newsletters were available in English and Spanish. The four nutrition workshops were two hours in length and held approximately two weeks apart. The workshops were led by nutritionists and addressed the following topics: 1) nutrition and the preschool child, 2) feeding a preschool child, 3) meal planning and preparation, 4) food shopping skills (Koblinsky, Guthrie, & Lynch, 1992). To determine the effectiveness of the nutrition education program mothers completed structured interviews at baseline and again one to two months after the completion of the program. In

Maryland, 48 mothers who received the program completed the interview and 30 mothers from the control condition completed the interview. In New York, 41 mothers who received the program completed the interview and 52 mothers from the control condition completed the interview. Data from these interviews determined that mothers from the centers who received the program in Maryland reported that their child consumed significantly more fruit and dark green vegetables compared to the control centers in Maryland ( $M_{\text{intervention}} = 2.72$ ,  $M_{\text{control}} = 1.61$ ,  $p < 0.01$ ;  $M_{\text{intervention}} = 0.58$ ,  $M_{\text{control}} = 0.03$ ,  $p < 0.01$ ). There were no significant difference in fruit and vegetable consumption among children exposed to the experimental and control condition in the New York centers. Mothers who received the program in New York and Maryland reported making changes to their child's diet, food shopping, meal planning, cooking and preparing foods compared to mothers in the control centers ( $p < 0.01$ ). (Koblinsky, Guthrie, & Lynch, 1992). Even though the study relied on self report from mothers, findings from the study demonstrate that a program targeting parents can improve the diets of children.

Another study conducted in Head Start centers assessed the effectiveness of a six week curriculum designed to increase children's knowledge and change their attitudes about nutritious foods (Byrd-Bredbenner, Marecic, & Bernstein, 1993). The evaluation was conducted in 65 Head Start classrooms. The classrooms were randomly assigned to the intervention or to a control condition. The number of classrooms assigned to each condition was not detailed in the report. The program lessons consisted of interactive activities that allowed children to try various nutritious food items. The program was implemented over a six week period. To evaluate the efficacy of the program, children's attitudes and knowledge concerning nutritious foods was assessed at pre-test and post-test. The time frame for the post test was not detailed in the study. The knowledge test consisted of pictures of food items and the researcher would ask children in

small groups (one to three children) to accurately identify the food items. Children marked the picture of the food item they thought was correct. To assess children's attitudes about nutritious food items, the researcher read a statement and children indicated their feelings about the statement by selecting either a smiling face, neutral face, frowning face, or question mark. At post-test, children who received the nutrition curriculum expressed more positive attitudes toward trying new foods ( $p < 0.05$ ) and eating nutritious foods ( $p < 0.02$ ). At post-test there were no significant attitude changes regarding vegetables. The study also found that children's knowledge did not significantly increase at post test. (Byrd-Bredbenner, Marecic, & Bernstein, 1993). The authors concluded that future preschool programs should be experiential in nature and should encourage children to try new healthy food items in the classroom (Byrd-Bredbenner, Marecic, & Bernstein, 1993).

“Eat Well and Keep Moving” is a nutrition and physical activity program developed for children in fourth and fifth grades (Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, et al., 1999). The program curriculum was integrated into math, science, language arts, and social studies classes. The program focuses on four behavioral changes, 1) decreasing the consumption of foods high in total fat and saturated fat, 2) increase the consumption of fruits and vegetables, 3) reduce television watching to less than two hours a day, 4) increase physical activity. The curriculum consisted of 13 lessons that were taught during 50-minute periods. There were also activities that were completed in the home by children and their parents. To evaluate the efficacy of the program, assessments were collected at baseline and two years after completion of the program. Children completed a food and activity survey at baseline and follow-up. The food and activity survey was a self report measure that assessed dietary intake, television viewing, physical activity, nutrition knowledge, and physical activity knowledge. Twenty four hour

dietary and physical activity recalls were administered at post-test to increase the validity of the food and activity survey. The 24 hour dietary recalls were conducted in interviews that took 20 - 30 minutes to complete. Data were collected from 785 children at baseline and post-test. Data from the 24 hour dietary recall indicated that total energy from fat and saturated fat ( $M_{\text{intervention}} = 12.57$ ,  $M_{\text{control}} = 11.93$ ,  $p = 0.05$ ;  $M_{\text{intervention}} = 33.20$ ,  $M_{\text{control}} = 35.20$ ,  $p = 0.04$ ) significantly decreased among intervention children compared to children in the control group. The number of fruits and vegetables consumed increase significantly among the intervention children compared to children in the control group ( $M_{\text{intervention}} = 1.78$ ,  $M_{\text{control}} = 1.41$ ,  $p = 0.01$ ). Vitamin C intake increased among intervention children compared to control children ( $M_{\text{intervention}} = 67.6$ ,  $M_{\text{control}} = 58.6$ ,  $p = 0.01$ ). Fiber intake also increased among intervention children ( $M_{\text{intervention}} = 6.33$ ,  $M_{\text{control}} = 5.65$ ,  $p = 0.05$ ). There were no significant differences in responses to the food and activity survey for total energy from saturated fat, number fruits and vegetables consumed, vitamin C intake and fiber intake. The authors conclude that the “Eat Well and Keep Moving” program can influence children’s nutrition and the program itself was well liked by the teachers. The authors emphasized that nutrition programs need to be integrated into existing classroom curriculum, such as in math and social sciences classes (Gortmaker, Cheung, Peterson, Chomitz, Cradle, Dart, et al., 1999).

Another evaluation assessed a school based program aimed at prevention of obesity among five to seven year olds in the United Kingdom (Warren, Henry, Lightower, Bradshaw, & Perwaiz, 2003). Classrooms from three primary schools were randomly assigned to one of four groups: nutrition only group (Eat Smart), physical activity only group (Play Smart), combined nutrition and physical activity group (Eat Smart Play Smart), or a control condition. The control condition received information about food in a non-nutrition format, such as food in different

countries and food processing. The three interventions were implemented over 14 months. Each lesson was designed to last 25 minutes and had an interactive component. The authors did not specify the number of lessons in the curriculum. All three intervention groups received an activity book that was designed for children to take home. Parent newsletters were also distributed. The “Eat Smart” nutrition only program promoted eating fruits and vegetables through interactive lessons that had children taste fruits and vegetables, children also played games using fruits and vegetables. The “Play Smart” physical activity only program promoted activity in daily life, such as being active at the playground and reducing television viewing. The “Be Smart Play Smart” program received half of the “Be Smart” program and half of the “Play Smart” program. Assessments were administered at baseline and one month after the completion of the interventions. A questionnaire was administered to assess children’s nutrition knowledge (Calfas, Sallis and Nader, 1991). The assessment presents children with photographs of food items and children are then required to select the healthiest items. To assess dietary changes, parents completed a 24 hour food recall and a food frequency questionnaire. Observation of the children during lunch time was also conducted. Among the children who ate school lunch, dietitians observed how much food was served to the child (pre-assessment) and then recorded the amount of food the child consumed (post-assessment). Among children who brought lunch from home, dietitians covertly recorded the contents of the meal before lunch and then observed and recorded the amount consumed during lunch. Additionally, within two hours after lunch the dietitians conducted interviews with the children and asked them to recall what they consumed for lunch (Warren, Henry, Livingstone, Lightowler, Bradshaw, & Perwaiz, 2003).

One hundred and eighty one students completed pre- and post-test assessments in the Warren et al (2003) study. Nutrition knowledge significantly increased from baseline to post-test

among all four groups, including the control condition. Overall, there was a significant increase in the consumption of vegetables ( $p < 0.05$ ) and fruit ( $p < 0.01$ ) within all groups. There was a significant increase from baseline to post-test among the children in the “Eat Smart” nutrition only program ( $p < 0.05$ ) and among children in the control condition which received basic information pertaining to food ( $p < 0.05$ ). There were no significant differences in the amount of fruit and vegetables that parents reported their child consuming. (Warren, Henry, Livingstone, Lightowler, Bradshaw, & Perwaiz, 2003).

### **1.7 Color Me Healthy**

Color Me Healthy (CMH) is an interactive program that was developed for preschool children, ages 4 and 5. The North Carolina Cooperative Extension and the North Carolina Division of Public Health developed CMH in North Carolina ([www.colormehealthy.com](http://www.colormehealthy.com)). The program employs interactive lessons to teach children about eating fruits and vegetables of different colors and physical activity. The majority of health promotion interventions do not employ one single theory; rather interventions utilize constructs from multiple theories. The authors developed CMH with the understanding that health promotion should utilize multiple strategies including education, advocacy, organizational change, policy change, and change to the environment (Dunn, 2005). To highlight these various strategies the authors used the social-ecological model as a guide during the development of the program. The social-ecological model identifies five levels of influence that are important in behavior change: Individual, Interpersonal, Organizational, Community, and Society. Below are examples of how CMH approaches each level of the socio-ecological model.

*Individual: Motivating change in individual behavior by increasing knowledge and influencing attitudes.* CMH seeks to educate children, parents, and child care providers about healthy eating and physical activity.

*Interpersonal: Recognizing that groups influence behavior by providing social identity and support.* CMH targets child care providers and parents as agents of change. At the CMH training, adult nutrition and physical activity is discussed with the providers and the trainer expresses that the providers are role models for the children. CMH targets parents through take home newsletters and posters directed toward parents.

*Organizational: Changing the policies, practices, and physical environment of an organization to support behavior change.* The CMH training supplies child care providers with the skills and resources to easily incorporate the program into their curriculum. The CMH “tool kit” also includes materials, such as posters and bulletin board ideas to make the child care facilities colorful and enhance the learning process.

*Community: Coordinating the efforts of all members of a community to bring about change.* CMH raises nutrition awareness among parents and child care providers. Newsletters ask parents to evaluate their environment and assess the availability of physical activity and healthy eating options.

*Society: Developing and enforcing state policies and laws that can increase beneficial health behaviors.* CMH was part of a larger state wide campaign in North Carolina called Eat Smart Move More. This statewide initiative encouraged healthy eating and physical activity.

## **1.8 Previous Evaluation of Color Me Healthy**

The authors of Color Me Healthy have conducted several evaluations. The first evaluation was conducted in 2002 and consisted of a 38 item self-report survey that assessed teachers’ perceptions regarding changes in children’s eating and physical activity since initiating

the CMH program. The survey was mailed or e-mailed to 1023 teachers who implemented the program in North Carolina. Participants who did not respond to the 8-week post-implementation survey were sent another survey at 11-weeks. Forty-eight percent (n = 486) of the teachers completed the process evaluation survey. Forty-eight percent of the teachers who completed the survey worked in child care centers, 35% worked in home day care settings, 8% worked in Head Start Centers, and 9% indicated they worked in “other” settings (Dunn, Thomas, Ward, Pegram, Webber, & Cullitan, 2006).

Among the childcare providers who responded to the evaluation questionnaire; 92% indicated that using the Color Me Healthy program had increased physical activity among the children, 92% indicated that it had increased the children’s knowledge about movement, 79% indicated that the program increased the children’s willingness to try new food, and 82% indicated that the program curriculum had improved children’s fruit and vegetable recognition (Dunn, Thomas, Ward, Pegram, Webber, & Cullitan, 2006). Teachers reported that the parent newsletters were the least used component in the CMH tool kit. Additionally, 74% of the teachers rated the CMH program as “excellent”, 24% rated the program as “very good”, 3% rated the program as “good”, and none of the teachers rated the program as “fair” or “poor”. Lastly, 100% of the teachers said they would use the CMH in the future (Dunn, Thomas, Ward, Pegram, Webber, & Cullitan, 2006). Even though the teachers had favorable responses concerning the CMH program, the evaluation relied on teachers self perceptions regarding program effectiveness.

The second evaluation was conducted October 2002 through September 2003. The results from this evaluation have yet to be published in a peer reviewed journal. However, the authors of the CMH program sent the researcher in the current study an eleven page document that outlined

the results from the second evaluation. The second evaluation consisted of three separate evaluation components: survey administration after CMH trainings, survey administration eight weeks after the trainings were conducted, and face to face interviews with child care providers. The survey that was administered after the CMH trainings consisted of 18 items that assessed the perceived utility of the training, how teachers would rate the CMH materials, and how frequently they plan to use the program in the future. Two thousand and sixty-four teachers completed the post-training survey. Results from the post-training survey indicated that 99% of the teachers were confident in their ability to use the curriculum, 95% reported that the training increased their knowledge about healthy eating and physical activity, 91% of the teachers planned to increase the amount of time spent teaching nutrition and physical activity in the classroom. The majority (62%) of the teachers planned on using the CMH curriculum weekly except for the parent newsletters which teachers indicated would be distributed monthly (Dunn, 2005)

The eight week survey was the same 38 item self-report assessment that was administered in the first evaluation. The authors of the program outlined specific outcome objectives to be obtained from the eight week self report survey: 1) 85% of the child care providers will report increasing the amount of nutrition education and physical activity in their classroom; 2) 50% of the teachers will report that after participating in CMH the children are more willing to try new fruits and vegetables; 3) 50% of the teachers will report that after participating in CMH the children have improved recognition of fruit and vegetables. Results from the eight week survey indicated that 87% of the teachers spent more time talking about nutrition in their classroom and 20% increased the amount of physical activity. Additionally, 78% of the teachers perceived that after receiving CMH the children were more willing to try new fruits and vegetables and 90% indicated that children's recognition of fruits and vegetables

had improved (Dunn, 2005). Thus, all of the outcome objectives were reached except for increasing the amount of physical activity time in the classroom. Results from the eight week survey indicated that 78% of the teachers rated the CMH program as “excellent”, 19% rated the program as “very good”, 3% as “good”, and none of the teachers rated the program “fair” or “poor” (CMH Evaluation Summary, 2005).

Face-to-face interviews were conducted with 42 child care providers. Providers were asked to quantify the CMH program; specifically the frequency of use of CMH, duration of use, whether the teacher liked the lessons and imaginary trips, and personal health changes the teachers had made. The 42 teachers reported using the CMH materials on a weekly basis. Seventy-two percent of the teachers used the CMH lessons presented in the teacher’s guide. The most used item in the CMH “tool kit” was the picture cards; 95% of the teachers reported using these materials. The least used item in the CMH “tool kit” was the parent newsletter; only 41% of the teachers used these materials. Thirty-nine percent of the teachers used CMH 55 minutes or less per week, 49% used CMH 1-3 hours per week, and 6% used CMH more than 3 hours per week. Among the teachers who reporting using the CMH lessons in the teacher’s guide, 70% of the teachers liked the lessons and 66% reported that the children liked the lessons. Additionally, 86% of the teachers mentioned that since initiating CMH they were trying to eat more fruits and vegetables.

## **1.9 Current Evaluation**

These previous evaluations reveal that teachers thought the CMH program positively influenced children’s eating behavior and physical activity. In addition, teachers reported that they will use the program in the future. However, these evaluations relied on child care provider’s subjective perception of the program. Self report surveys are subject to limitations,

such as response bias and social desirability. A thorough evaluation that measures actual behavior has not been conducted. The current study provides a systematic evaluation of the CMH program to determine if program positively influences fruit and vegetable intake among preschool age children. The evaluation investigated whether an interactive program that includes classroom lessons and interactive parent-child activities increases fruit and vegetable consumption among children. The study tested the following hypothesis:

*Hypothesis 1:* Children who participate in the Color Me Healthy program will increase fruit and vegetable consumption at child care centers compared to children who do not receive the program.

*Hypothesis 2:* Parents of children who participate in the Color Me Healthy program will increase the amount of fruit and vegetables *served* in the home environment compared to parents of children who did not participate in the program.

*Hypothesis 3:* Children who participate in the Color Me Healthy program will increase fruit and vegetable *consumption* in their home environment compared to children who do not participate in the program.

## **Chapter 2: Method**

### **2.1 Sample**

#### **2.1.1 Children**

Two hundred and sixty-three children, ages 4 to 6, participated in the evaluation. Fifty three percent were male. The researchers were not permitted to obtain specific ages of each child but were informed by the Centers' directors that the age range for the children was between 4 and 6 years of age, with the majority of the children being 4 or 5 years old. All of the classrooms offered half day and full day child care; 28% of the children attended only in the morning, 44% attended only in the afternoon, and 28% attended all day. Other demographic information was not collected from the children due to restrictions from the child care centers.

Throughout the evaluation process, there were 42 new enrollees in the child care programs (33 CMH, 9 Comparison). In the CMH sites, some of the new children received several lessons from the CMH curriculum and some did not receive the CMH curriculum. For simplicity, all new children were excluded from the data analysis. There was also attrition due to disenrollment from the child care program or absenteeism on the assessment days. There were 31 CMH and 10 Comparison children that quit attending the child care programs.

#### **2.1.2 Child Care Centers**

Seventeen classrooms from fourteen child care centers participated in the evaluation. The classrooms provided child care to preschool age children. Fifteen of the classrooms were from the Just for Kids (JFK) Child Care program. JFK is operated through the Boise School District and is comprised of thirteen child centers. The centers are located at public elementary schools throughout the city of Boise. JFK offers child care for children between the ages of 6 weeks to 12 years old. All (n = 15) of the JFK centers that provided services for preschool and

kindergarten age children participated in the evaluation. Two of the JFK centers had multiple classrooms for 4-6 year old children and the other thirteen centers had only one classroom for 4-6 year old children. Two preschool classrooms from the Boise State Children's Center (BSC) also participated in the evaluation. Only two classrooms participated from BSC because the other preschool classroom already had a nutrition component in their curriculum. Table 2 details the number of children in each child care classroom. The average class size was 8.35 children ( $SD = 5.12$ ).

The classrooms that were operated through the Boise School District were located in a separate building by an elementary school. The children in these classrooms were from the geographic region that the elementary school served. Since the researchers were not permitted to obtain socioeconomic (SES) status of each child, the percent of low income families in the geographic area that the child care classroom served was calculated using Social Explorer. Social Explorer is an interactive geographic map that displays 2000 U.S Census data and was used to determine the percent of low income families in the areas the child care center serves (Social Explorer, 2008). The interactive maps are based on the geographic census tracts, which are small subdivisions of a county. Census information pertaining to the different tracts can be displayed on the map. The percent of low income families in designated census tracts is based on the US Census Bureau's poverty threshold, which is calculated using the number of individuals in a household and the household income. The census tract that each child care classroom was located in was identified and the percent of low income families in that specific tract was recorded. The remaining two classrooms were from the Boise State Children's Center (BSC). To determine the census tract for BSC, research staff inquired with the center director. The director

informed staff that the majority of families lived near the campus in census tract nine, which has 10% to 15% of the population living in poverty (Social Explorer, 2008).

All of the classrooms participated in the United States Department of Agriculture's Child and Adult Care Food Program (CACFP). The CACFP provides financial assistance for free meals or reduces the cost of meals in child care centers and other settings that provide food to low income individuals, such as adult day cares and homeless shelters (United States Department of Agriculture (USDA), 2008). CACFP is available for a child care center if at least 25% of the enrolled children meet income eligibility guidelines, which are outlined by the CACFP program (USDA, 2008). Thus, both child care programs that participated in the evaluation had at least 25% of their enrollees that met the CACFP's income eligibility guidelines. The investigator was not permitted to obtain socioeconomic information pertaining to the children that participated in the evaluation.

### **2.1.3 Teachers**

All of the teachers at the child care centers were licensed providers within the city of Boise. Each classroom had a ratio of one teacher to twelve children. Each classroom ( $n = 17$ ) had a designated lead teacher that was responsible the classroom lesson plans and for teaching educational curriculum. Ninety four percent of the lead teachers were female. The lead teachers had worked in child care for an average of 14 years ( $SD = 9.31$ ) and had been employed with the current center for an average of 5 years ( $SD = 4.17$ ) Thirty percent of the lead teachers had completed some vocational training or college and 70% had received a bachelor degree.

### **2.1.4 Parents**

Two hundred and sixty three parents were invited to participate in the evaluation and 38% ( $n = 100$ ) completed the initial surveys. At follow up, 14% ( $n = 38$ ) of the parents

completed the surveys. Only one parent per household completed the surveys. Each household decided which parent (mother or father) would complete the surveys. Eighty nine percent of the surveys were completed by the child's mother. The average age of the parents who completed the surveys was 35 years old ( $SD = 6.41$ ). The average age of the child the parent was responding about was 5 years old ( $SD = 0.74$ ). Eighty eight percent of the parents identified their ethnicity as white, 8% identified as Hispanic, 1% Black, 1% Asian or Pacific Islander, and 2% identified as being mixed ethnicity. Sixty five percent of the respondents were married, 17% were divorced, 14% were single, 1% was widowed, and 3% indicated "other". Three percent of the parents reported never completing high school, 3% completed high school, 38% completed some college or vocational training, 6% obtained an associate degree, 30% obtained a bachelor degree, and 20% obtained a graduate degree.

## **2.2 Power Analysis**

A randomized cluster design was utilized in the study. Randomization will occur at the child care center level. Previous research has indicated that data analytic models that ignore potential non-independence among the clusters will produce inaccurate parameter estimates (Raudenbush & Liu, 2000; Carajal, Baumler, Harrist, & Parcel, 2001). A suggested data analytic method that accounts for variation within each cluster that could influence program effects is multilevel modeling, which is also referred to as hierarchical linear modeling. Multilevel models provide a flexible technique to evaluate program effects (Carajal, Baumler, Harrist, & Parcel, 2001).

A power analysis was conducted to determine how many classrooms were needed to detect an effect. Previous intervention designed to increase healthy nutrition among preschool and elementary school students have found effect sizes ranging from 0.40 to above 1.00. It was

estimated that approximately 30 children were enrolled in each cluster (i.e., child care classroom). The addition of each cluster is costly, thus a power analysis was conducted to determine the optimal number of child care classrooms that would be needed. The power software Optimal Design version 1.76, developed by Raudenbush, Spybrook, Liu, & Congdon (2006), was used to calculate number of classrooms, with approximately 30 children in each cluster that would be needed to detect an effect of at least 0.40. Figure 1 displays the effect for a randomized controlled trial with 30 children in each classroom for the effect sizes of 0.40, 0.50, 0.60, and also for the intra cluster correlations of 0.01 and 0.05. Based on this table for a power of 0.80, 16 classrooms are needed to provide a power of 0.80 to detect an effect of at least 0.40. The only condition when the power is not sufficient is when the effect is 0.40 and the intra cluster correlation is 0.05. However, previous studies in school settings have generally found an intra cluster correlation of 0.01 or lower (Carajal, Baumler, Harrist, & Parcel, 2001).

Since the evaluation assessed fruit and vegetable consumption at multiple time periods, another power analysis was calculated for repeated measures design. To account for a potential 50% attrition rate among the children at follow up time periods, this analysis estimated only 15 children per classroom. The smallest effect of 0.40 that has been seen in previous studies was used in the analysis. Additionally, since previous studies in school settings have generally found small intra cluster correlations between 0.001 and 0.01, these two values were used in the analysis. Figure 2 presents the power table for the repeated measures power analysis. Based on this table, 16 classrooms is sufficient to detect an effect of 0.40. Moreover, adding additional classrooms would have been costly; each CMH kit costs \$80. Thus, adding four more classrooms would not have provided significantly greater power, especially given the likelihood that effects would be at least 0.40.

### **2.3 Color Me Healthy Materials**

CMH comes in a plastic “tool kit” that includes a teacher’s guide, four sets of picture cards, three classroom posters, two parent posters, music CD that contains seven original songs, hand stamp, and reproducible parent newsletters. The picture cards, posters, and parent newsletters are available in English and Spanish. The teacher’s guide is a spiral bound notebook that details each lesson. The teacher guide outlines the intent of the lesson, the materials needed for the lesson, and a step by step scripted outline for the lesson. Thus, teachers spend a minimal time developing lesson plans. CMH is comprised of 12 lessons and 6 imaginary trips. The interactive lessons use color and music to teach children about healthy eating and physical activity. Lessons use picture cards to teach children about healthy eating and physical activity. One set of cards display colors of food (e.g., red, green, yellow, orange, blue, purple, brown), another set shows where fruits and vegetables grow (e.g., on a vine, on a stalk, on a tree, in the ground), one card shows a cow and dairy products that come from the cow, and another set of cards display places where children can be active (e.g., backyard, pool, park, mountains, beach).

The classroom posters include a poster with the Color Me Healthy logo, which is a cartoon boy pulling a red wagon full of fruits and vegetables. Another classroom poster has text stating “Remember to Eat All Your Colors” and has name of a color and pictures of various fruits and vegetables of that color. The last classroom poster lists the letters of the alphabet and displays objects that begin with the various letters. Songs on a CD are also used to enhance the circle time lessons. The song’s messages include the colors of fruits and vegetables, trying new foods, playing outside, and how your heart beats faster when you move. Duration of the lessons is between 15 and 30 minutes. Five of the CMH lessons focus on fruits and vegetables. The goal of these five lessons is to teach children about fruits and vegetables of different colors through fun interactive lessons and encourage children to eat fruits and vegetables. These five lessons

discuss the colors of fruits and vegetables, the texture and shape of fruits and vegetables (e.g., round or long, smooth or rough), the taste of fruits and vegetables (e.g., sweet, tart) and where the fruits and vegetables grow. Four circle time lessons discuss physical activity. The goal of these four lessons is to increase the acceptability of physical activity and help children realize how much fun and easy it is to be active. Color Me Healthy incorporates strategies that previous nutrition programs found effective, specifically involving parents/families, targeting preschool children's behaviors, using developmentally appropriate learning experiences, including food based activities that allow children to taste fruit and vegetables, including activity based teaching activities that can include art projects, singing songs about healthy foods, and role playing eating healthy foods (Contento, Balch, Bronner, et al., 1995).

The first lesson in the CMH curriculum, titled "Singing and Dancing with Color Me Healthy," is an introduction to the program and teaches children the CMH theme song. This lesson utilizes the music CD that is provided in the CMH kit. The teacher initially tells the children that they are starting a new program called Color Me Healthy and that they will be learning about eating healthy food and moving their bodies. The teacher interacts with the children and asks them about the different colors in the classroom, colors outside, colors of their clothes, and colors at their home. Then the teacher has the children talk about food of different colors that they like to eat. How teachers had the children respond to the interactive questions varied by classroom. Some teachers had each child answer the question, while other classrooms had children raise their hands and answer the question. After children respond to questions pertaining to the colors of food they like to eat, the teacher then plays the Color Me Healthy theme song from the music CD. After listening to the song the teacher discusses the song with the children and asks the children what colors the song named, and if the song named colors of

food they eat. The teacher also asks the children if the song named some things they do outside and the type of activities the song named. Next the teacher plays the song again, this time allowing the children to stand up and dance and sing along with the music. At the end of the lesson the teacher states “Aren’t we glad we are in a Color Me Healthy classroom!”

The second lesson, titled “Eat a Rainbow of Colors,” teaches children about fruits and vegetables of different colors. This lesson utilizes the “color of foods” picture cards. An example of the color of food picture card is displayed in Appendix A. The “color of foods” picture cards used in this lesson have a color on one side of the card (e.g., red) and on the other side of the card displays fruits and vegetables of that color (e.g., red apple, strawberries, watermelon, tomato). There are eight “colors of foods” picture cards: red, orange, green, yellow, blue, purple, brown, and white. To begin the lesson the teacher explains that they are going to talk about colors of food. The teacher then selects a picture card and asks the children how many of them have eaten food of that particular color. After children respond the teacher then asks them to name some foods of that color. After the children respond the teacher turns the card over and talks about the food items on the back of the card. The teacher asks the children about the different food items and if they have ever tried them. Then the teacher asks the children to think about other food items of that color. The teacher repeats the process with the other “colors of foods” picture cards. At the end of the lesson the teacher plays the “Taste the Colors” song from the music CD. The song talks about fruits and vegetables of different colors and states that these foods are fun and good for you to eat. After children listen to the song the teacher asks the children which colors were named in the song and which foods named in the song they have tried before. The teacher then plays the song again and the children are allowed to dance and sing along with the music.

The third lesson, titled “Where Can We Be Physically Active?” teaches children about how they can be active in different places. This lesson utilizes the “activity scene” picture cards. An example of an “activity scene” picture card is displayed in Appendix A. One side of the card has a picture of a location (e.g., park) and the other side of the card lists activities that children can do in this location (e.g., swing, fly a kite, walk with a friend, climb on equipment). There are five “activity scene” picture cards: beach, mountain, park, backyard, and pool. The teacher begins the lesson by telling the children that they are going to talk about how they can be active in many different places. The teacher then chooses an “activity scene” picture card and asks the children “What would be the first thing you would do at this location (e.g., the beach) if you had never been there before?” After the children respond the teacher then asks the children “What is your favorite thing to do at this location (e.g., the beach)?” This process is repeated for all of the “activity scene” picture cards. The teacher then plays the “Play Outside” song from the music CD. The lyrics in the song discusses playing outside and the singer states that playing outside is her favorite activity of the day and she can’t wait to go outside. After children listen to the song the teacher asks the children what they like to do outside. After the children respond the teacher plays the song again and the children are permitted to act out the activities in the song and dance to the beat.

The fourth lesson, titled “Try New Foods”, teaches children that trying new fruits and vegetables is a fun adventure. This activity utilizes the “colors of foods” picture cards. The teacher begins the lesson by telling the children that they are going to talk about an adventure in eating. The teacher then uses the “colors of foods” picture cards and points to the different fruits and vegetables and asks the children if they have tried them. The teacher discusses with the children how the item tasted. The teachers are encouraged to use positive statements about the

fruits and vegetables, for example “Isn’t a peach yummy! I like how the outside is fuzzy!” The teacher then emphasizes that trying new foods is an adventure and the next time they have an opportunity to try a new food they should take a bite. The teacher asks how many children have not tried the food item before and if they would like to try it in the future. The teacher then plays the “Try New Foods” song from the music CD. The song talks about how trying new fruits and vegetables is a fun and exciting adventure. The teacher then discusses the song with the children and if the song named fruits and vegetables they have tried and if the song named fruits and vegetables they would like to try. The teacher then plays the song again and the children are allowed to sing and dance along with the music.

The fifth lesson, titled “I Can Feel My Heart Beat” teaches children about the heart. The lesson notes that when children are active their hearts beat faster. The teacher begins the lesson by telling the children they are going to learn about the most important muscle in their body, the heart. The teacher then has the children make a fist with their hand and tells them that their heart is the same size as their fist. The teacher then has the children stand up and move to the “Color Me Healthy Dance Mix” song on the music CD. After the song is over the teacher instructs the children to place their hand over their heart and feel how fast their heart is beating. The teacher tells the children that they need to get their heart beating fast everyday for them to grow up healthy and strong. The teacher then lets the children calm down and has them feel their heart beat again and talks about how it is beating slower because they stopped moving. The teacher then plays the “Heartbeat Song” from the music CD. This song talks about moving and making the heart beat faster. After the song ends the teacher talks to the children about how their heart beats faster when they move. The teacher then plays the “Heartbeat Song” again and the children are allowed to stand up and dance and sing along with the music.

The sixth lesson is titled “Brown Paper Bag Mystery.” In this lesson fruits and vegetables are placed in a brown paper bag, children put their hand into the bag, and based on the shape and texture of the food item the children guess which fruit or vegetable they are feeling. The lesson begins with the teacher explaining that they are going to be detectives and try to figure out what fruits and vegetables are in the brown paper bag. The teacher then passes the bag around to all of the children and they put their hand in the paper bag and feel the fruits and vegetables. The teacher asks each child to talk about how the fruits and vegetables felt. The teacher then passes the paper bag around again and has all the children close their eyes and smell the fruits and vegetables. The teacher then has each child talk about how the fruits and vegetables smelled. The teacher then takes the fruits and vegetables out of the bag and talks about the color and shape of each one and passes it around to the children. At the end of the lesson the fruits and vegetables are washed, cut up, and distributed for the children to taste. Children are encouraged to take a bite but are not forced to try the fruits and vegetables.

The seventh lesson, titled “Color Yourself Healthy,” the children draw a picture of themselves doing something active. After the children are done drawing their picture, they talk about what they drew and what activity they like. The teacher then has the option of posting the drawings in the classroom.

The eighth lesson, titled “Snack Attack,” teaches children that fruits and vegetables make good snacks. The lesson utilizes the “color of foods” picture cards. The teacher shows the children the side of the card that displays the different fruits and vegetables. The teacher asks the children if they have had the different fruits and vegetables for a snack. The teacher then asks the children about textures and shapes of the different fruits and vegetables that are displayed on the picture card. The teacher also asks the children to identify their favorite fruit and vegetable snack.

and then explain why it is their favorite snack. The teacher then plays the “Picnic Song,” which talks about eating fruits and vegetables at a picnic.

In the ninth lesson, titled “Instead of Watching TV I Could...” children learn about activities that are alternatives for TV viewing. The teacher begins the lesson by asking the children about activities that move their body and that they could do instead of watching TV. The teacher then discusses all of the things children could do instead of watching TV; children talk about the activities they can do outside, inside, in their room, by themselves, with their parents, and with their friends. The children then draw a picture of themselves doing a healthy activity other than watching TV. After the children are done drawing they are encouraged to talk about their picture. The teacher also has the option of playing the “Play Outside” song or the “Color Me Healthy” theme song.

The tenth lesson, titled “Its Milking Time,” teaches children about different dairy products. This lesson utilizes the “cow” picture card, which has a picture of a cow on one side and pictures of dairy products on the other side. The teacher begins the lesson by telling the children that thanks to the cow they have plenty of good foods to eat. The teacher asks the children to name food items that are made from milk. The teacher then flips over the card and has the children discuss the different dairy products they have tried. Then the teacher has the children draw their favorite dairy product. After children are done drawing, the teacher is encouraged to make a collage of the drawings and have the children talk about their drawing.

The eleventh lesson, titled “Where do the Colors Grow?” teaches children about the different places fruits and vegetables grow, such as on a tree, under the ground, or on a vine. This lesson utilizes the “Where Do Foods Grow” picture cards. An example of a “Where do Foods Grow” picture card is displayed in Appendix A. On one side of the card there is a picture of a

fruit or vegetable. On the other side of the card there is a picture of where the food grows, such as on a tree, on a vine, or under the ground. There are fifteen “Where Do Foods Grow” picture cards. The teacher begins the lesson by telling the children that they are going to talk about where foods grow. The teacher then selects one of the picture cards and shows children the side that displays the fruit or vegetable. The teacher asks the children if they know what it is, if they have ever eaten it before, if they would like to eat it, if they liked it, what it tasted like, color and its shape. After discussing the fruit or vegetable the teacher then asks the children where they think it grows. The teacher then turns over the card and shows the picture of where the fruit or vegetable grows. The teacher repeats the question for the other “Where Do Foods Grow” picture cards.

The last lesson, titled “Activity Alphabet” has children imitate animals, people, and things that correspond to the letter of the alphabet. For example, for the letter “A” children could imitate an airplane and pretend they are flying. The teacher repeats this activity for all letters of the alphabet. This lesson allows children to move their bodies.

The six imaginary trips included in CMH program encourage children to use their imagination to explore new places, be physically active, and eat fruits and vegetables. In a group setting children act out an imaginary trip to such places as the park, beach, farm, fire station, mountains, and a birthday party. For each imaginary trip the teacher is provided a script that contains dialogue they read aloud and activities they are to act out with the children. For example, in the “Climb Every Mountain” imaginary trip children pretend that they are going to the mountains. The teacher leads the group of children and they act out the following activities: driving to the mountains, setting up the camp, going for a hike, going for a canoe ride, making a healthy vegetable stew, eating the vegetable stew, getting ready for bed, going to sleep, and then

packing up camp the next day. These imaginary trips allow children to be physically active and role play eating nutritious foods.

*Take Home Activities.* The current researcher developed six interactive activities that were completed at home by the children and their parent or guardian. These interactive activities coincided with the circle time lessons. The parent component consisted of a packet that was given to parents on a weekly basis. The parent packets contained educational information and interactive parent-child activities that coincided with circle time lessons that were delivered to the children during the same week. An interactive parent component was not included in the original CMH program.

The first take home packet included information that described the colors of fruits and vegetables. The packet contained one informational sheet and two activity worksheets. The informational component informed parents about the take home activities and the importance of eating fruits and vegetables. The first activity worksheet displayed different colors (e.g., orange, yellow, green) and had parents help children list fruits and vegetables of different colors. The second activity worksheet required children to color black and white pictures of different fruits and vegetables.

The second take home packet emphasized physical activity and consisted of one informational component and two activity worksheets. The informational component outlined the importance of physical activity and provided the physical activity guidelines for children and adults. The first activity worksheet listed locations (e.g., park, backyard, mountains, pool) and had parents and children list all the physically active things they could do together in the different locations. The other activity worksheet had parents and children check various activities they

could do together indoors, such as play musical chairs, dance to music, play indoor hide and seek.

The third take home packet emphasized trying fruits and vegetables and consisted of one informational component and one activity worksheet. The informational component provided parents with tips for getting children to eat fruits and vegetables. The interactive activity worksheet was a grocery store treasure hunt where parents took their child to the produce section in a grocery store and found fruits and vegetables of different colors. Parents were encouraged to purchase one or two produce items and share with the child.

The fourth take home packet emphasized eating healthy snacks and consisted of one informational component and one activity worksheet. The informational component provided parents with ideas for healthy snacks, such as including fresh fruit in yogurt, making a face on a pizza using vegetables, making a fruit smoothie. The activity worksheet had pictures of healthy snacks (e.g., banana, grapes) and unhealthy snacks (e.g., ice cream bar, potato chips) and parents helped children circle the healthy snacks.

The fifth take home packet consisted of one informational component and one activity worksheet. The informational component discussed making healthier selections at fast food restaurants. For instance, a local sandwich chain, Blimpies, was used in the following example: instead of ordering a Tuna Fish sandwich that has 660 calories and 44 grams of fat, order a grilled chicken sandwich that has 400 calories and 9 grams of fat. The activity worksheet consisted of parents and children checking activities that they could do together instead of being in front of the “screen” (television or computer). Examples of activity options included: walking the dog, washing the car, playing Frisbee, doing yard work, dancing to music.

The sixth take home packet emphasized the new food pyramid and consisted of one informational component and one activity worksheet. The informational component provided information about the new pyramid, displayed the new food pyramid and provided the website address ([www.mypyramid.gov](http://www.mypyramid.gov)). The activity worksheet displayed the food groups and had pictures of food items that belong in each group. The activity had parents help children identify which food items belonged to the different food groups.

*Teacher Training.* The lead teachers from the ten classrooms that received CMH were required to attend a training seminar that was held September 27, 2006. The seminar's main objective was to introduce the Color Me Healthy program components, review each circle time lesson in detail, and review the timeline for the project. In addition, the seminar also presented information about the increase in the prevalence of childhood obesity, the importance of encouraging healthy behaviors among preschool age children, how teachers are role models for the children, and why it is important for the teachers to eat healthy. Basic adult nutrition information was reviewed, such as eating a balanced diet rich in fruits and vegetables, proper portion sizes for adults, healthy options when eating out, and increasing physical exercise.

*Timeline.* The CMH program was initiated on October 23, 2006 and was implemented for six weeks. Two circle time lessons were taught to the children each week. In addition to the two circle time lessons, one imaginary trip was also introduced each week. See Appendix B for a detailed schedule of the curriculum timeline.

## **2.4 Assessment**

Since the majority of the Color Me Healthy curriculum focuses on fruits and vegetables, these food items were of interest in the current evaluation. The current study included an outcome evaluation that assessed the efficacy of the intervention and a process evaluation that

assess the fidelity of program implementation. The outcome evaluation determined if children's consumption of fruit and vegetables significantly increased during snack time in the child care classrooms and in the home after exposure to the CMH program. The process evaluation assessed: delivery of lessons to the children, children's attendance at the lessons, and the completion of take-home activities.

## **2.4.1 Outcome Evaluation**

### **2.4.1.1 Fruit and Vegetable Consumption in the Classroom**

To determine if the CMH program increased children's consumption of fruit and vegetables in the classroom, children were given fruit and vegetable snacks one week before Color Me Healthy was initiated (October 17 - 20, 2006), one week after the program was complete (December 5 - 8, 2006), and three months after the program was complete (March 6 - 9, 2007). To determine the amount of fruit and vegetable snack consumed, the fruit and vegetable snacks were weighed before they were served to children and then weighed again after children had an opportunity to consume the snack.

The fruit snack consisted of one cup of mixed fresh fruit: 4 purple grapes, 4 pineapple chunks, 4 cantaloupe chunks, and 2 strawberries. The vegetable snack consisted of one cup of mixed fresh vegetables: 2 cherry tomatoes, 2 celery sticks, 3 broccoli florets, and 3 baby carrots. Fat free ranch dressing, in a 2 ounce plastic cup, was distributed with the veggie snack. Children could dip the raw vegetables in the ranch dressing. Each snack also contained 2 Ritz crackers and ½ of a large graham cracker. Initially, the fruit mixture and vegetable mixture was weighed, in grams, and recorded for each child. Then the mixture was placed into a hinged three-compartment Styrofoam container that had one large compartment and two smaller

compartments. Each child's name was written on top of the container with a Sharpie permanent marker. If there were children with the same first name, then the first initial of the children's last name was also written on top of the container. The graham crackers were then placed in the right small compartment and the Ritz crackers were placed in the left small compartment.

Fruit snacks were served in the classrooms on Tuesdays and Wednesdays. Vegetable snacks were served in the classrooms on Thursdays and Fridays. The snacks were delivered to the classrooms 15 - 45 minutes before snack time. Snack time varied by classroom, some classrooms served snacks in the morning and others in the afternoon. Children were given a single snack, either in the morning or in the afternoon. Morning snacks were given to children around 10:00 a.m. Afternoon snacks were given to children around 2:00 p.m. See Appendix B for an outline detailing when classrooms received the snacks. At snack time, teachers distributed the containers to the appropriate children. Teachers were instructed to avoid commenting on the snack and avoid encouraging children to eat the snack. When children finished, the teacher closed the container lids and placed the containers in a large box that project staff retrieved from the centers. The remaining fruit and vegetable mixtures were then re-weighed, in grams, and recorded for each child.

#### **2.4.1.2 Parent Surveys**

To assess changes in fruit and vegetable consumption in the home, parents completed a 3-day food diary, the Harvard Food Frequency Questionnaire, and a general health survey (Appendix C). The parent surveys were placed in a large manila envelope. Each classroom either had a cubbyhole for each child or had a plastic file storage that had each child's name written on a hanging folder. Teachers normally distributed classroom information by either placing the information in the cubbyhole or in the hanging folder. The surveys were distributed in the same

manner; each child received an envelope in their cubbyhole or hanging folder on Thursday. The envelope contained a letter that instructed parents to complete the surveys over the weekend and return the surveys on Monday. Parents were also informed that if they returned the completed surveys on Monday they would be eligible for a classroom drawing to win a \$50 or \$25 gas card. Completed surveys were placed in a large box. In order to ensure that the surveys were anonymous parents returned the gas card drawing form in a separate box.

Parent surveys were administered before the CMH program initiated (baseline) and were administered again the week after the program was complete (immediate follow up). Baseline surveys were sent home on Thursday October 12, 2006 and parents were instructed to return the surveys the following Monday October 16, 2006. Gas card drawings were held on Wednesday and winners received their gas card on Thursday or Friday. Follow-up surveys were administered the week after the completion of the program. Parent survey packets were sent home on Thursday December 6, 2006 and parents were instructed to complete the surveys and return them the following Monday December 10, 2006.

#### **2.4.1.2.1 Three-Day Food Diary**

Parents completed a three-day food diary that summarized children's food consumption over a single weekend; from Friday through Sunday. The three-day food diary was developed for the current study, validity and reliability had been assessed. The baseline food diary was completed Friday October 13, 2006 through Sunday October 15, 2006. The follow up food diary was completed Friday December 7, 2006 through Sunday December 9, 2006. Food diaries generally have respondents list only the amount of food consumed. However, the food diary used in the current evaluation had parents list the food item consumed, the amount of food served (1 cup, 2 cookies). In addition, parents indicated the amount of each food item consumed: "none,"

“ate/drank a little,” “ate/drank half,” “ate/drank most,” “ate/drank all.” The addition of the latter items allows researchers to assess not only the quantity served to the children but also the amount the children consumed. Parents also reported the time the child ate and where the child ate (e.g., home, Burger King, Subway). Thus, the food diary consisted of five columns. In the first column parents listed the time the food item(s) that was consumed, in the second column parents listed where the food item(s) was consumed, in the third column the parents listed the type of food item(s) served, in the fourth column the parents listed the amount of food item(s) served, and in the fifth column parents checked one of the response options for the amount the child consumed.

Food diary reports were used to calculate the number of times a parent served a fruit or vegetable and the amount served to the child. The number of servings was calculated using standardized serving sizes for fruits and vegetables. A serving was defined as  $\frac{1}{2}$  cup of raw, cooked, or canned fruit/vegetables, or one medium size fruit (e.g., apple or orange), or  $\frac{3}{4}$  cup of 100% fruit or vegetable juice, or 1 cup of leafy vegetables, or  $\frac{1}{4}$  cup of dried fruit (CDC, 2008). Lastly, parents reported daily how often they completed the diary within 5-10 minutes of serving the food or beverage.

Children’s enrollment in the child care centers varied; some children attended full day and some attended half day. If food diaries were completed by parents during the week then they would have reflected different amounts of time children spent with a parent(s) and different amount of meals that children had in the presence of a parent(s). To eliminate this issue, parents kept a three-day food diary from Friday through Sunday. Thus, data were collected on two full days when children were not at the child care center.

Parents were instructed to record everything their child ate or drank from Friday morning through Sunday evening. Parents were instructed not to record the food items the child ate at the child care center on Friday. Parents were asked to record the precise measurement (1 cup of cereal) or number (2 cookies) of each food item. Parents were given visual images to help them estimate the amount of food served. For example, a visual image was used to show that a cupped handful of a food item is approximately equal to  $\frac{1}{2}$  cup. A sample diary with two entries was also displayed in the instructions.

#### **2.4.1.2.2 Food Frequency Questionnaire**

The Harvard Food Frequency Questionnaire (HFFQ; Harvard Food Service Manual) is an 84 item self administered questionnaire that assess food intake over a four week period. Parents completed the HFFQ at baseline and follow up. The HFFQ was included in the parent survey packets which were completed over a weekend. The HFFQ presents individual food items that are grouped together in separate boxes by food type, such as dairy, fruit, vegetables, chips/crackers/soda, meat/protein. The respondent indicates how frequently they ate a particular food item over the previous four weeks by checking one of the provided response options. There are nine response options: none in the past 4 weeks, 1-3 times in the past 4 weeks, 1 time each week, 2-3 times each week, 5-6 times each week, 1 time a day, 2-3 times a day, 4-5 times a day, 6 or more times a day.

There are 14 fruit items on the HFFQ: orange juice, other juice, bananas, peaches, fruit cocktail or fruit mixture, orange or grapefruit, apple or pear, applesauce, grapes, strawberries, grapes, strawberries, melon, pineapple, raisins or prunes. There are 17 vegetable items on the HFFQ: corn, peas, tomatoes/tomato sauce/salsa, pepper (green, yellow, red, hot), carrots, green beans, spinach, greens (mustard, turnip, kale), mixed vegetables, squash, zucchini, french

fries/friend potatoes/tater tots, potatoes (baked, boiled, mashed), sweet potatoes/yams, cabbage/coleslaw, cauliflower, lettuce salad. The remaining 53 items on the HFFQ assess consumption of chips/crackers/soda, meat/protein, and dairy products.

Only the fruit and vegetable items were of interest in the current study. The researchers calculated the number of times a serving of fruits and vegetables was consumed per week. Thus, to calculate the number of servings consumed per week each fruit and vegetable item on HFFQ was given a specific value based on how frequently the parent indicated the item was consumed. The response option “none over the previous 4 weeks” was given a value of zero. The response option “1-3 times over the previous 4 weeks” was given a value of 0.5. The response option “1 time per week” was given a value of 1. The response option “2-3 time each week” was given the value 2.5. The response option “5-6 times each week” was given the value 5.5. The response option “1 time each day” was given a value of 7. The response option “2-3 times each day” was given a value of 17.5. The response option “4-5 times each day” was given a value of 31.5. The response option “6 or more times each day” was given a value of 42.

The first version of the HFFQ was developed as a dietary assessment tool for use among low-income pregnant women (Suitor, Gardner, & Willett, 1989). This original version was then adapted as a tool for use with young children, ages one to five and with youth ages 6 to 18. When evaluating the food intake of one to five year olds, the HFFQ is completed by a parent or guardian. The HFFQ assessed how frequently a food item was consumed by children during the four weeks preceding the survey (Suitor, Gardner, & Willett, 1989). This version of the HFFQ was used in the current evaluation. The mean number of servings for food groups or food items can be estimated from the HFFQ. Customized nutrition software can analyze the HFFQ and provide detailed information regarding micro-nutrient intake (e.g., fiber, zinc, calcium) (HFFQ

manual). The HFFQ is a valid instrument when findings are compared to 24 hour dietary recalls, the nutrient intakes estimated by each tool varied by less than 10%. Correlations between the micronutrient assessments from the 24 hour food recall and the HFFQ ranged from 0.26 to 0.63. Protein, dietary fiber, and zinc had correlations of 0.47 or higher. (Blum, Wei, Rockett, Langellers, Leppert, Gardner, et al, 1999). Reliability of the HFFQ has not been published.

For the current evaluation, several modifications were made to the instructions and food items on the HFFQ. Specifically, the new instructions gave multiple hypothetical examples of how to complete the survey. For instance, one example displayed a hypothetical response for the food item milk. This example stated: “During the past 4 weeks imagine that your child drank a glass of milk about 3 times a week, you would look for the column labeled “Each Week” and place an “X” in the “2-3 times” column.” Additionally, the original HFFQ had food items grouped together in separate boxes by food type. Such as, dairy, fruit, vegetables, chips/crackers/soda, meat/protein. However, the original HFFQ did not have these boxes labeled. The current evaluation added labels to each box. Lastly, there were several fruit and vegetable items that are presented in Color Me Healthy but were absent on the HFFQ questionnaire. Specifically, the following fruit items were added to the HFFQ: plum, blueberries, and raspberries. Next to the “melon” food item, watermelon, honeydew, and cantaloupe were added in parenthesis. The following vegetable items were added to the HFFQ: celery, mushrooms, and onion.

#### **2.4.1.2.3 General Health Survey**

The general health survey consisted of three sections: “Survey of Child’s Activity,” “Parent Questionnaire,” and “Background Information” (See Appendix C). The “Survey of Child’s Activity” was developed by the researcher and psychometric properties have not been

assessed.. The survey contained 14 items that measured fruit and vegetable consumption and physical activity during the previous month. The current study examined six items on the “Survey of Child’s Activity” that assessed the number of times parents talked to their child about nutrition, the number of new fruits and vegetables that were served to the children over the previous month, children’s willingness to eat fruits and vegetables, and reported changes in children’s diets over the previous month. To assess the number of times parents talked to their child about nutrition, an open ended question asked “During the past month how many times did you talk to your child about nutrition?” To assess children’s willingness to try new fruits and vegetables parents were asked, “How willing is your child to try a new fruit he/she has never eaten?” Parents responded on a 5-point likert scale ranging from “very willing” to “very unwilling.” The same question was asked for vegetables. To assess the number of new fruits and vegetables served to the children during the previous month parents were asked the following open ended question, “During the past month how many times did you serve a new fruit or vegetable that your child had never eaten?” To assess if parents made changes to children’s diets during the previous month, parents were asked the following dichotomous yes/no question, “During the past month did you make changes to your child’s diet?” If parents answered yes, they were asked to circle examples of changes they made, such as served more fruits, served more vegetables, served foods that have reduced fat, served foods that have reduced sodium, served foods that have reduced sugar.

Three additional items on the “Survey of Child’s Activity” assessed a child’s physical activity level. To assess the number of times parents were active with their children during the previous month, an open ended item asked parents “During the past month how many times did you and your child do something physically active together (either outdoors or indoors)?” The

other two items assessed how often the child was active for at least 30 minutes and 60 minutes. The item assessing how often the child was active for at least 30 minutes asked parents, “On average how often is your child active for at least 30 minutes?” Parents responded on a 5-point scale: none, 1 day a week, 2 days a week, 3-5 days a week, 6 or more days a week. The same question was asked for a child being active at least 60 minutes in a week. Two items assessed daily and weekly TV and video game use. The item assessing daily TV and video game use asked, “On average how much TV or video games does your child watch each day?” Response options were on a 6-point scale: none, less than 1 hour, 1-2 hours, 3-4 hours, 5-6 hours, more than 6 hours. The item assessing weekly TV and video game use asked, “On average how much TV or video games does your child watch each week?” Response options were on a 5-point scale: none, less than 7 hours, 7-14 hours, 14-21 hours, more than 21 hours

The second section of the general health survey was titled “Parent Survey” and contained five items that assessed parents’ attitudes toward fruit and vegetable consumption. The items were developed by Kellar and Abraham (2005). These five items were general statements (e.g., “It would be enjoyable for me to eat 5 serving of fruits and vegetables each day) with seven point likert style response options ranging from “strongly agree” to “strongly disagree.” Higher scores indicate a positive attitude regarding fruits and vegetables. These items were developed in a previous study and had Cronbach alpha values ranging from 0.80 to 0.84 on pre and post assessment (Kellar & Abraham, 2005).

The last section of the general health survey was a demographic survey consisting of 14 items that assessed basic background information (e.g., parent gender, child gender, parent date of birth, education level, marital status, ethnicity, etc). Parents also provided the child’s height and weight, which was used to calculate the child’s Body Mass Index (BMI). BMI among

children has different scoring categories than adults. BMI among children is grouped by percentile that indicates the relative position of a child's BMI compared to other children of the same sex and age. Children are categorized as underweight if their BMI is less than the 5<sup>th</sup> percentile. Children are categorized as healthy weight if their BMI is between the 5<sup>th</sup> and 85<sup>th</sup> percentile. Children are categorized as overweight if their BMI is between the 85<sup>th</sup> and 95<sup>th</sup> percentile. Children are obese if their BMI is equal to or greater than the 95<sup>th</sup> percentile (CDC, 2008).

#### **2.4.1.3 Teacher Surveys**

Seven items assessing teacher's perceived changes in children's eating and physical activity were administered to the teachers who implemented the Color Me Healthy program. (see Appendix D). These seven items were originally developed by the authors of Color Me Healthy. Psychometric properties for the survey have not been assessed. Each item on the survey is assessed separately. The current study slightly modified the response options by adding a 7-point likert scale ranging from "strongly agree" to "strongly disagree." Additionally, for clarity the wording on the last three items was slightly modified. See appendix E for the original and modified survey.

Four items asked teachers about their perceived changes in children's knowledge about fruits and vegetables, children's willingness to eat fruits and vegetables, children's consumption of fruits and vegetables, and whether children's recognition of fruits and vegetables increased. The item pertaining to changes in children's knowledge about fruits and vegetables stated "Using Color Me Healthy has increased the children's knowledge about fruits and vegetables." Teachers indicated their level of agreement with this statement on a 7-point likert scale ranging from "strongly agree" to "strongly disagree". To assess changes in children's willingness to eat fruit

and vegetables a dichotomous yes/no item asked, “Since initiating Color Me Healthy are the children more willing to try new fruits and vegetables?” To assess changes in children’s consumption of fruits and vegetables a dichotomous yes/no item asked, “Since initiating Color Me Healthy are the children eating more fruits and vegetables?”. To assess perceived changes in children’s recognition of fruits and vegetables a dichotomous yes/no item asked, “Since initiating Color Me Healthy are the children recognizing more fruits and vegetables?” The remaining item inquired into changes in teacher’s attitudes about the importance of teaching children about nutrition and physical activity.

Two of the items on the survey asked teachers about their perception of change in children’s level of physical activity and knowledge about physical activity. The item pertaining to teacher’s perceived changes in physical activity stated, “Using Color Me Healthy has increased the physical activity of the children.” The item pertaining to changes in children’s knowledge about physical activity stated, “Using Color Me Healthy has increased children’s knowledge about movement and physical activity.” Teachers indicated their level of agreement with these statements on a 7-point likert scale ranging from “strongly agree” to “strongly disagree.”

The surveys were placed in the teacher’s mail boxes that were located in the center office. Teachers also received an e-mail informing them that they would receive the survey in their mailbox and explained that their feedback was valued and important to the project. The surveys were anonymous and teachers did not provide any identifying information on the survey. Once completed, the teachers placed the surveys in a large envelope that was kept in the main office. The survey was administered to the teachers twice. The first survey was administered three weeks after the program was initiated (i.e., after six of the twelve circle time lessons had been

implemented). The first survey pertained to the first three weeks of program implementation and was titled “First 3-Week Survey.” The second survey was administered the week after the program was complete and was titled “Last 3-Week Survey.” This second survey pertained to the last three weeks of program implementation.

#### **2.4.1.3.1 Teacher Interviews**

At the end of the program the ten lead teachers that implemented the CMH program were interviewed. This interview was semi-structured and was guided by questions pertaining to teachers’ perceptions of the CMH program. The interview was audio recorded, and the researcher took brief notes while the teacher talked. Eight questions guided the interview. The questions asked teachers if they administered all of the lessons, if they implemented any additional activities that were not in the teacher’s guide, what they liked about CMH, what they disliked about CMH, what the children thought about CMH, did they see changes in the children’s ability to recognize more fruits and vegetables, did they receive feedback from the parents, and recommendations for getting parents more involved in the future. The interviews were reviewed and similarities in responses were noted.

#### **2.4.2 Process Evaluation**

##### **2.4.2.1 Teacher Process Survey**

To assess which components of the CMH curriculum were delivered in the classroom, a nine item survey was administered to the teachers who implemented CMH. These process items were included on the same anonymous survey that contained the teacher outcome evaluation items. The authors of the CMH program developed an evaluation form specifically for teachers. Several modifications were made to the original survey. See appendix E for original and modified versions. The revised survey had questions pertaining to each lesson and imaginary

trip. For each individual lesson and imaginary trip, the teachers were asked if they used the lesson, if they liked the lesson, and if the children liked the lesson. Teachers indicated whether they used a lesson or not by circling yes or no. Teachers indicated whether they liked the lesson by circling one of three response options: “very much,” “somewhat,” “not at all.” The same response options were used to indicate whether the children liked the lessons. Items were also added to the modified survey that asked teachers which lesson was their favorite and which lesson was the children’s favorite.

Two teacher process surveys were administered. The first teacher process survey, titled “First 3-Week Survey,” was administered three weeks after the program was initiated and pertained to the first six lessons: Singing and Dancing with Color Me Healthy, Eat a Rainbow of Colors, Where Can We Be Physically Active, Try New Foods, I Can Feel My Heart Beat, Brown Paper Bag Mystery. The first survey also asked questions pertaining to the first three imaginary trips: A Day at the Beach, A Visit to the Farm, What is Going on at the Park. The second survey, titled “Last 3-Week Survey,” was administered the week after the program was complete and assessed the final six lessons and three imaginary trips. The second survey pertained to the following lessons: Color Yourself Healthy, Snack Attack, Instead of Watching TV I Could..., It’s Milking Time, Where do Color Grow, Activity Alphabet. The second survey also asked questions pertaining to the following imaginary trips: The Birthday Party, Climb Every Mountain, A Trip to the Fire Station.

#### **2.4.2.2 Child Attendance**

Teachers who implemented CMH also recorded each child’s attendance at CMH lessons in a log book. A spreadsheet for each week was created. Each child’s name was listed in one column, and each week’s lessons were listed across the top of the spreadsheet. After teaching a

Color Me Healthy lesson the teachers were requested to complete the attendance log for that lesson the same day. Teachers placed a letter “A” next to the child’s name if they were absent for a lesson. The attendance log books were collected from the teachers the week after the program was complete.

### **2.4.2.3 Parent Take Home Activities**

Several assessments were used to determine the number of parent activities that were completed. Each classroom that implemented CMH had a “Take Home Activity Poster Board”. The poster board listed the six take home activities across the top and each child’s name was listed down the side of the poster board. Teachers collected completed activities from the children. When children returned a completed activity, they received a sticker by their name for that activity. When the program was complete the poster boards were collected from each classroom and activity completions were tallied. Additionally, after the program was complete parents who received the take home activities were asked “Did you read the informational materials that were in the Weekly Take Home Packets?” and “Did you complete the parent-child activities that were in the Weekly Take Home Packets?”

## **2.5 Procedure**

A randomized controlled design was utilized in the current study; the seventeen classrooms were randomly assigned to either receive CMH or to a comparison group. Ten classrooms received CMH and seven acted as comparisons. Two hundred and sixty three children participated in the evaluation: 165 received CMH and 98 were in the comparison group. The comparison classrooms did not receive any information pertaining to nutrition or physical activity during the evaluation period. The comparison group was a delayed treatment control.

Thus, if there was evidence that CMH was effective then the comparison classrooms would be given the program beginning in the fall of the following school year.

Introductory letters were sent home to parents on October 9, 2006. The letters informed parents that their child was going to be a participant in a project called the “Child Health Project,” which was trying to identify fun and effective health programs for child care centers in Idaho. The introductory letter also explained that surveys would be sent home for the parent(s) to complete and if they completed the surveys they would be eligible for a classroom drawing to win either a \$25 or \$50 gas card. Parents in the CMH group received a slightly different letter; information about the take home activities was included. Additionally, the letters were signed by the director(s) of the child care program.

The fruit and vegetable snack baseline data were collected the week prior to program implementation: October 17 – 20, 2006. The CMH program was initiated on October 23, 2006 and was implemented for six weeks. Two circle time lessons were presented each week. In addition to the two circle time lessons, one imaginary trip was also taught to the children each week. See Appendix B for a detailed schedule of the curriculum timeline. Follow up data were collected the week after the program was complete; December 5 - 8, 2006. Data were collected again three months after the program was complete; March 6 - 9, 2007.

## **Chapter 3: Results**

### **3.1 Outcome Evaluation**

#### **3.1.1 Fruit and Vegetable Snack**

##### **3.1.1.1 Fruit Snack**

There were 83 CMH children and 70 Comparison children who received fruit snacks at all three time periods (baseline, immediate post test, and three month post-test). Sixty nine children were absent at one of the time periods when a fruit snack was served. At each time period the fruit mixture was initially weighed and recorded (pre-weight). After children had the opportunity to consume the snack the remaining fruit mixture was reweighed and recorded (post weight). The immediate follow up average pre-weight fruit snack was statistically different from the average pre-weight fruit snack at baseline assessment ( $t = 30.31, df = 224, p < 0.01$ ) and the pre-weight at three month follow-up assessment ( $t = -35.93, df = 221, p < 0.01$ ). The immediate follow-up assessment was conducted in December, when most fruit is not in season and the fruit in the mixture was smaller in size and weighed slightly less than the fruit at baseline and three month follow up. To account for this small difference the percent of snack consumed was calculated at each assessment instead of subtracting the post-weight from the pre-weight at each assessment.

##### **3.1.1.2 Vegetable Snack**

There were a total of 70 CMH children and 52 Comparison children who received vegetable snacks at all three time periods (baseline, immediate post test, and three month post test). One hundred additional children were absent at one of the time periods when a vegetable snack was served. At each time period the vegetable mixture was initially weighed and recorded

(pre-weight). After children had the opportunity to consume the snack the vegetable mixture was reweighed (post-weight). The percent of snack consumed was calculated for each child.

### **3.1.2 Repeated Measures Analysis of Variance**

#### **3.1.2.1 Fruit Snack: Repeated Measures Analysis of Variance**

To determine if children who received the CMH program consumed significantly more fruit snack after receiving the program, a Repeated Measures Analysis of Variance (ANOVA) was conducted. Table 3 displays the percent of snack consumed for CMH and comparison children at all three time periods. Figure 3 displays the percent consumed over the three time periods among children in both groups. Since percentages were used, an arcsine transformation was conducted before ANOVA analyses were conducted. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2 = 15.32, p < 0.05$ ); therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = 0.91$ ). There was a significant main effect for the amount of fruit consumed over the three time periods ( $F(1.82, 271.33) = 13.70, p = 0.00$ ). There was a significant interaction effect between group assignment and the amount of fruit snack consumed ( $F(12.73, 271.33) = 34.18, p = 0.00$ ). Contrasts determined that children who received CMH consumed significantly more fruit snack at the immediate follow-up ( $F(1, 149) = 62.26, p < 0.00, d = 1.29$ ) and three month follow-up ( $F(1, 149) = 17.41, p < 0.00, d = 0.68$ ) compared to children who did not receive the program. A Repeated Measures ANOVA also determined that there was a non-significant interaction effect between gender and the amount of fruit snack consumed across all three time periods ( $F(1.82, 271.33) = 0.43, p = 0.63$ ).

Repeated Measures ANOVA was conducted for the amount of fruit item (i.e., pineapple, cantaloupe, grape, and strawberry) remaining after children had an opportunity to consume the

fruit mixture. Table 4 displays the average amount of fruit snack items remaining for CMH and control children at each time period. Repeated Measures ANOVA was conducted for the amount of pineapple remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2 = 11.17, p < 0.05$ ); therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = 0.93$ ). There was a significant main effect for the amount of pineapple remaining over the three time periods ( $F(1.86, 269.85) = 5.30, p = 0.01$ ). There was a significant interaction effect between group assignment and the amount of remaining pineapple ( $F(1.861, 269.85) = 22.08, p = 0.00$ ). Contrasts determined that children who received CMH had significantly less pineapple remaining at the immediate follow-up ( $F(1, 145) = 42.54, p < 0.00, d = 1.08$ ) and three month follow-up ( $F(1, 145) = 7.45, p < 0.01, d = 0.45$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of cantaloupe remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had not been violated. There was a significant main effect for the amount of cantaloupe remaining over the three time periods ( $F(2, 290) = 12.95, p = 0.00$ ). There was a significant interaction effect between group assignment and the amount of remaining cantaloupe ( $F(2, 290) = 30.08, p = 0.00$ ). Contrasts determined that children who received CMH had significantly less cantaloupe remaining at the immediate follow-up ( $F(1, 145) = 58.57, p < 0.00, d = 1.27$ ) and three month follow-up ( $F(1, 145) = 16.67, p < 0.00, d = 0.68$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of purple grapes remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2 = 14.97, p < 0.00$ ); therefore degrees of freedom were corrected using Greenhouse-Geisser

estimates of sphericity ( $\epsilon = 0.90$ ). There was a non-significant main effect for the amount of purple grapes remaining over the three time periods ( $F(1.82, 265.92) = 2.29, p = 0.11$ ). However, there was a significant interaction effect between group assignment and the amount of remaining purple grapes ( $F(1.82, 265.92) = 17.38, p = 0.00$ ). Contrasts determined that children who received CMH had significantly fewer grapes remaining at the immediate follow-up ( $F(1, 145) = 30.36, p < 0.00, d = 0.92$ ) and three month follow-up ( $F(1, 145) = 12.84, p < 0.00, d = 0.59$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of strawberries remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2 = 6.26, p < 0.05$ ); therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = 0.96$ ). There was a significant main effect for the amount of strawberry remaining over the three time periods ( $F(1.96, 270.18) = 6.14, p < 0.01$ ). There was a significant interaction effect between group assignment and the amount of remaining strawberry ( $F(1.92, 270.18) = 10.01, p < 0.01$ ). Contrasts determined that children who received CMH had significantly fewer strawberries remaining at the immediate follow-up ( $F(1, 141) = 18.47, p < 0.01, d = 0.71$ ) and three month follow-up ( $F(1, 141) = 5.74, p < 0.02, d = 0.40$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was also conducted for the amount of Ritz crackers and Graham crackers remaining after children had an opportunity to consume the fruit snack. Repeated Measures ANOVA for the amount of Ritz cracker remaining determined that there was a non-significant main effect over the three time periods ( $F(2, 290) = 0.49, p = 0.96$ ). There was also a non-significant interaction effect between group assignment and the amount of Ritz crackers remaining over the three time periods ( $F(2, 290) = 1.37, p = 0.25$ ). The Repeated

Measures ANOVA for the amount of Graham cracker determined that there was a non-significant main effect for the amount of Graham crackers remaining over the three time periods ( $F(2, 290) = 0.14, p = 0.87$ ). There was also a non-significant interaction effect between group assignment and the amount of Graham crackers remaining over the three time periods ( $F(2, 290) = 0.33, p = 0.86$ ).

### **3.1.2.2 Vegetable Snack: Repeated Measures Analysis of Variance**

To determine if children who received the CMH program consumed significantly more vegetable snack after receiving the program a Repeated Measures Analysis of Variance (ANOVA) was conducted. Table 5 displays the percent of snack consumed for CMH and comparison children at all three time periods. Figure 4 displays the percent consumed over the three time periods among children in both groups. Since percentages were used an arcsine transformation was conducted before ANOVA analyses were conducted. Mauchley's test indicated that the assumption of sphericity had not been violated ( $\chi^2 = 2.63, p > 0.05$ ). There was a main effect for the amount of vegetable consumed across the three time periods ( $F(2, 240) = 21.67, p < 0.01$ ). There was a significant interaction effect between group assignment and the amount of vegetable snack consumed ( $F(2, 240) = 27.65, p < 0.01$ ). Contrasts determined that children who received CMH consumed significantly more vegetable snack at the immediate follow up ( $F(1, 120) = 24.14, p < 0.00; d = 0.90$ ) and three month follow-up ( $F(1, 120) = 43.41, p < 0.00, d = 1.20$ ) compared to children who did not receive the program. A Repeated Measures ANOVA determined that there was a non-significant interaction effect for gender and the amount of vegetable snack consumed across all three time periods ( $F(2, 240) = 3.05, p = 0.05$ ). However, this effect was slightly non-significant at the 0.05 level.

Repeated Measures ANOVA was conducted for the amount of vegetable item (i.e., carrot, cherry tomato, celery, and broccoli) remaining after children had an opportunity to consume the vegetable mixture. Table 6 displays the average amount of vegetable snack item remaining for CMH and children in the control group over the three time periods. A Repeated Measures ANOVA was conducted for the amount of carrot remaining. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2 = 7.12, p < 0.03$ ); therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = 0.94$ ). There was a significant main effect for the amount of carrot remaining over the three time periods ( $F(1.89, 234.80) = 11.81, p = 0.00$ ). There was a significant interaction effect between group assignment and the amount of remaining carrot ( $F(1.89, 234.80) = 3.37, p = 0.04$ ). Contrasts determined that there was a non-significant difference between children who received CMH and children in the control group for the amount of carrot remaining at the immediate follow-up ( $F(1, 124) = 3.58, p = 0.06, d = 0.34$ ). However, the contrast between baseline and three month follow up determined that children who received CMH had significantly fewer carrots remaining ( $F(1, 124) = 6.07, p < 0.01, d = 0.44$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of cherry tomatoes remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had not been violated. There was a non-significant main effect for the amount of cherry tomato remaining over the three time periods ( $F(1.96, 238.86) = 1.26, p = 0.29$ ). However, there was a significant interaction effect between group assignment and the amount of remaining cherry tomato ( $F(1.93, 238.86) = 3.99, p = 0.02$ ). Contrasts determined that there was a non-significant difference for the amount of remaining cherry tomatoes between children who received CMH and control children at immediate follow-up ( $F(1, 124) = 0.07, p = 0.79, d = 0.05$ ). However,

the contrast between baseline and three month follow-up determined that CMH children had significantly less cherry tomatoes remaining ( $F(1, 124) = 5.93, p < 0.02, d = 0.44$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of celery remaining at each assessment. Mauchly's test indicated that the assumption of sphericity had not been violated. There was a significant main effect for the amount of celery remaining over the three time periods ( $F(2, 248) = 6.73, p = 0.00$ ). There was a significant interaction effect between group assignment and the amount of remaining celery ( $F(2, 248) = 12.03, p = 0.00$ ). Contrasts determined that children who received CMH had significantly less celery remaining at the immediate follow-up ( $F(1, 124) = 9.37, p < 0.00, d = 0.55$ ) and three month follow-up ( $F(1, 124) = 20.96, p < 0.00, d = 0.82$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was conducted for the amount of broccoli remaining. Mauchly's test indicated that the assumption of sphericity had not been violated. There was a significant main effect for the amount of broccoli remaining over the three time periods ( $F(2, 248) = 11.78, p = 0.00$ ). There was a significant interaction effect between group assignment and the amount of remaining broccoli ( $F(2, 248) = 12.09, p = 0.00$ ). Contrasts determined that children who received CMH had significantly less broccoli remaining at the immediate follow-up ( $F(1, 123) = 11.55, p < 0.00, d = 0.61$ ) and three month follow-up ( $F(1, 123) = 20.15, p < 0.00, d = 0.81$ ) compared to children who did not receive the program.

A Repeated Measures ANOVA was also conducted for the amount of Ritz crackers and Graham crackers remaining after children had an opportunity to consume the vegetable snack at each assessment. Repeated Measures ANOVA for the amount of Ritz cracker remaining determined that there was a non-significant main effect over the three time periods ( $F(2, 250)$

=0.26,  $p = 0.57$ ). There was also a non-significant interaction effect between group assignment and the amount of Ritz crackers remaining over the three time periods ( $F(2, 250) = 1.43, p = 0.24$ ). The Repeated Measures ANOVA for the amount of Graham crackers determined that there was a non-significant main effect for the amount of Graham cracker remaining over the three time periods ( $F(1.90, 237.97) = 1.48, p = 0.23$ ). There was also a non-significant interaction effect between group assignment and the amount of Graham cracker remaining over the three time periods ( $F(1.90, 237.97) = 0.34, p = 0.70$ ).

### **3.1.3 Hierarchical Linear Modeling**

The evaluation was a nested design; children were nested within classrooms. The classrooms were the units of assignment but the outcome data were collected among the children. This nested structure creates a unit of analysis problem. If data are analyzed at the individual level and the nesting of individuals within organizational units is ignored, estimated standard errors would be too small and risk of Type I errors (i.e., reject the null when it is true) is inflated. If data is analyzed on the organizational level, using the means of individuals as the outcome, it becomes problematic to include additional individual level predictors in the analysis. Additionally, biased estimates of organizational effects can occur. Thus, a hierarchical framework can represent all levels of a nested structure (Raudenbush & Bryk, 2002).

HLM 6 software (Raudenbush, Bryk, Cheong, Congdon, & de Toit, 2004) was used to analyze the data. Separate HLM analyses were conducted for the fruit snack and vegetable snack. The study design was a three level design: the first level was the repeated measures; the second level included child variables; the third level included classroom and teacher variables. Unfortunately, the HLM 6 software is not capable of performing a four level analysis, which would have been repeated measures as the first level, child variables at the second level, teacher

variables at the third level, and classroom variables at the fourth level. Due to these limitations, two separate analyses were conducted: one analysis with teacher level variables in the third level and one analysis with classroom variables in the third level.

Level one consisted of the repeated measures, which assessed the amount of fruit snack and vegetable snack consumed at the three time periods: baseline, immediate follow up, and three month follow up. As with the Repeated Measures ANOVA, since the repeated measures data were presented as percentage, the data were transformed using an arcsine transformation. Data reported as percentages or proportions are often skewed and an arcsine transformation makes these distributions more normally distributed (Cohen & Cohen, 1975). Level one in the HLM model represents individual change over the three time periods.

The second level consisted of child variables: 1) gender, 2) the timing of when the snack was served to the children (0 = AM, 1 =PM). The third level consisted of classroom and teacher variables. Teacher variables in the third level included, group assignment (CMH or comparison), years of experience in child care, and education level (high school, some college, bachelors degree, graduate degree). The classroom variables included group assignment (CMH or comparison), socioeconomic (SES) status, and classroom size. SES status was the percent of low income families in the geographic area that the child care center served, which was calculated using Social Explorer (Social Explorer, 2008).

### **3.1.3.1 Fruit Snack: Hierarchical Linear Modeling.**

#### **3.1.3.1.1 Fruit Snack: Unconditional Model**

The amount of fruit snack consumed was nonlinear. The children in the CMH group consumed significantly more fruit snack at the immediate follow-up then slightly decreased consumption at the three month follow up. Children in the control condition decreased

consumption at the immediate follow-up then increased consumption at three month follow-up. Raudenbush and Byrk (2002) suggest performing a piecewise linear growth model for nonlinear data. Thus, the comparison of fruit snack consumed at the three time periods was split into two separate functions: comparison of baseline to immediate follow-up and comparison of baseline to three month follow-up. HLM analysis typically begins with the fitting of an unconditional model, which consists of only the repeated measures at level one and no predictors specified at levels two or three. An unconditional model provides useful information concerning individual change over the measurement period and baseline statistics. Table 7 presents the results for the unconditional model.

The mean fruit consumption at baseline was 1.93 arcsine transformed units ( $t = 20.27, p < 0.01$ ). The mean change in fruit consumption from baseline to immediate follow-up was 0.41 arcsine transformed units ( $t = 2.73, p < 0.01$ ). The mean change in fruit consumption from baseline to three month follow-up was 0.06 arcsine transformed units ( $t = 0.76, p = 0.50$ ). Variance estimates are also displayed in Table 7. There was significant variation among children within classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 115.06, p < 0.01$ ). There was significant variation among children within classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 91.79, p < 0.01$ ). There was significant variation between classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 123.53, p < 0.01$ ). There was significant variation between classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 36.63, p < 0.01$ ).

#### **3.1.3.1.2 Fruit Snack: Conditional Model- Group**

The level three predictor variable titled “group” is of particular interest in the evaluation. Group identifies whether the classroom received the Color Me Healthy program or was a

comparison. This level three predictor was added to the model. Classrooms randomly assigned to the Color Me Healthy program were given a value of “1” and classroom randomly assigned to the comparison group were given a value of “0”. Table 8 displays the results for this analysis with only the group predictor added at the third level.

Group status significantly predicted fruit consumption from baseline to immediate follow-up ( $\gamma = 1.08$ ,  $t = 6.76$ ,  $p < 0.01$ ). Children who received the Color Me Healthy program consumed 1.08 arcsine transformed units more at the immediate follow-up compared to children in the comparison group. Since the data values have been transformed, this coefficient needs to be back translated to provide relevant information. If a back transformation is conducted, this coefficient translates into children in the Color Me Healthy group consuming an average of 27% more of the fruit snack at immediate follow-up compared to children in the comparison group.

Group status significantly predicted fruit consumption from baseline to three month follow-up ( $\gamma = 0.53$ ,  $t = 4.09$ ,  $p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.53 arcsine transformed units more at the three month follow-up compared to children in the comparison group. This coefficient translates into children in the Color Me Healthy group consuming an average of 7% more of the fruit snack at three month follow-up compared to children in the comparison group.

Table 8 also presents the estimated variances and related  $\chi^2$  statistics for this three level model. There was little residual variation among children within classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 116.74$ ,  $p > 0.50$ ). There was little residual variation among children within classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 93.14$ ,  $p > 0.50$ ). There was little variation between classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 20.66$ ,  $p > 0.15$ ). There was

little variation between classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 10.94, p > 0.50$ ).

### **3.1.3.1.3 Fruit Snack: Conditional Model- Child and Teacher Variables**

The next HLM model that was conducted included child predictors at level 2 and teacher predictors at level 3. Child predictors included gender (0 = female, 1 = male) and when the snack was consumed, either in the morning (AM = 0) or afternoon (PM = 1). Teacher predictors at level 3 included teacher's educational level, teacher's years of experience working in child care, and group assignment; either Color Me Healthy or comparison. Table 9 presents the results for this analysis.

In this model, group assignment was the only significantly predictor for fruit consumption from baseline to immediate follow-up ( $\gamma = 1.11, t = 6.11, p < 0.01$ ). Children who received the Color Me Healthy program consumed 1.11 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy group consuming an average of 28% more of the fruit snack at immediate follow-up compared to children in the comparison group. Group assignment was the only significant predictor for fruit consumption from baseline to three month follow-up ( $\gamma = 0.58, t = 3.35, p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.58 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy group consuming an average of 8% more of the fruit snack at three month follow-up compared to children in the comparison group.

Table 9 also presents the estimated variances and related  $\chi^2$  statistics for this three level model. There was little residual variation among children within classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 118.69, p > 0.50$ ). There was little

residual variation among children within classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 92.73, p > 0.50$ ). There was little variation between classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 14.31, p > 0.35$ ). There was little variation between classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 9.17, p > 0.50$ ).

#### **3.1.3.1.4 Fruit Snack: Conditional Model- Child and Classroom Variables**

The next HLM model that was conducted included child predictors at level two and classroom predictors at level three. Child predictors included gender and when the snack was consumed, either in the morning (AM = 0) or afternoon (PM = 1). Classroom predictors at level three included the number of children in the classroom (classroom size), the percent of low income households in the geographic area the center serves (percent low income), and group assignment; either Color Me Healthy or comparison. Table 10 presents the results for this analysis.

Group assignment was the only significantly predictor for fruit consumption from baseline to immediate follow-up ( $\gamma = 1.04, t = 5.02, p < 0.01$ ). Children who received the Color Me Healthy program consumed 1.04 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy consuming an average of 25% more of the fruit snack at immediate follow-up compared to children in the comparison group. Group assignment was the only significant predictor for fruit consumption from baseline to three month follow-up ( $\gamma = 0.55, t = 3.19, p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.55 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy consuming an

average of 7% more of the fruit snack at three month follow-up compared to children in the comparison group.

Table 10 also presents the estimated variances and related  $\chi^2$  statistics for the three level model. There was little residual variation among children within classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 118.50, p > 0.50$ ). There was little residual variation among children within classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 92.43, p > 0.50$ ). There was little variation between classrooms for fruit consumption rate from baseline to immediate follow-up ( $\chi^2 = 19.34, p > 0.11$ ). There was little variation between classrooms for fruit consumption rate from baseline to three month follow-up ( $\chi^2 = 9.92, p > 0.50$ ).

### **3.1.3.2. Vegetable Snack: Hierarchical Linear Modeling**

#### **3.1.3.2.1 Vegetable Snack: Unconditional Model**

Table 11 presents the results for the unconditional model. The mean vegetable consumption at baseline was 1.46 arcsine transformed units ( $t = 19.77, p < 0.01$ ) and the mean change in vegetable consumption over the time periods was 0.39 arcsine transformed units ( $t = 3.48, p < 0.01$ ). Both coefficients are significant indicating that both parameters are necessary for describing the mean change at follow up time periods. Table 11 also presents the estimated variances and related  $\chi^2$  statistics for the unconditional model. There was significant variation among children within classrooms for vegetable consumption rate ( $\chi^2 = 205.28, p < 0.01$ ). There was significant variation between classrooms for vegetable consumption rate ( $\chi^2 = 80.07, p < 0.01$ ).

#### **3.1.3.2.2 Vegetable Snack: Conditional Model- Group**

The level three predictor variable titled “group” is of particular interest in the evaluation. Group identifies whether the classroom received the Color Me Healthy program or was a comparison. This level three predictor was added to the model. Classrooms randomly assigned to the Color Me Healthy program were given a value of “1” and classroom randomly assigned to the comparison group were given a value of “0”. Table 12 displays the results for this analysis with only the group predictor added at the third level.

Group status significantly predicted vegetable consumption over the three time periods ( $\gamma = 0.82, t = 8.55, p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.82 arcsine transformed units more at follow up time periods compared to children in the comparison group. This coefficient translates into children in the Color Me Healthy group consuming an average of 16% more of the vegetable snack at follow up time periods compared to children in the comparison group. Table 12 also presents the estimated variances and related  $\chi^2$  statistics for this three level model. There was significant variation among children within classrooms for vegetable consumption rate ( $\chi^2 = 204.03, p < 0.01$ ). There was no significant variation between classrooms for the vegetable consumption rate ( $\chi^2 = 16.58, p > 0.34$ ).

### **3.1.3.2.3 Vegetable Snack: Conditional Model- Child and Teacher Variables**

The next HLM model that was conducted included child predictors at level 2 and teacher predictors at level 3. Child predictors included gender (0 = female, 1 = male) and when the vegetable snack was consumed, either in the morning (AM = 0) or afternoon (PM = 1). Teacher predictors at level 3 included teacher’s educational level, teacher’s years of experience working in child care, and group assignment; either Color Me Healthy or comparison. Table 13 presents the results for this analysis.

Group assignment significantly predicted vegetable consumption over the three time periods ( $\gamma = 0.83$ ,  $t = 8.17$ ,  $p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.83 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy group consuming an average of 17% more of the vegetable snack at follow up time periods compared to children in the comparison group. No other level two or three variable significantly predicted vegetable consumption at the follow up time periods. Table 13 also presents the estimated variances and related  $\chi^2$  statistics for this three level model. There was significant variation among children within classrooms for vegetable consumption rate ( $\chi^2 = 198.44$ ,  $p < 0.01$ ). There was no significant variation between classrooms for the vegetable consumption rate ( $\chi^2 = 16.53$ ,  $p > 0.22$ ).

#### **3.1.3.2.4 Vegetable Snack: Conditional Model- Child and Classroom Variables**

The next HLM model that was conducted included child predictors at level two and classroom predictors at level three. Child predictors included gender and when the snack was consumed, either in the morning (AM = 0) or afternoon (PM = 1). Classroom predictors at level three included the number of children in the classroom (classroom size), the percent of low income households in the geographic area the center serves (percent low income), and group assignment; either Color Me Healthy or comparison. Table 14 presents the results for this analysis.

Group assignment was the only significantly predictor for vegetable consumption over the three time periods ( $\gamma = 0.83$ ,  $t = 7.52$ ,  $p < 0.01$ ). Children who received the Color Me Healthy program consumed 0.82 arcsine transformed units more than children in the comparison group. This coefficient translates to children in the Color Me Healthy group consuming an average of 17% more of the vegetable snack at follow up time periods compared to children in

the comparison group. No other level two or three variable significantly predicted vegetable consumption at the follow up time periods. Table 14 also presents the estimated variances and related  $\chi^2$  statistics for this three level model. There was significant variation among children within classrooms for vegetable consumption rate ( $\chi^2 = 199.33, p < 0.01$ ). There was no significant variation between classrooms for the vegetable consumption rate ( $\chi^2 = 15.39, p > 0.28$ ).

### **3.1.4 Parent Survey**

Two hundred and sixty three parents were invited to participate in the evaluation and 38% (n = 100) completed the initial surveys; 70 were from CMH classrooms and 30 were from comparison classrooms. At follow-up 14% (n = 38) of the parents completed the surveys, 21 were from CMH classrooms and 17 were from comparison classrooms. Since so few parents completed the follow up surveys, no substantive conclusions concerning changes in the home environment could be made. However, baseline surveys were analyzed to assess children's nutrition in the home environment at a single time point.

Body Mass Index (BMI) was calculated from the height and weight parents reported for their child. Mean BMI was 16.29 ( $SD = 3.03$ ). Since BMI for children varies by age, BMI was calculated for three, four, five, and six year olds. Six percent of the children were three years old, 33% were four years old, 51% were five years old, and 10% were six years old. The mean BMI for the three year olds was 15.65 ( $SD = 4.05$ ), which is categorized as healthy weight. However, among the three year olds two children were obese. The mean BMI for the four year olds was 16.76 ( $SD = 3.02$ ), which is within the healthy range but is borderline overweight. Twenty- eight percent of the four year olds were overweight and twenty- seven percent were obese. The mean BMI for five year olds was 16.11 ( $SD = 3.09$ ). Seven percent of the five year

olds were overweight and fourteen percent were obese. The mean BMI among six year olds was 15.95 ( $SD = 2.75$ ). Among the six year olds, one child was overweight and one was obese.

#### **3.1.4.1 Three Day Food Diary**

Food diaries were reviewed and the number and amount of fruit and vegetable items that were served to the children was calculated. The number and amount of fruits and vegetables was tallied over a three day period; from Friday October 13, 2006 through Sunday October 15, 2006. The amount of fruit and vegetables served to the children was measured in cups. Over the three day period parents served an average of 4.10 fruit items ( $SD = 3.03$ ) and 2.36 vegetable items ( $SD = 2.80$ ) to the children. Over the three day period the average amount of fruit served was 2.75 cups ( $SD = 2.16$ ). Additionally, of the 2.75 cups of fruit that was served to the children, an average of 0.95 cups was juice ( $SD = 1.28$ ). Over the three day period the average amount of vegetable served was 0.83 cups ( $SD = 1.02$ ). Child's BMI significantly predicted the amount of vegetables served to the children over the three day period ( $\beta = 0.12$ ,  $t = 2.71$ ,  $p = 0.01$ ). BMI was not a significant predictor for number of vegetables served, number of fruit served, amount of fruit served.

For Friday the parents only recorded what the child ate at home. Parents served an average of 1.16 fruit items ( $SD = 1.28$ ) and 0.56 vegetable items ( $SD = 0.93$ ) on Friday. The average amount served was 0.75 cups of fruit ( $SD = 0.90$ ). Additionally, of the 0.75 cups of fruit that were served to the children on Friday, an average of 0.21 cups was juice ( $SD = 0.51$ ). On Friday, an average of 0.21 cups of vegetables ( $SD = 0.38$ ) were served to the children.

On Saturday the average number of fruit items served to the children was 1.02 ( $SD = 0.91$ ). The average number of vegetable items served to the children was 0.93 ( $SD = 1.34$ ). The average amount of fruit served on Saturday was 1.02 cups ( $SD = 0.91$ ). Additionally, of the 1.02

cups of fruit served to the children, 0.39 cups was juice ( $SD = 0.57$ ). The average amount of vegetables served on Saturday was 0.32 cups ( $SD = 0.52$ ).

On Sunday parents served an average number of 1.30 fruit items ( $SD = 1.14$ ) and 0.86 vegetable items ( $SD = 1.28$ ). The average amount of fruit served on Sunday was 0.91 cups ( $SD = 0.94$ ). Additionally, of the 0.91 cups of fruit that was served to the children on Sunday, an average of 0.34 cups was juice ( $SD = 0.63$ ). The average amount of vegetable served on Sunday was 0.28 cups ( $SD = 0.43$ ).

#### **3.1.4.2. Harvard Food Frequency Questionnaire**

The number of servings of fruits and vegetables consumed per week was calculated. Children consumed an average of 15.14 servings of fruit items per week ( $SD = 11.32$ ) and 17.64 servings of vegetable items per week ( $SD = 11.12$ ). The fruit servings that were consumed the most in a weekly period were “other” juice ( $M = 3.55$ ,  $SD = 4.09$ ), apples and pears ( $M = 2.49$ ,  $SD = 3.64$ ), orange juice ( $M = 2.47$ ,  $SD = 4.46$ ), banana ( $M = 1.71$ ,  $SD = 1.83$ ), and applesauce ( $M = 1.61$ ,  $SD = 3.58$ ). The vegetable servings that were consumed the most in a weekly period were tomatoes ( $M = 2.12$ ,  $SD = 2.50$ ), carrots ( $M = 2.00$ ,  $SD = 2.35$ ), green beans ( $M = 1.56$ ,  $SD = 2.25$ ), french fries ( $M = 1.52$ ,  $SD = 1.32$ ), and broccoli ( $M = 1.35$ ,  $SD = 1.53$ ). Additionally, child BMI was not correlated with the amount of fruit and vegetable items consumed.

#### **3.1.4.3 General Health Survey**

At baseline parents reported that they talked to the child about nutrition an average of 11.20 times ( $SD = 9.85$ ) over the previous month. Parents reported that they served an average of 1.5 ( $SD = 1.86$ ) new fruits and vegetables to the child over the previous month. The majority of the parents reported that the child was either “somewhat willing” (31%) or “very willing” (26%) to try a new fruit item. Additionally, the majority of the parents reported that the child was either

“somewhat unwilling” (31%) or very unwilling (13%) to try a new vegetable item. Twenty-five percent ( $n = 25$ ) of the parents reported that they made changes to the child’s diet over the previous month. Of these 25 parents who reported they made changes; 9% indicated they served more fruit, 12% indicated they served more vegetables, 5% indicated they served foods that have reduced fat, 4% indicated they served foods that have reduced sodium, and 8% indicated they served foods that have reduced sugar.

Parents reported that they were physically active with their child for an average of 14.34 days ( $SD = 9.36$ ) over the previous month. For the item assessing how frequently the child was active for at least 30 minutes, 1% of the parents selected none, 5% selected 2 days a week, 33% selected 3-5 days a week, and 61% selected 6 or more days a week. For the item assessing how frequently the child was physically active for at least 60 minutes, 6% of the parents responded zero days, 13% responded 1 day a week, 17% responded 2 days a week, 37% responded 3-5 days a week, and 27% responded 6 or more days a week. For the item assessing how many hours the child watches TV or plays video games each week, 7% of the parents selected none, 24% selected less than 1 hour, 51% selected 1-2 hours, and 18% selected 3-4 hours. Additionally, child’s BMI was not associated with the amount of physical activity or TV time parents reported.

#### **3.1.4.4 Parent Fruit and Vegetable Attitude**

Regression analysis assessed whether parents’ attitudes toward consuming fruit and vegetables predicted the number of fruit and vegetables parent’s reported serving to their child on the three-day food diary and the amount of fruit and vegetables parents reported their child consumed in a week on the HFFQ. On the three-day food diary, parent attitude toward consuming fruit and vegetables significantly predicted the number of vegetable items ( $\beta = -0.01$ ,  $t = -2.01$ ,  $p < 0.04$ ), number of fruit items ( $\beta = -0.26$ ,  $t = -3.75$ ,  $p < 0.01$ ), and the amount of fruit

items ( $\beta = -0.16, t = -3.00, p < 0.01$ ) parents served to their child. Parent's attitude did not significantly predict the amount of vegetables parents reported serving to their child on the three-day food diary. On the HFFQ, parent attitude toward consuming fruit and vegetables significantly predicted that amount of vegetables parents reported children consuming during a seven day period ( $\beta = -0.68, t = -2.63, p < 0.01$ ). Parent attitude did not significantly predict amount of fruit parents reported children consuming during a seven day period. Additionally, parent attitude predict children's reported willingness to try new vegetables ( $\beta = -0.08, t = -2.96, p < 0.01$ ) but did not predict children's reported willingness to try new fruit.

### **3.1.5 Teacher Survey**

All ten teachers completed the teacher survey. The survey was administered twice; once half way through the program and again the week after the program was completed. The first survey was labeled "First 3-Week Survey" and pertained to the first three weeks of program implementation. The second survey was labeled "Last 3-Week Survey" and pertained to the final three weeks of program implementation. The items on both surveys were identical.

#### **3.1.5.1 First 3-Week Survey**

All ten lead teachers that implemented the Color Me Healthy program completed the "First 3-Week" survey. The majority (90%) of the teachers thought that the children were more willing to try new foods since initiating the program. Eighty percent of the teachers thought that the children were eating more fruits and vegetables since initiating the program, and 90% of the teachers thought that children were recognizing more fruits and vegetables since initiating the program. The ten lead teaches either strongly agreed (20%) or agreed (80%) with the following statement "Using Color Me Healthy has increased children's knowledge about fruits and vegetables." For the statement, "Using Color Me Healthy has increased the physical activity of

the children.” 20% agreed, 70% somewhat agreed, and 10% somewhat disagreed with this statement. For the statement, “Using Color Me Healthy increased the children’s knowledge about movement and physical activity.” 40% agreed and 60% somewhat agreed with this statement.

### **3.1.5.2 Last 3-Week Survey**

All ten lead teachers that implemented the Color Me Healthy program completed the “Last 3-Week” survey. The majority (90%) of the teachers thought that the children were more willing to try new foods since initiating the program. Teacher’s responses were identical to the responses on the “First 3-Week Survey”. Ninety percent of the teachers thought that the children were eating more fruits and vegetables since initiating the program. All of the teachers thought that children were recognizing more fruits and vegetables since initiating the program. The ten lead teaches either strongly agreed (30%) or agreed (70%) with the following statement “Using Color Me Healthy has increased children’s knowledge about fruits and vegetables.” For the statement, “Using Color Me Healthy has increased the physical activity of the children.” 40% agreed, 50% somewhat agreed, and 10% were unsure with this statement. For the statement, “Using Color Me Healthy increased the children’s knowledge about movement and physical activity.” 10% strongly agreed, 50% agreed and 40% somewhat agreed with this statement.

## **3.2 Process Evaluation Results**

### **3.2.1. Teacher Process Survey**

There was one classroom that omitted an imaginary trip because a teacher resigned and while a replacement was being found the imaginary trip was not taught to the children. The new teacher was trained to administer Color Me Healthy the week she was hired. The other classrooms implemented all of the lessons in the CMH curriculum.

Table 15 displays the results for the process teacher survey. The teachers indicated that they liked all of the lessons and imaginary trips either “very much” or “somewhat.” There was only one teacher that indicated that they did not like the “It’s Milking Time” lesson, which teaches children about dairy products. Additionally, the teachers also indicated that the children liked all of the lessons and imaginary trips either “very much” or somewhat.” Teacher’s also responded to an open ended item asking which lesson was their favorite. The lesson that was listed the most was the “Brown Paper Bag Mystery” lesson, followed by the “I Can Feel My Heartbeat” lesson. All of the teachers indicated that the children enjoyed the “Climb Every Mountain” and “A Visit to the Farm” imaginary trip “very much”, these were the only items on the teacher process survey that had unanimous agreement.

### **3.2.2. Child Attendance**

Child attendance at the twelve circle time lessons and six imaginary trips ranged from 63% to 85%. Table 16 displays percentage of attendance for each circle time lesson and imaginary trip. Children attended an average of 14.22 lessons ( $SD = 3.95$ ). Children attended an average of 9.48 ( $SD = 2.68$ ) circle time lessons and 4.74 imaginary trips ( $SD = 1.54$ ).

### **3.2.3 Parent Take Home Activities**

Three classrooms did not complete the activities poster board. Two of the poster boards were accidentally broken and the other was ruined by water. The project coordinator was not notified of the ruined poster boards until the end of the program. An average of 3.40 take-home weekly activities ( $SD = 2.36$ ) were completed. Table 17 displays the average number of completed take home activities for each classroom. Moreover, 22% ( $n = 22$ ) of the children

completed all six take home activities with a parent or guardian. Twenty-four (n = 25) percent of the children did not complete any of the take home activities.

Table 18 displays the percent of children who completed and returned the take home activity for each week. Seventy one percent (n = 73) of the children returned a completed week one take home activity which had parents help children list colors of fruits and vegetables. Sixty-four percent (n = 65) of the children returned a completed week two take home activity, which had parents and children list all the physically active things they could do together at the park, in the mountains, in their yard, at the pool/lake, and indoors. Fifty percent (n = 51) of the children returned a completed week three take home activity, which was a grocery store treasure hunt where parents took their child to the produce section in a grocery store and found fruits and vegetables of different colors. Sixty percent (n = 61) of the children returned a completed week four take home activity, which had parents help their children circle pictures of healthy snacks. Thirty-nine percent (n = 40) of the children returned a completed week five take home activity, which consisted of parents and children checking activities that they could do together instead of being in front of the “screen” (television or computer). Fifty-seven (n = 58) of the children returned a completed week six take home activity, which had parents help children identify which food items belonged to the different food groups.

## Chapter 4: Discussion

Poor diet and lack of physical activity are two factors contributing to the increased prevalence of overweight and obese children in the United States (Grunbaum, Kann, Kinchen, Ross, Hawkins, Lowry, et al, 2004). Such unhealthy behaviors are often initiated early in life and remain into adulthood. Public health investigators have questioned if such behaviors can be modified in young children and numerous studies have sought to identify the characteristics of successful interventions and the populations in which they can be implemented. Increasing fruit and vegetable consumption in young children may be a singularly important behavior change for their subsequent health as adolescents and adults. However, previous research has found that many children do not eat the recommended amounts of fruits and vegetables (Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997; Ludwig, Peterson, & Gortmaker, 2001).

The majority of nutrition programs conducted among preschool age children have assessed changes in children's knowledge concerning fruits and vegetables and changes in children's attitudes toward consuming fruits and vegetables. Previous program evaluations have lacked assessment of behavior change (Gorelick & Clark, 1985; Koblinsky, Guthrie, & Lynch, 1992; Byrd-Bredbenner, Marecic, & Bernstein, 1993). Previous assessments of the Color Me Healthy program relied on teacher's subjective assessments of program effectiveness. The current findings are noteworthy for several reasons. First, the findings were obtained from a randomized controlled design which eliminated many of the potential biases that may have been present in previous assessments of the CMH program. Prior research assessing the efficacy of the CMH program merely asked teachers for their subjective evaluations of the program and thus failed to obtain behavioral measures of fruit and vegetable consumption before or after implementation of the program. Such weak 'experimental' designs are subject to numerous

biases, including response bias and selection bias. The current study provides the first evaluation of the CMH program that relies on behavioral assessments and rigorous experimental design. Prior assessments of the CMH program also failed to employ control groups or random assignment. Here, too, such failures could introduce numerous experimental design biases, including testing effects, history effects, selection bias, and maturation. Finally, prior assessments failed to conduct follow-up assessments and failed to examine the impact of teacher and classroom setting on the efficacy of the program. The current study addressed all of the above experimental design limitations and thus provides the first rigorous evaluation of the CMH program.

The current findings suggest that children's consumption of fruits and vegetables can be modified through the implementation of an interactive nutrition program in child care settings. The hypothesis that children who receive the Color Me Healthy program will consume more fruit and vegetables in the classroom compared to children in the control group was supported. Children who were exposed to the Color Me Healthy program increased their consumption of fruit snack by approximately 31.2% between baseline assessment and the assessment conducted one week after the completion of the study. Children exposed to the CMH program in child care classrooms increased their consumption of vegetable snack by approximately 24.2% between baseline assessment and the assessment conducted one week after completion of the program. More importantly, children continued to display an increase in their fruit and vegetable consumption three months after the completion of the curriculum. Children exposed to the CMH program increased their consumption of fruit snack by approximately 20.8% between baseline assessment and the assessment conducted three months after the completion of the program and increased consumption of vegetable snack by approximately 33.1% between baseline assessment

and the assessment conducted three months after the completion of the CMH program. The latter finding suggests that the impact of the Color Me Healthy program on children's behavior was not transient and future studies would benefit from longer longitudinal designs assessing the impact of the CMH program at six months, one year, and 2 years post-intervention. Few evaluations of nutrition programs in child care settings have extended post-intervention assessments to six months and one year after program completion (Gorelick & Clark, 1985; Koblinsky, Guthrie, & Lynch, 1992). The lack of longer follow-ups may be associated with children changing child care facilities or entering elementary school. Notably, evaluations of nutrition programs conducted among elementary school children have found that increases in fruit and vegetable consumption are maintained one and even two years after program implementation (Perry et al, 1998; Gortmaker, et al, 1999; Warren, et al., 2003). The importance of developing a healthy diet early in life cannot be overstated. The current findings suggest that CMH may provide one avenue towards achieving this goal and child care centers can serve as a venue for introducing important health-related behavior changes in young children.

Notably, the impact of the CMH program on fruit and vegetable consumption was not restricted to a specific fruit (e.g., grapes) or vegetable (e.g., carrots). That is, children who were exposed to the CMH program increased their consumption of all four vegetables (i.e., carrots, celery, broccoli, and cherry tomatoes) included in the assessments; children exposed to the CMH program also increased their consumption of all four fruits (i.e., pineapple, cantaloupe, strawberries, and grapes) included in the assessments. These findings suggest that the impact of the CMH program is not an artifact of a particular fruit (e.g., grapes) or vegetable (e.g., carrots) included in the assessment. Additionally, it is notable that the consumption of graham crackers and Ritz crackers did not differ significantly between CHM and control children. Thus, the

CMH program did not simply increase the consumption of any food item but specifically fruits and vegetables. Future studies will need to examine if the CMH program can increase the consumption of additional fruits and vegetables that were not included in the assessment and perhaps even less familiar too children but nevertheless healthy (e.g., zucchini or plums). Future studies would also benefit from examining the impact of the CMH program on children's consumption of cooked vegetables (e.g., spinach, Brussel sprouts, cauliflower, asparagus) and other vegetables that are high in fiber, vitamin A and C.

As noted earlier, children who were exposed to the CMH program increased their fruit consumption by 20.8% and vegetable consumption by 33.1% at the three month post-intervention assessment. There were no significant increases among children in the comparison group. The recommended daily amounts of fruit and vegetables for preschool age children is 1.5 cups of fruit and 2 cups of vegetables for boys and 1 cup of fruit and 1.5 cups of vegetables for girls. If children are served the recommended amounts of fruits and vegetables over a seven day period the latter increases among children exposed to CMH would represent boys consuming approximately 8.35 cups of fruit per week and 9.94 cups of vegetables per week. Whereas, boys not exposed to the program would consume approximately 6.81 cups of fruit per week and 4.76 cups of vegetables per week. Girls exposed to CMH would consume approximately 5.57 cups of fruit per week and 7.46 cups of vegetables per week. Whereas, girls not exposed to the program would consume 4.54 cups of fruit and 3.57 cups of vegetables per week. Stated otherwise, during the course of a year boys who were exposed to the CMH program might consume an additional 80.08 cups of fruit and 269.36 cups of vegetables and girls exposed to the CMH program might consume an additional 53.56 cups of fruit and 202.28 cups of vegetables.

Hierarchical linear modeling failed to reveal important, child, classroom, or teacher variables that predicted fruit snack and vegetable snack consumption at post-intervention assessments. The latter finding is particularly noteworthy from an applied standpoint. The failure to identify significant classroom or teacher variables suggests that the CMH program can be successfully adapted in a range of child care facilities and classrooms. Equally importantly, the findings suggest that a range of teachers can successfully implement the program, regardless of their education or years of teaching experience. It is important to acknowledge, however, that a limited number of classrooms and children were recruited into the study. The current study had 52% power to detect the latter relations for fruit snack and 97% power to detect the latter relations for vegetable snack. Power for fruit snack did not meet the suggested standard of 80%, future studies assessing fruit consumption would benefit from increasing the sample size of the study. From a statistical standpoint, future research would benefit more from increasing the number of classrooms and centers in the study than increasing the number of children within classrooms. Additionally, even though the power for vegetable snack exceeded the suggested standard, HLM analysis determined that models which included child, teacher, and classroom variables had significant variability among children in classrooms, indicating that there may be additional variables that predict vegetable consumption. Future research should assess additional child variables (e.g., child attitude toward consuming vegetables) and determine if they are significant predictors of vegetable consumption.

The current study yielded mixed results regarding the ability to involve parents in the program's activities. Of the six parent-child activities, an average of 3.40 out were completed and returned to the classroom. Twenty-two percent of the children completed and returned all six parent-child activities. The study did not validate the completed activities and estimates may be

inflated. Future studies would benefit from a greater focus on parental involvement in the program. However, even in the absence of dramatic parental involvement, the current findings suggest that child care centers can serve as important venues for improving the dietary habits of young children.

Unfortunately, few parents completed follow-up surveys pertaining to fruit and vegetable consumption in the home at the immediate follow-up. Thus, there was insufficient data to conduct statistical comparisons from baseline to follow-up and the hypothesis regarding children's consumption of fruits and vegetables in the home could not be assessed. Lack of parent data at follow-up is a limitation in the current study and changes in fruit and vegetable consumption among the Color Me Healthy children could not be extended to the home. Statistical analyses were conducted only for baseline parent data. Information from the three day food dairies indicated that parents are not serving the recommended daily amounts of fruits and vegetables. Parents reported serving an average of 0.89 cups of fruit and 0.27 cups of vegetables per day. Thus, parents are serving more fruit than vegetables to their child; opposite of the daily recommendations which suggests consuming more vegetables than fruit. Additionally, fruit juice constituted 35% of the fruit served to the children over the three day period. Fruit juice contains little fiber and is often sugar sweetened. Story et al (2006) commented that parents often view fruit juice as nutritious and the convenient packaging and sweet taste make fruit juice easily over consumed among young children. Future programs need to target children's consumption of fruit juice in the home. Educating parents that whole fruit is encouraged over fruit juice and emphasizing that fruit juice is not always a nutritious alternative, may be one method for changing fruit juice consumption in the home.

Parent's attitude toward consuming fruits and vegetable predicted the number of fruit and vegetable items parents reported serving to the children on the three day food diary; parents with a more positive attitude toward consuming fruits and vegetables reported serving more fruit and vegetable items to their child. Parents with more positive attitudes also reported that their child was more willing to consume vegetables. These findings emphasize the importance of also targeting parents in nutrition programs and changing their nutrition behavior. Parental involvement may be increased by holding an open house for parents that introduces the CMH program and provide information pertaining to fruits and vegetables. Child care centers could also provide interactive seminars for parents on healthy cooking, incorporating fruits and vegetables into meals, and tips for encouraging children to eat fruits and vegetables. Koblinsky, Guthrie, and Lynch (1992) found that a program targeting parents via newsletters and nutrition workshops, increased changes to children's diet in the home, changed parent's food shopping behavior, and meal preparation.

A previous review of nutrition programs in child care settings suggest that nutrition programs among preschool age children should use developmentally appropriate curriculum, include activity based activities, target children's behavior, include food based interactive activities, and involve the parents (Contento, Balch, Bronner, et al, 1995). The CMH program is developmentally appropriate for preschool age children and also targets children's behavior. However, future studies of the CMH program could benefit from including more food based activities, such as incorporating fresh fruits and vegetables in the curriculum lessons and having children try the fresh fruits and vegetables at the end of the lesson. Planting a garden at the child care center may be an excellent avenue for teaching young children about fruits and vegetables and encouraging them to eat fruits and vegetables. Several nutrition programs in elementary

schools have found evidence that having children tend gardens increases fruit and vegetable consumption during lunch time (Rauzon, Studer, Martin, et al, 2008; Paxton, Joshi, Fleming, Ammerman, 2008). As previously mentioned, future studies need to find effective methods for involving parents in nutrition programs. Parents have a large impact on the quantity of fruits and vegetables served to children. Parent's knowledge, attitude, and behavior pertaining to the consumption of fruits and vegetables also need to be modified.

The current findings also suggest several other avenues for future research. First, assessing the effects of a booster program several months after the completion of the program could be beneficial. Booster sessions may assist in maintaining increased consumption of fruits and vegetables among preschool children. Second, future studies would benefit from an assessment of group effects among children during meal times. Comments from peers regarding fruit and vegetables during meal times may impact the amount and type of food items consumed. Third, since the evaluation was conducted only among child care centers the results from the current study cannot be generalized to other child care settings, such as family child care. The effectiveness of Color Me Healthy in family child care settings needs to be assessed in the future. Lastly, there are few regulations regarding what is served in child care centers (Story, Kaphingst, & French, 2006). Many child care facilities do not serve enough fruits and vegetables due to budgetary constraints or lack of knowledge concerning nutritional recommendations. Future research needs to investigate the efficacy of modifying the child care food system and providing more fruits and vegetables during meal times. Potential modifications to the food system could include, educating food service personnel about the daily recommendations for fruits and vegetables and how fruits and vegetables can be incorporated into meals, altering child care

menus to incorporate more fruits and vegetables without increasing budgetary costs, and establishing service contracts with local produce suppliers.

Notably, the CMH program is currently being implemented in the seven classrooms that acted as comparisons in the evaluation. The program is also being implemented in six of the 13 Head Start programs located throughout the state of Idaho. Specifically, the CMH program is being implemented in 90 classrooms serving approximately 1,800 children throughout Idaho. The Blue Cross of Idaho Foundation for Health (BCIFH) covers the costs of purchasing the CMH kits and training of child care staff. Additionally, classrooms also receive a \$30 gift card to a local grocery store, which allows the teachers to purchase fresh fruits and vegetables to enhance the CMH lessons. Findings from the current study suggest that child care centers can serve as important venues for teaching children healthy eating habits during developmentally important years.

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Table 1: Fruits and vegetables that are good and excellent source of vitamins and minerals.

<b>Vitamin/Minerals</b>	<b>Health Benefits</b>	<b>Excellent Source*</b>	<b>Good Source*</b>
<b>Calcium</b>	Essential for healthy bones and normal functioning of muscles, nerves, and some organs		Collard greens, Spinach, Turnip greens,
<b>Fiber</b>	Reduces risk of coronary heart disease	Apples, Blackberries, Pears, Raspberries, Spinach	Artichokes, Bananas, Blueberries, Broccoli, Brussel sprouts, Green beans, Guavas, Kiwis, Onions, Oranges, Peas, Dried plums, Sweet potatoes
<b>Folate</b>	Reduces women's risk of giving birth to babies with brain or spinal cord defects	Asparagus, Broccoli, Collard greens, Endive, Peas, Spinach, Strawberries,	Artichoke, Beets, Blackberries, Brussel sprouts, Cabbage, Cantaloupe, Cauliflower, Lettuce, Okra, Papaya, Pepper
<b>Iron</b>	Healthy blood and normal cell functioning	Spinach	Apricots,
<b>Magnesium</b>	Maintain healthy bones, building protein, regulating body temperature, assists in releasing	Spinach	Artichoke, Okra, Squash

stored energy from muscles

**Potassium**

Maintain healthy blood pressure

Apricots,  
Bananas,  
Broccoli,  
Cherries,  
Kiwis,  
Peas,  
Potatoes,  
Sweet  
potatoes  
Tomatoes

**Vitamin A**

Keep eye and skin healthy, also  
protects against infections.

Apricots,  
Cabbage,  
Cantaloupe,  
Carrots,  
Chili pepper,  
Collard green,  
Grapefruit,  
Lettuce,  
Mangos,  
Peppers,  
Spinach,  
Sweet  
potatoes  
Tomatoes  
Watermelon

Asparagus,  
Celery,  
Okra,  
Plums

**Vitamin C**

Helps immune system, keeps teeth  
and gums healthy, reduce risk of  
coronary heart disease and cancer.

Apricots,  
Bell peppers,  
Blackberries,  
Broccoli,  
Brussel  
sprouts  
Cabbage,  
Cantaloupe,  
Cauliflower,  
Collards,  
Chili peppers,  
Grapefruit,  
Guavas,  
Kiwis,  
Lemons,  
Limes,  
Honeydew,  
Okra,

Artichokes,  
Asparagus,  
Bananas,  
Blueberries,  
Carrots,  
Celery,  
Cherries,  
Corm  
Cucumber,  
Green beans,  
Mangos,  
Peaches,  
Pears,  
Plums

Onions,  
Oranges,  
Papayas,  
Peppers,  
Pineapple,  
Potatoes,  
Prickly pears,  
Raspberries,  
Squash,  
Strawberries,  
Sweet  
potatoes  
Tangerines,  
Tomatoes,  
Watermelon

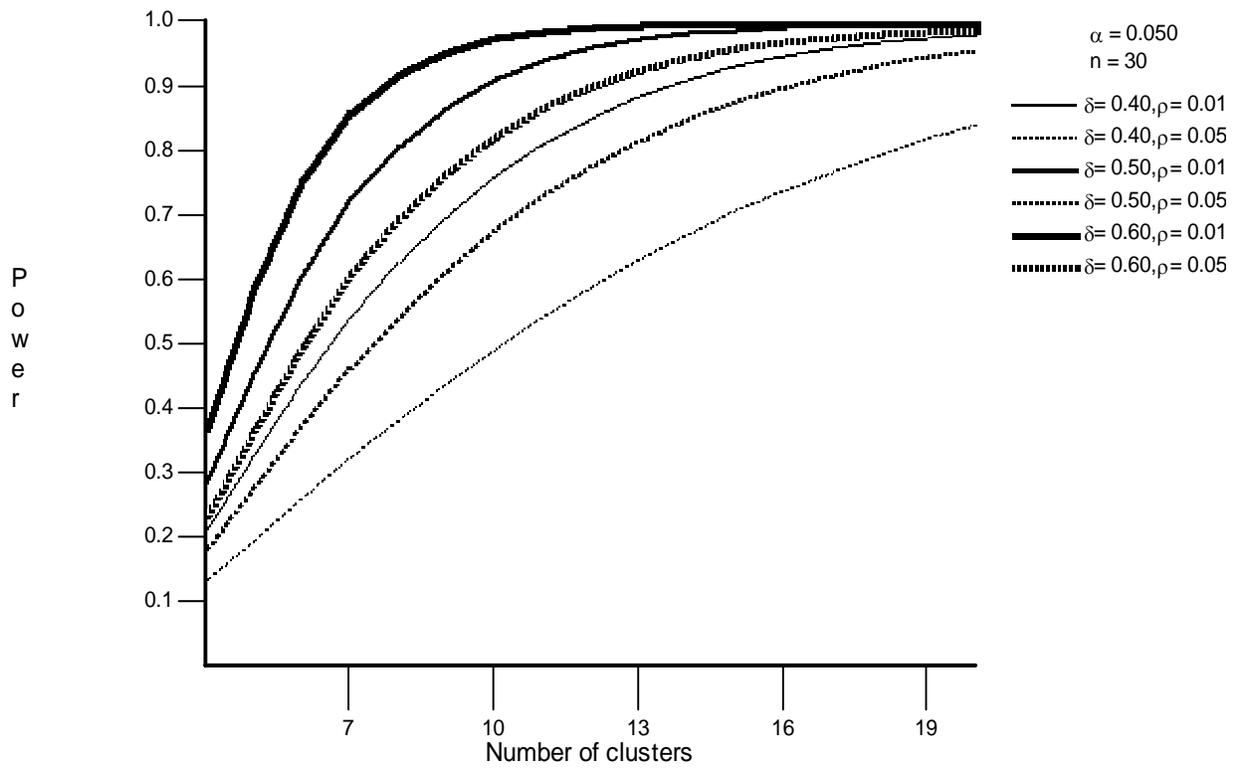
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*Excellent Source: contains 20% or more of the recommended daily value*

*Good Source: contains 10% to 19% of the recommended daily value*

Table 2: Number of children in each child care center

<b>Child Care Classroom</b>	<b>Number of children</b>	<b>Group Assignment</b>
Boise State: 1	21	Color Me Healthy
Boise State: 2	19	Color Me Healthy
JFK: Cynthia Mann	20	Color Me Healthy
JFK: Franklin	13	Color Me Healthy
JFK: Garfield	12	Color Me Healthy
JFK Hawthorne 1	22	Color Me Healthy
JFK: Hawthorne 2	6	Color Me Healthy
JFK: Riverside	24	Color Me Healthy
JFK: Trailwind 1	21	Color Me Healthy
JFK: Valley View	7	Color Me Healthy
<hr/>		
JFK: Amity	15	Comparison
JFK: Horizon	18	Comparison
JFK: Lowell	9	Comparison
JFK: Shadow Hills	12	Comparison
JFK: Taft	12	Comparison
JFK: Trailwind 2	22	Comparison
JFK: Whitney	10	Comparison



**Figure 1: Power table for cluster randomized trial.**

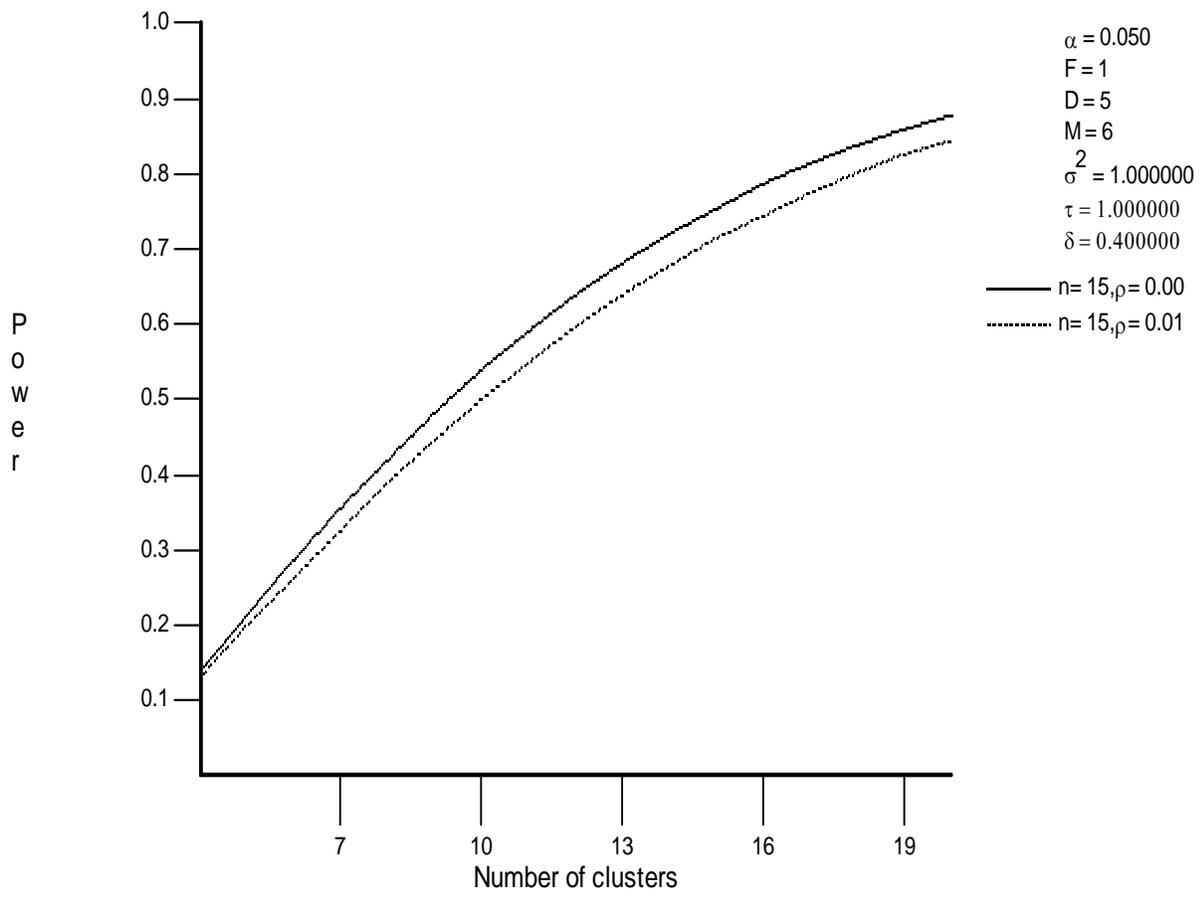


Figure 2: Power table for repeated measures.

Table 3: Percent of Fruit Snack consumed at the three time periods.

	Color Me Healthy: Percent of Fruit Snack consumed	Comparison: Percent of Fruit Snack consumed
Baseline	58.7%	66.3%
Immediate Follow Up	89.9%	58.3%
Three Month Follow Up	79.5%	64.9%

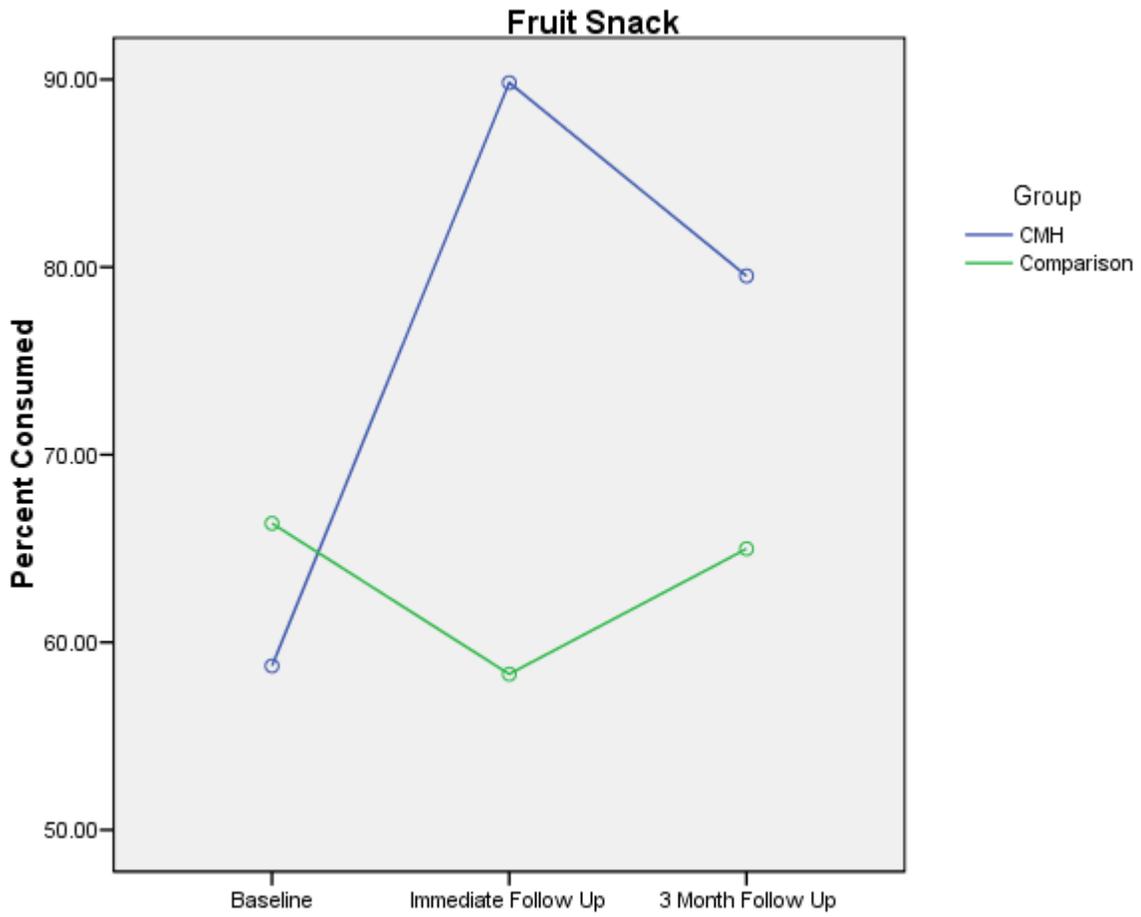


Figure 3: Percent of fruit snack consumed over the three time periods.

Table 4: Average amount of fruit snack items remaining for Color Me Healthy and children in the control group at the three time periods.

Fruit Snack Item	Baseline	Immediate Follow Up	3-Month Follow Up
<b>Pineapple</b>			
Color Me Healthy	1.90	0.64	1.13
Control	1.51	2.02	1.54
<b>Cantaloupe</b>			
Color Me Healthy	2.40	0.62	1.26
Control	1.51	1.92	1.57
<b>Purple Grape</b>			
Color Me Healthy	1.15	0.33	0.54
Control	0.30	0.64	0.46
<b>Strawberry</b>			
Color Me Healthy	0.80	0.24	0.49
Control	0.75	0.82	0.80
<b>Ritz Cracker</b>			
Color Me Healthy	0.40	0.61	0.73
Control	0.58	0.42	0.56
<b>Graham Cracker</b>			
Color Me Healthy	0.38	0.45	0.68
Control	0.42	0.43	0.61

*Note: Fruit Snack Consisted of 4 Pineapple Chunks, 4 Cantaloupe Chunks, 4 Purple Grapes, 2 Strawberries, 2 Ritz Crackers, 2 ¼ squares Graham Cracker.*

Table 5: Percent of vegetable snack consumed at the three time periods.

	Color Me Healthy: Percent of Vegetable Snack Consumed	Comparison: Percent of Vegetable Snack Consumed
Baseline	37.9%	35.6%
Immediate Follow Up	62.1%	33.2%
Three Month Follow Up	71.0%	34.0%

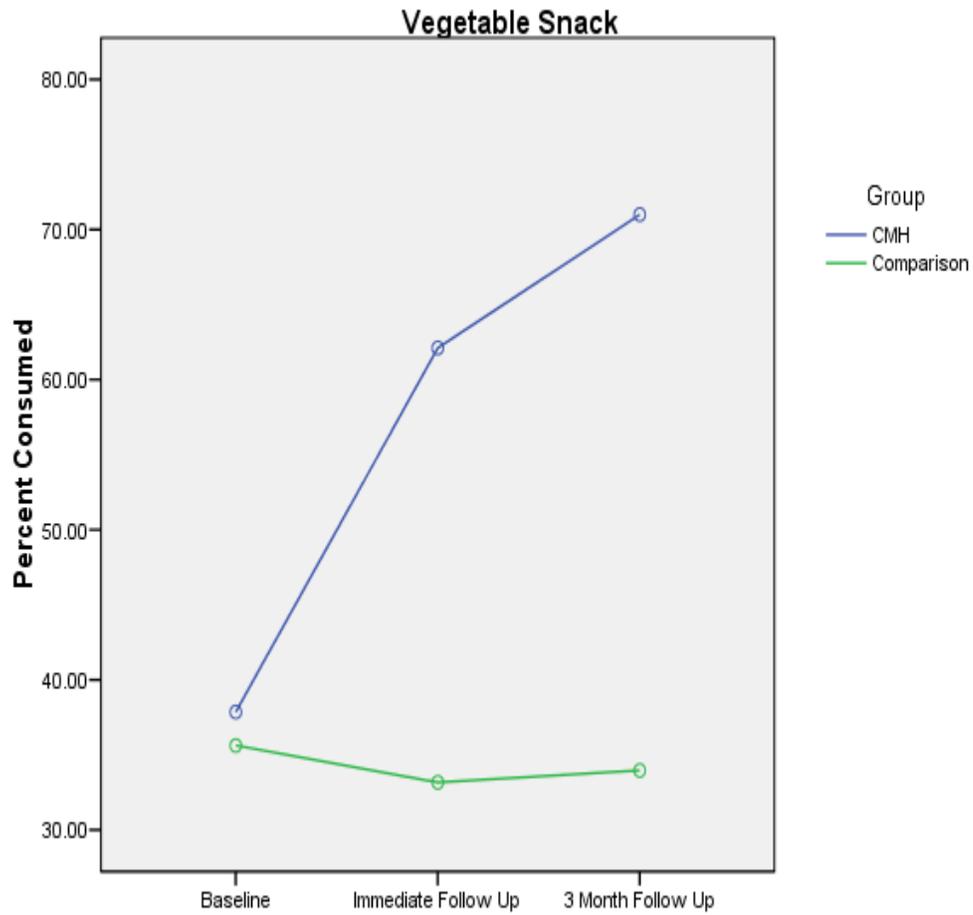


Figure 4: Percent of vegetable snack consumed over the three time periods.

Table 6: Average amount of vegetable snack items remaining for Color Me Healthy and children in the control group at the three time periods.

Vegetable Snack Item	Baseline	Immediate Follow Up	3-Month Follow Up
<b>Carrot</b>			
Color Me Healthy	1.41	0.87	0.55
Control	1.49	1.45	1.19
<b>Cherry Tomato</b>			
Color Me Healthy	1.12	1.09	0.78
Control	1.26	1.27	1.35
<b>Celery</b>			
Color Me Healthy	1.39	0.99	0.76
Control	1.40	1.47	1.49
<b>Broccoli</b>			
Color Me Healthy	2.14	1.38	1.10
Control	2.38	2.39	2.39
<b>Ritz Cracker</b>			
Color Me Healthy	0.54	0.57	0.67
Control	0.86	0.67	0.72
<b>Graham Cracker</b>			
Color Me Healthy	0.68	0.53	0.66
Control	0.58	0.52	0.70

*Note: Vegetable Snack Consisted of 3 Baby Carrots, 2 Cherry Tomatoes, 3 Celery Sticks, 3 Broccoli Florets, 2 Ritz Crackers, 2 ¼ squares Graham Cracker.*

Table 7: Fruit Snack Unconditional Model

<i>Fixed Effects</i>		<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status					
	Mean fruit consumption: Baseline	1.93	0.09	20.27	0.00
	Mean fruit consumption rate: Baseline to Immediate Follow-Up	0.41	0.15	2.73	0.01
	Mean fruit consumption rate: Baseline to Three Month Follow-Up	0.06	0.08	0.76	0.46
<i>Random Effects</i>		<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1					
	Temporal variation $e_{tij}$	0.55			
Level 2					
	Child fruit consumption rate: Baseline to Immediate Follow- Up	0.03	184	115.06	0.00
	Child fruit consumption rate: Baseline to 3 Month Follow-Up	0.02	184	91.79	0.00
Level 3					
	Classroom fruit consumption rate: Baseline to Immediate Follow -Up	0.55	16	68.93	0.00
	Classroom fruit consumption rate: Baseline to Three Month Follow-UP	0.21	16	21.23	0.17

Table 8: Fruit snack conditional model with group variable added at the third level.

<i>Fixed Effects</i>		<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status					
	Intercept	2.01	0.08	23.92	0.00
	Group	0.29	0.10	2.65	0.01
Model for Fruit Consumption Rate: Baseline to Immediate Follow-Up					
	Intercept	0.24	0.09	2.14	0.05
	Group	1.08	0.15	6.76	0.00
Model for Fruit Consumption Rate: Baseline to Three Month Follow Up					
	Intercept	0.26	0.10	2.32	0.04
	Group	0.53	0.12	4.09	0.00
<i>Random Effects</i>		<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1					
	Temporal variation	0.78			
Level 2					
	Child fruit consumption: Baseline to Immediate Follow-Up	0.02	184	116.74	>.50
	Child fruit consumption rate: Baseline to 3 Month Follow-Up	0.02	184	93.14	>.50
Level 3					
	Classroom fruit consumption rate: Baseline to Immediate Follow-Up	0.26	15	20.66	0.15
	Classroom fruit consumption rate: Baseline to 3 Month Follow-UP	0.07	15	10.94	>.50

Table 9: Fruit snack conditional model with child and teacher variables.

<i>Fixed Effects</i>	<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status $\pi_{0ij}$				
Intercept	2.31	0.20	11.63	0.00
Group	0.27	0.09	3.21	0.00
Teacher Education	-0.21	0.09	-2.33	0.04
Teacher Experience	-0.01	0.01	-1.12	0.28
Gender	-0.03	0.07	-0.52	0.60
AM/PM	0.09	0.07	1.32	0.19
Model for Fruit Consumption Rate: Baseline and Immediate Follow-Up				
Intercept	-0.77	0.43	-1.75	0.10
Group	1.11	0.18	6.11	0.00
Teacher Education	0.31	0.19	1.61	0.13
Teacher Experience	0.02	0.01	1.46	0.17
Gender	-0.18	0.16	-1.15	0.25
AM/PM	-0.08	0.16	-0.50	0.61
Model for Fruit Consumption Rate: Baseline to 3 Month Follow-Up				
Intercept	1.09	0.42	2.61	0.02
Group	0.58	0.17	3.35	0.00
Teacher Education	-0.26	0.18	-1.45	0.17
Teacher Experience	0.01	0.01	0.61	0.55
Gender	-0.01	0.16	-0.04	0.97
AM/PM	-0.29	0.17	-1.76	0.08
<i>Random Effects</i>	<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1				
Temporal variation	0.59			
Level 2				
Child fruit consumption rate: Baseline to Immediate Follow-Up	0.00	182	118.70	>.50
Child fruit consumption rate: Baseline to 3 Month Follow-Up	0.00	182	92.73	>.50
Level 3				
Classroom fruit consumption rate: Baseline to Immediate Follow-Up	0.03	13	14.31	0.35
Classroom fruit consumption rate: Baseline to 3 Month Follow-Up	0.01	13	9.16	>.50

Table 10: Fruit snack conditional model with child and classroom variables.

<i>Fixed Effects</i>	<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status				
Intercept	1.92	0.30	6.53	0.00
Group	0.29	0.11	2.63	0.02
Class Size	-0.01	0.01	-0.22	0.82
Percent Low-Income	0.01	0.01	0.26	0.79
Gender	-0.03	0.06	-0.50	0.62
AM/PM	0.07	0.07	0.90	0.37
Model for Fruit Consumption Rate: Baseline to Immediate Follow-Up				
Intercept	-0.51	0.59	-0.88	0.40
Group	1.03	0.21	5.02	0.00
Class Size	0.02	0.02	0.76	0.46
Percent Low-Income	0.01	0.01	1.09	0.29
Gender	-0.19	0.16	-1.09	0.22
AM/PM	-0.08	0.17	-0.48	0.64
Model for Fruit Consumption Rate: Baseline to 3 Month Follow-Up				
Intercept	0.53	0.52	1.00	0.33
Group	0.55	0.17	3.19	0.01
Class Size	0.01	0.02	0.16	0.88
Percent Low-Income	0.01	0.01	1.34	0.20
Gender	-0.01	0.16	-0.08	0.94
AM/PM	-0.35	0.17	-2.03	0.04
<i>Random Effects</i>	<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1				
Temporal variation	0.59			
Level 2				
Child fruit consumption rate: Baseline to Immediate Follow-Up	0.00	182	118.50	>.50
Child fruit consumption rate: Baseline to 3 Month Follow-UP	0.00	182	92.43	>.50
Level 3				

Classroom fruit consumption rate: Baseline to Immediate Follow-Up	0.06	13	19.34	>.50
Classroom fruit consumption rate: Baseline to 3 Month Follow-Up	0.00	13	19.34	>.50

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Table 11: Vegetable snack unconditional model.

<i>Fixed Effects</i>		<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status					
	Mean baseline status	1.46	0.07	19.78	0.00
	Mean veg consumption rate	0.39	0.11	3.48	0.00
<i>Random Effects</i>		<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1					
	Temporal variation	0.46			
Level 2					
	Child veg consumption rate	0.12	151	205.28	0.00
Level 3					
	Classroom veg consumption rate	0.17	16	80.07	0.00

Table 12: Vegetable snack conditional model with group variable added at the third level.

<i>Fixed Effects</i>		<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status					
	Intercept	1.15	0.05	21.89	0.00
	Group	0.52	0.07	7.01	0.00
Model for Veg Consumption Rate					
	Intercept	-0.09	0.08	-1.07	0.30
	Group	0.82	0.10	8.00	0.00
<i>Random Effects</i>		<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1					
	Temporal variation	0.46			
Level 2					
	Child veg consumption rate	0.34	151	204.03	0.00
Level 3					
	Classroom veg consumption rate	0.02	15	16.58	0.34

Table 13: Vegetable snack conditional model with child and teacher variables.

<b><i>Fixed Effects</i></b>		<b><i>Coefficient</i></b>	<b><i>SE</i></b>	<b><i>t-ratio</i></b>	<b><i>p-value</i></b>
Model for Baseline Status					
	Intercept	1.50	0.18	8.45	0.00
	Group	0.50	0.07	6.87	0.00
	Teacher Education	-0.12	0.07	-1.55	0.14
	Teacher Experience	-0.01	0.01	-0.73	0.48
	Gender	-0.04	0.07	-1.79	0.10
	AM/PM	-0.05	0.07	-0.72	0.47
Model for Veg Consumption Rate					
	Intercept	-0.45	0.25	-1.79	0.10
	Group	0.83	0.10	8.17	0.00
	Teacher Education	0.05	0.10	0.50	0.62
	Teacher Experience	0.01	0.01	0.41	0.69
	Gender	0.14	0.10	1.42	0.16
	AM/PM	0.10	0.10	1.04	0.30
<b><i>Random Effects</i></b>		<b><i>Variance</i></b>	<b><i>df</i></b>	<b><i>X<sup>2</sup></i></b>	<b><i>p-value</i></b>
Level 1					
	Temporal variation	0.21			
Level 2					
	Child veg consumption rate	0.10	149	198.44	0.00
Level 3					
	Classroom veg consumption rate	0.02	13	16.53	0.22

Table 14: Vegetable snack conditional model with child and classroom variables.

<i>Fixed Effects</i>	<i>Coefficient</i>	<i>SE</i>	<i>t-ratio</i>	<i>p-value</i>
Model for Baseline Status				
Intercept	1.41	0.25	5.60	0.00
Group	0.53	0.09	6.24	0.00
Class Size	-0.01	0.01	-0.51	0.62
Percent Low-Income	-0.01	0.01	-0.58	0.57
Gender	-0.04	-0.52	-0.52	0.60
AM/PM	-0.07	-0.90	-0.90	0.37
Model for veg Consumption Rate				
Intercept	-0.32	0.34	-0.93	0.37
Group	0.83	0.11	7.52	0.00
Class Size	-0.01	0.01	-0.19	0.85
Percent Low-Income	0.01	0.01	0.71	0.49
Gender	0.14	0.10	1.37	0.17
AM/PM	0.07	0.11	0.67	0.50
<i>Random Effects</i>	<i>Variance</i>	<i>df</i>	<i>X<sup>2</sup></i>	<i>p-value</i>
Level 1				
Temporal variation	0.22			
Level 2				
Child fruit consumption rate	0.10	149	199.33	0.00
Level 3				
Classroom fruit consumption rate	0.00	13	15.39	0.28

Table 15: Responses from teacher process survey

<b>Lesson</b>	<b>Teacher Liked the Lesson</b>			<b>Children Liked the Lesson</b>		
	Very Much	Somewhat	Not at all	Very Much	Somewhat	Not at all
Singing And Dancing With CMH	40%	60%		60%	40%	
Eat A Rainbow Of Colors	70%	30%		80%	20%	
Where Can We Be PA	70%	30%		80%	20%	
Try New Foods	80%	20%		70%	30%	
I Can Feel My Heart Beat	90%	10%		90%	10%	
Brown Paper Bag Mystery	80%	20%		80%	20%	
Color Yourself Healthy	60%	40%		40%	60%	
Snack Attack	80%	20%		70%	30%	
Instead Of Watching TV	80%	20%		60%	40%	
Milking Time	70%	20%	10%	70%	30%	
Where Do Colors Grow	80%	20%		80%	20%	
Activity Alphabet	50%	50%		30%	70%	
<b>Imaginary Trip</b>						
A Day At The Beach	70%	30%		90%	10%	
A Visit To The Farm	90%	10%		100%		
What Is Going On At The Park?	80%	20%		90%	10%	
Birthday Party	80%	20%		90%	10%	
Climb Every Mountain	90%	10%		100%		

Table 16: Weekly child attendance at lessons and imaginary trip.

Lesson	Present	Absent	No Longer Attending
<b>Week 1</b>			
<i>Circle Time Lesson: Singing &amp; Dancing with CMH</i>	82.6%	16.5%	0.8%
<i>Circle Time Lesson: Eat a Rainbow of Colors</i>	80.2%	19.0%	0.8%
<i>Imaginary Trip: A Day At the Beach</i>	85.1%	14.0%	0.8%
<b>Week 2</b>			
<i>Circle Time Lesson: Where Can We Be Phys. Active</i>	85.2%	11.5%	3.3%
<i>Circle Time Lesson: Try New Foods</i>	78.7%	18.0%	3.3%
<i>Imaginary Trip: A Visit To The Farm</i>	74.6%	22.1%	3.3%
<b>Week 3</b>			
<i>Circle Time Lesson: I Can Feel My Heart Beat</i>	73.2%	22.8%	4.0%
<i>Circle Time Lesson: Brown Paper Bag Mystery</i>	63.4%	32.5%	4.0%
<i>Imaginary Trip: What's Going On At The Park</i>	73.2%	22.8%	4.0%
<b>Week 4</b>			
<i>Circle Time Lesson: Color Yourself Healthy</i>	79.8%	16.1%	4.0%
<i>Circle Time Lesson: Snack Attack</i>	76.6%	19.4%	4.0%
<i>Imaginary Trip: The Birthday Party</i>	75.8%	20.2%	4.0%
<b>Week 5</b>			
<i>Circle Time Lesson: Instead of Watching TV</i>	70.0%	26.0%	4.0%
<i>Imaginary Trip: Climb Every Mountain</i>	73.2%	22.8%	4.0%

<b>Week 6</b>			
<i>Circle Time Lesson: Its Milking Time</i>	72.9%	23.1%	4.0%
<i>Circle Time Lesson: Where Do Colors Grow?</i>	81.4%	14.6%	4.0%
<i>Imaginary Trip: A Trip To The Fire Station</i>	75.2%	20.8%	4.0%
<b>Week 7</b>			
<i>Circle Time Lesson: Activity Alphabet</i>	73.6%	22.4%	4.0%

Table 17: Average number of completed take home activities for each Color Me Healthy classroom.

Color Me Healthy Classroom	Average number of completed take-home activities ( n = 6 take home activities)
Boise State: 1	3.4
Boise State: 2	4.3
JFK: Cynthia Mann	1.3
JFK: Franklin	N/A
JFK: Garfield	N/A
JFK Hawthorne 1	1.5
JFK: Hawthorne 2	N/A
JFK: Riverside	4.2
JFK: Trailwind 1	3.9
JFK: Valley View	2.6

*Note: there were a total of six interactive take home activities; one for each week the program was implemented.*

Table 18: Percent of children who completed and returned take home activities each week.

Take Home Activity	Percent Completed
Week 1: Colors of Fruit & Vegetables Activity	71% (73)
Week 2: Physical Activity in Different Places	64% (65)
Week 3: Grocery Store Treasure Hunt	50% (51)
Week 4: Healthy Snacks	60% (61)
Week 5: Activities Instead of watching TV	39% (40)
Week 6: Food Pyramid	57% (58)

## Appendix A: Color Me Healthy Picture Cards





## **Appendix B: Timelines**

### Color Me Healthy Curriculum Timeline

#### **Week 1: October 23<sup>rd</sup>- October 27<sup>th</sup>**

Lesson 1: Singing and Dancing with Color Me Healthy  
Lesson 2: Eat a Rainbow of Colors  
Imaginary Trip 1: A Day at the Beach

#### **Week 2: October 30<sup>th</sup> – November 3<sup>rd</sup>**

Lesson 3: Where Can We Be Physically Active?  
Lesson 4: Try New Foods  
Imaginary Trip 2: A Visit to Mr. and Mrs. Smith's Farm

#### **Week 3: November 6<sup>th</sup> – November 10<sup>th</sup>**

Lesson 5: I Can Feel My Heart Beat  
Lesson 6: Brown Paper Bag Mystery  
Imaginary Trip 3: What's Going On At the Park?

#### **Week 4: November 13<sup>th</sup> – November 17<sup>th</sup>**

Lesson 7: Color Yourself Healthy  
Lesson 8: Snack Attack  
Imaginary Trip 4: The Birthday Party

#### **Week 5: November 20<sup>th</sup> – November 22<sup>nd</sup> (Thanksgiving Break)**

Lesson 9: Instead of Watching TV I Could...  
Imaginary Trip 5: Climb Every Mountain

#### **Week 6: November 27<sup>th</sup> – December 1<sup>st</sup>**

Lesson 10: It's Milking Time  
Lesson 11: Where Do Colors Grow?  
Imaginary Trip 6: A Trip to the Fire Station

#### **Week 7: December 4<sup>th</sup> – December 8<sup>th</sup>**

Lesson 12: Activity Alphabet

Fruit and Vegetable Snack Weekly Timeline

<b>Tuesday Fruit Snack</b>	<b>Wednesday Fruit Snack</b>	<b>Thursday Veggie Snack</b>	<b>Friday Veggie Snack</b>
<b><u>CMH Sites- AM</u></b>	<b><u>CMH Sites- AM</u></b>	<b><u>CMH Sites- AM</u></b>	<b><u>CMH Sites- AM</u></b>
Trailwind 1	Cynthia Mann	Trailwind 1	Cynthia Mann
Riverside		Riverside	
Hawthorne 1		Hawthorne 1	
Garfield		Garfield	
<b><u>Comparison Sites- AM</u></b>	<b><u>Comparison Sites- AM</u></b>	<b><u>Comparison Sites- AM</u></b>	<b><u>Comparison Sites- AM</u></b>
Horizon	Shadow Hills	Horizon	Shadow Hills
Amity	Lowell	Amity	Lowell
	Trailwind 2		Trailwind 2
<b><u>CMH Sites- PM</u></b>	<b><u>CMH Sites- PM</u></b>	<b><u>CMH Sites- PM</u></b>	<b><u>CMH Sites- PM</u></b>
Riverside	Cynthia Mann	Riverside	Cynthia Mann
Hawthorne Kinder	Valley View	Hawthorne Kinder	Valley View
Garfield	Franklin	Garfield	Franklin
	BSU 1		BSU 1
	BSU 2		BSU 2
<b><u>Comparison Sites- PM</u></b>	<b><u>Comparison Sites- PM</u></b>	<b><u>Comparison Sites- PM</u></b>	<b><u>Comparison Sites- PM</u></b>
Horizon	Taft	Horizon	Taft
Amity	Shadow Hills	Amity	Shadow Hills
Whitney	Lowell	Whitney	Lowell
	Trailwind 2		Trailwind 2

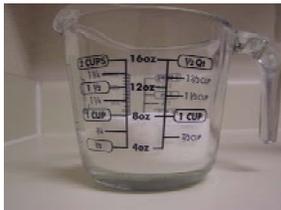
## **Appendix C: Outcome Evaluation Surveys**

### Parent Surveys

## Part I: Child's Food Record

Please record everything your child eats or drinks from Friday morning through Sunday Evening. Use the Food Record that we have given you to record this information.

- 1) Keep the Food Record in a convenient place (such as on the refrigerator) where it is easy to record the food your child eats or drinks.
- 2) Record the information during the meal or immediately after the meal. Please avoid recording information later.
- 3) Record the time and place where your child ate or drank a beverage (such as at home, Subway, Burger King, Applebee's)
- 4) Record food items that were served to your child, the amount served, and the amount your child ate or drank.
- 5) List each food or beverage on a separate line.
- 6) Please be very specific when recording the food or beverages that were served to your child on the Food Record. For example:
  - a. Specify if the bread is white or wheat
  - b. Specify ingredients in a salad (lettuce, tomato, etc.) or casserole (chicken, peas, etc.)
- 7) Be as accurate as possible when recording the amount of food or beverages served. Pictures are provided below to help you estimate the amount of food or beverages served. For example: A  $\frac{1}{2}$  cup of blueberries is equivalent to a rounded handful of blueberries.
- 8) Give the measurement (1 cup of cereal) or number (2 cookies) of food(s) or beverages whenever possible. For example:
  - a.  $\frac{1}{2}$  cup of grapes (about 15 grapes)
  - b. 2 cups of pasta with tomato sauce
  - c. 1 apple
  - d. 2 pieces of white toast with butter
  - e. 3 Chips Ahoy cookies
  - f. 1 small order of french fries



**1 cup**

=

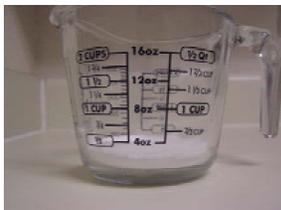
**Baseball or Woman's Fist**



**$\frac{1}{2}$  cup**

=

**Rounded Handful**



**$\frac{1}{4}$  cup**

=

**Large Egg or Golf Ball**



# Food Record

*Please keep track of everything your child eats or drinks during each meal or snack. Please record the type of food or drink your child consumes, the amount of food or drink that is served to your child, and the amount your child eats or drinks. Indicate where you ate (such as home, Subway, Burger King). Be specific when recording the amount served to your child, **include the measurement (such as 1/2 cup of Cheerios) or number (such as 2 cookies) whenever possible**. Use the pictures on the direction sheet to help you estimate the amount of food or beverage served to your child. Don't record food and drink items your child consumed at the child care center.*

**Example Food Record:**

<u>Time</u>	<u>Where your child ate or drank</u>	<u>Type of Food or Drink</u>	<u>Amount Served</u>	<u>Amount Ate/Drank</u>				
				None	Ate/Drank A Little	Ate/Drank Half	Ate/Drank Most	Ate/Drank All
8:30am	Home	Cheerios (cereal)	about ½ cup Cheerios				✓	
		banana	½ banana		✓			
		2% milk	1 cup Milk				✓	
		orange juice	½ cup Orange Juice					✓
10:45am	Home	Cheese Nip Crackers	about 12 crackers (1/2 cup)					✓
		Apple (sliced)	1 apple	✓				
		Hi-C	1 drink box (200mL)					✓













## Part II: Food Questionnaire

Please complete this questionnaire for your child who is involved in the Child Health Project. During the **past 4 weeks**, how often did your child eat a serving of each of the foods listed below? For each food think about how often your child ate that food during the past 4 weeks; was it each day, each week, or a few times? Based on how frequently your child has had that food place an “X” in the appropriate column. For each food please place only one “X” in the appropriate column.

**Example:**

**Milk:** During the past 4 weeks imagine that your child drank a glass of milk about 3 times each week. You would look for the column labeled “Each Week” and place an “X” in the 2-3 times column (see example below)

**Hot Chocolate:** During the past 4 weeks imagine that your child has not drunk any hot chocolate. You would look for the column labeled “Last 4 Weeks” and place an “X” in the “0” column (see example below)

**Yogurt:** During the past 4 weeks imagine that your child has eaten yogurt one time everyday. You ld look for the column labeled “Each Day” and place and an “X” in the 1 time column (see example below)

<i>Number of Times</i>	<i>Last 4 Weeks</i>		<i>Each Week</i>			<i>Each Day</i>			
	<i>0</i>	<i>1-3</i>	<i>1</i>	<i>2-3</i>	<i>5-6</i>	<i>1</i>	<i>2-3</i>	<i>4-5</i>	<i>6 +</i>
<i>Milk</i>				X					
<i>Hot Chocolate</i>	X								
<i>Yogurt</i>						X			

**Please Turn Over Page to Complete the Food Questionnaire**

**1) Dairy**

Number of Times	Last 4 Weeks		Each Week			Each Day			
	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Milk									
Hot Chocolate									
Cheese, plain or in sandwich									
Yogurt									
Ice Cream									
Pudding									

**2) What kind of milk does your child usually drink? (Check One)**

- Breastmilk     
  Whole     
  1%     
  Chocolate Milk  
 Formula     
  2%     
  Skim     
  Other \_\_\_\_\_

**3) Fruit and Juices**

Number of Times	Last 4 Weeks		Each Week			Each Day			
	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Orange juice or grapefruit juice									
Other juice									
Fruit drinks (Hi-C, Kool-Aide, Lemonade, Sports drink)									
Banana									
Peaches									
Fruit Cocktail, Mixed Fruit									
Orange or Grapefruit									
Apple or Pear									
Applesauce									
Grapes									
Strawberries									
Melon (Honeydew, Watermelon, Cantaloupe)									
Pineapple									
Raisins or prunes									
Plum									
Blueberries									
Raspberries									

#### 4) Vegetables

Number of Times	Last 4 Weeks		Each Week			Each Day			
	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Corn									
Peas									
Tomatoes, tomato sauce, salsa									
Peppers (green, yellow, red, hot)									
Carrots									
Broccoli									
Green beans									
Spinach									
Greens (mustard, turnip, kale)									
Mixed vegetables									
Squash									
Zucchini									
French fries, fried potatoes, tater tots									
Potatoes (baked, boiled, mashed)									
Sweet potatoes or yams									
Celery									
Mushrooms									
Onion									
Cabbage, coleslaw, or cauliflower									
Lettuce salad									
Salad dressing									
Mayonnaise									

#### 5) Chips, Crackers, Soda, etc.

Number of Times	Last 4 Weeks		Each Week			Each Day			
	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Chips (potato, corn, or others)									
Popcorn or pretzels									
Crackers									
Nuts									
Cookies or brownies									
Cake or cupcake									
Pie									
Jello									
Chocolate or candy bar									
Other candy (not chocolate)									
Soda, soft drink, pop (not sugar free)									
Soda, soft drink, pop (sugar free)									

**6) Meats/Protein, Grains, etc.**

	Last 4 Weeks		Each Week			Each Day				
	Number of Times	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Beans (baked, chili, or other)										
Rice										
Spaghetti or other pasta										
Pizza										
Tacos, burritos										
Macaroni and cheese										
Hot dogs										
Sausage										
Hamburger (prepared any way)										
Canned tuna										
Fried fish										
Other fish										
Cold cuts (baloney, ham, salami, turkey)										
Fried chicken, chicken nuggets										
Other chicken or turkey										
Pork or ham										
Roast beef or steak										
Liver, organ meats										
Peanut butter										
Bread (sliced) toast, roll, or pita										
Butter (not margarine)										
Margarine										

**7) Soups, Grains, etc**

	Last 4 Weeks		Each Week			Each Day				
	Number of Times	0	1-3	1	2-3	5-6	1	2-3	4-5	6 +
Vegetable soup										
Other soup										
Cornbread or tortilla										
Eggs										
Bacon or Sausage										
Hot cereal										
Cold cereal										
Donut										
Sweet roll or muffin										
Pancake, waffle, or french toast										
English muffin or bagel										
Biscuit										

### Part III: Survey of Child's Activities

Please answer the following questions about your child's activities during the previous month. Remember this survey is anonymous; please respond to the questions honestly. These questions concern only your child involved in the Child Health Project.

- 1) During the past month how many times did you talk to your child about the classroom activities (such as lessons or projects) he/she was involved in at the child care center?  
\_\_\_\_\_Times
  
- 2) During the past month how many times did you help your child with a "take home activity" or project for his/her child care center? \_\_\_\_\_Times
  
- 3) During the past month how many times did you talk to your child about brushing his/her teeth before going to bed? \_\_\_\_\_Times
  
- 4) During the past month how many times did you talk to your child about nutrition?  
\_\_\_\_\_Times
  
- 5) During the past month how many times did you serve a new fruit or vegetable that your child had never eaten? \_\_\_\_\_Times

What new fruits/vegetables did you serve (please list)?

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- 6) During the past month did you make a change to your child's diet?

Yes      No

If yes, please circle the changes that you have made (circle all that apply):

Served more fruits

Served foods that have reduced salt

Served more vegetables

Served foods that have reduced sugar

Served foods that have reduced fat

Other: \_\_\_\_\_

- 7) During the past month about how many days did you and your child do something physically active together (either outdoors or indoors)? \_\_\_\_\_Days

What physical activities did you do together (such as played at the park)  
(please list):

1) On average how often is your child physically active for at least 30 minutes? (please circle)

None	1 Day a Week	2 Days a Week	3-5 Days a Week	6 or more Days a Week
------	-----------------	------------------	--------------------	--------------------------

2) On average how often is your child physically active for at least 60 minutes?

None	1 Day a Week	2 Days a Week	3-5 Days a Week	6 or more Days a Week
------	-----------------	------------------	--------------------	--------------------------

3) On average how much TV or video games does your child watch each day?

None	Less than 1 hour	1-2 hours	3-4 hours	5-6 hours	More than 6 hours
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4) On average how much TV or video games does your child watch each week?

None	Less than 7 hours	7-14 hours	14-21 hours	More than 21 hours
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5) How willing is your child to try new fruit he/she has never eaten? (circle response)

Very Willing	Somewhat Willing	Unsure	Somewhat Unwilling	Very Unwilling
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6) How willing is your child to try new vegetables he/she has never eaten? (circle response)

Very Willing	Somewhat Willing	Unsure	Somewhat Unwilling	Very Unwilling
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7) Currently, what type of fruit and vegetables do you have in your house? (please list canned and fresh fruit/vegetables)

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## Part IV: Parent Questionnaire

Please read each of the following statements. Indicate whether you agree or disagree with each statement by circling your response.

**1) It would be enjoyable for me to eat 5 servings of fruits and vegetables every day**

Strongly Agree	Agree	Somewhat Agree	Unsure	Somewhat Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------	--------	----------------------	----------	----------------------

**2) It would be beneficial for me to eat 5 servings of fruits and vegetables every day.**

Strongly Agree	Agree	Somewhat Agree	Unsure	Somewhat Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------	--------	----------------------	----------	----------------------

**3) It would be pleasant for me to eat 5 servings of fruits and vegetables every day.**

Strongly Agree	Agree	Somewhat Agree	Unsure	Somewhat Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------	--------	----------------------	----------	----------------------

**4) It would be worthwhile for me to eat 5 servings of fruits and vegetables every day.**

Strongly Agree	Agree	Somewhat Agree	Unsure	Somewhat Disagree	Disagree	Strongly Disagree
-------------------	-------	-------------------	--------	----------------------	----------	----------------------

**5) It would be boring for me to eat 5 servings of fruits and vegetables every day.**

Strongly Agree	Agree	Somewhat Agree	Unsure	Somewhat Disagree	Disagree	Strongly Disagree
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## Appendix D: Process Evaluation Surveys

Original Teacher Evaluation

Color Me Healthy: Eight-Week Follow-Up Evaluation

### BACKGROUND INFORMATION

1. In what type of child care setting do you work?

Head Start                  Family Day Care Home                  Child Care Center  
Other: *(please specify)* \_\_\_\_\_

2. How many children are in your child-care facility? \_\_\_\_\_

3. How many children do you personally work with each day? \_\_\_\_\_

4. How many years have you worked in the child-care profession? \_\_\_\_\_

5. In what county is your childcare facility located? \_\_\_\_\_

6. What is the zip code where your child care center is located? \_\_\_\_\_

7. Does your child care facility participate in the Child Feeding Program?  
Yes                  No

### USING COLOR ME HEALTHY IN THE CLASSROOM

8. Have you used any of the components in the Color Me Healthy program?  
Yes \_\_\_\_\_  
No \_\_\_\_\_

If no, Please explain why not and Proceed to Question No. 13

\_\_\_\_\_  
\_\_\_\_\_

We would like to get your opinion about the different components in the Color Me Healthy kit. Circle your answers in column 2, 3, and 4 for each of the Color Me Healthy kit components.

<b>Color Me Healthy Kit Components</b>	<b>Did you use?</b>		<b>Did you like?</b>		<b>Will You Use in the future?</b>	
<i>Column 1</i>	<i>Column 2</i>		<i>Column 3</i>		<i>Column 4</i>	
<b>Teacher's Guide</b>						
Circle Time	Yes	No	Yes	No	Yes	No
Color Me Active-Imaginary Trips	Yes	No	Yes	No	Yes	No
Color Your Classroom	Yes	No	Yes	No	Yes	No
Color Me Healthy Songbook	Yes	No	Yes	No	Yes	No
Color You Healthy	Yes	No	Yes	No	Yes	No
Resources	Yes	No	Yes	No	Yes	No
<b>Classroom Posters</b>						
CMH Logo	Yes	No	Yes	No	Yes	No
Pretend You Are A...	Yes	No	Yes	No	Yes	No
Colors of Foods	Yes	No	Yes	No	Yes	No
<b>Parent Posters</b>						
Remember to Eat All Your Colors	Yes	No	Yes	No	Yes	No
It All Counts	Yes	No	Yes	No	Yes	No
<b>Picture Cards</b>						
Places to Be Active	Yes	No	Yes	No	Yes	No
Colors of Foods	Yes	No	Yes	No	Yes	No
Dairy Products	Yes	No	Yes	No	Yes	No
Where Foods Grow	Yes	No	Yes	No	Yes	No
<b>Music</b>						
CD	Yes	No	Yes	No	Yes	No
Cassette Tape	Yes	No	Yes	No	Yes	No
<b>Parent Newsletters</b>						
Welcome Newsletter	Yes	No	Yes	No	Yes	No
Song Lyric Newsletter	Yes	No	Yes	No	Yes	No
Monthly Newsletters	Yes	No	Yes	No	Yes	No
<b>Hand Stamp</b>	Yes	No	Yes	No	Yes	No

**8. Overall how would you rate the Color Me Healthy Materials?**

Excellent      Very Good      Good      Fair      Poor

Indicate whether you strongly agree, agree, somewhat agree, somewhat disagree, or disagree with the following statements.

	Strongly Agree	Somewhat Agree	Somewhat Disagree	Disagree	Strongly Disagree
Using Color Me Healthy has increased the physical activity of the children?	5	4	3	2	1
Using Color Me Healthy has increased the children's knowledge about movement and physical activity?	5	4	3	2	1
Using Color Me Healthy has increased the children's knowledge about healthful eating?	5	4	3	2	1
Using Color Me Healthy has positively changed my attitude about the importance of teaching children about physical activity and nutrition?	5	4	3	2	1

**9. Have you seen any positive changes in the children with respect to healthful eating (for example: more likely to try new foods)?**

Yes                  No

If yes, please explain: \_\_\_\_\_  
 \_\_\_\_\_

**10. Have you seen any positive changes in the children with respect to fruit and vegetable recognition since using Color Me Healthy?**

Yes                  No

If yes, please explain: \_\_\_\_\_  
 \_\_\_\_\_

**11. Have you seen any positive changes in the children with respect to their attitude toward physical activity?**

Yes                  No

If yes, please explain: \_\_\_\_\_  
 \_\_\_\_\_

**12. Which of the following would you like to see added to the Color Me Healthy program? (circle as many as you like)**



Revised: Teacher Process Surveys



Color Me Healthy  
3 Week Teacher Survey



We would like your opinion about the different materials that have been used during ***the first 3 weeks of the Color Me Healthy Program.*** For each material please circle your response in each column.

Color Me Healthy Material	Have you used?		Did you like?			Did the children like?		
<b>Teacher's Guide</b>								
<i>Circle Time Lessons</i>								
Singing and Dancing with Color Me Healthy	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Eat a Rainbow of Colors	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Where Can We Be Physically Active	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Try New Foods	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
I Can Feel My Heart Beat	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Brown Paper Bag Mystery	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
<i>Imaginary Trips</i>								
A Day at the Beach	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
A Visit to the Farm	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
What is going on at the park	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all

So far, which circle time lesson has been your favorite? \_\_\_\_\_

So far, which circle time lesson has been the children's favorite? \_\_\_\_\_

Have you passed out the "parent take home activities"? Yes No

Have parents given any feedback concerning the "take home activities"? Yes No

If yes, what feedback have parents provided? \_\_\_\_\_

The following statements pertain to the **FIRST 3 WEEKS** of the Color Me Healthy program. Indicate whether you agree or disagree with the following statements. Please circle your response

**1) Using Color Me Healthy has increased the physical activity of the children.**

Strongly Agree      Agree      Somewhat Agree      Unsure      Somewhat Disagree      Disagree      Strongly Disagree

**2) Using Color Me Healthy has increased the children’s knowledge about movement and physical activity.**

Strongly Agree      Agree      Somewhat Agree      Unsure      Somewhat Disagree      Disagree      Strongly Disagree

**3) Using Color Me Healthy has increased the children’s knowledge about fruits and vegetables.**

Strongly Agree      Agree      Somewhat Agree      Unsure      Somewhat Disagree      Disagree      Strongly Disagree

**4) Using Color Me Healthy has positively changed my attitude about the importance of teaching children about physical activity and nutrition.**

Strongly Agree      Agree      Somewhat Agree      Unsure      Somewhat Disagree      Disagree      Strongly Disagree

**5) Since initiating Color Me Healthy are the children more willing to try new foods?**

Yes      No

If **yes**, please explain: \_\_\_\_\_  
\_\_\_\_\_

**6) Since initiating Color Me Healthy are the children eating more fruits and vegetables?**

Yes      No

If **yes**, please explain: \_\_\_\_\_  
\_\_\_\_\_

**7) Since initiating Color Me Healthy are the children recognizing more fruits and vegetables?**

Yes      No

If **yes**, please explain: \_\_\_\_\_  
\_\_\_\_\_



Color Me Healthy  
Last 3 Week Teacher Survey

We would like your opinion about the different materials that have been used during ***the last 3 weeks of the Color Me Healthy Program.*** For each material please circle your response in each column.

Color Me Healthy Material	Have you used?		Did you like?			Did the children like?		
<b>Teacher's Guide</b>								
<i>Circle Time Lessons</i>								
Color Yourself Healthy	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Snack Attack	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Instead of Watching TV I Could...	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
It's Milking Time	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Where do Colors Grow?	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Activity Alphabet	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
<i>Imaginary Trips</i>								
The Birthday Party	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
Climb Every Mountain	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all
A Trip to the Firestation	Yes	No	Very much	Somewhat	Not at all	Very much	Somewhat	Not at all

**Which circle time lesson in the entire Color Me Healthy curriculum was your favorite?**

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**Which circle time lesson in the entire Color Me Healthy curriculum was the children's favorite?**

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**Did you pass out all of the "parent take home activities"?** Yes No

**Have parents given any feedback concerning the "take home activities"?** Yes No

If yes, what feedback have parents provided? \_\_\_\_\_

**Did you record the attendance in the “Color Me Healthy Attendance Log Book”?**

Recorded All                      Recorded Some                      Recorded Very Little                      Did not Record

*The following questions pertain to the entire Color Me Healthy curriculum. Indicate whether you agree or disagree with the following statements. Please circle your response.*

**1) Using Color Me Healthy has increased the physical activity of the children.**

Strongly      Agree      Somewhat      Unsure      Somewhat      Disagree      Strongly  
Agree                      Agree                      Disagree                      Disagree

**2) Using Color Me Healthy has increased the children’s knowledge about movement and physical activity.**

Strongly      Agree      Somewhat      Unsure      Somewhat      Disagree      Strongly  
Agree                      Agree                      Disagree                      Disagree

**3) Using Color Me Healthy has increased the children’s knowledge about fruits and vegetables.**

Strongly      Agree      Somewhat      Unsure      Somewhat      Disagree      Strongly  
Agree                      Agree                      Disagree                      Disagree

**4) Using Color Me Healthy has positively changed my attitude about the importance of teaching children about physical activity and nutrition.**

Strongly      Agree      Somewhat      Unsure      Somewhat      Disagree      Strongly  
Agree                      Agree                      Disagree                      Disagree

**5) Since initiating Color Me Healthy are the children more willing to try new foods?**

Yes      No

If yes, please explain: \_\_\_\_\_  
\_\_\_\_\_

**6) Since initiating Color Me Healthy are the children eating more fruits and vegetables?**

Yes      No

If yes, please explain: \_\_\_\_\_  
\_\_\_\_\_

**7) Since initiating Color Me Healthy are the children recognizing more fruits and vegetables?**

Yes      No

If **yes**, please explain: \_\_\_\_\_

\_\_\_\_\_

Overall Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

We appreciate all you do for Idaho's children. Your input will help us greatly.

Thank you for your cooperation and assistance!

## Part V: Background Information

Please answer the following questions about yourself and your child who is involved in the Child Health Project.

1) **Your Gender:** Male \_\_\_\_\_ Female \_\_\_\_\_

2) **Child's Gender:** Male \_\_\_\_\_ Female \_\_\_\_\_

3) **Your Age:** \_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

Month Day Year

4) **Your Birth Date:**

5) **Child's Age:** \_\_\_\_\_  
**Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_\_

Month Day Year

6) **Child's Birth**

7) **Child's Approximate Height:** \_\_\_\_\_ft. \_\_\_\_\_in.  
**Approximate Weight:** \_\_\_\_\_

8) **Child's**

8) **Your Ethnicity (place a checkmark next to the appropriate description):**

- \_\_\_\_\_ Hispanic or Latino
- \_\_\_\_\_ White, not of Hispanic origin
- \_\_\_\_\_ Black, not of Hispanic origin
- \_\_\_\_\_ Asian or Pacific Islander
- \_\_\_\_\_ Native American
- \_\_\_\_\_ Other (write in): \_\_\_\_\_

9) **Your Marital Status**

Single \_\_\_\_\_ Married \_\_\_\_\_ Divorced \_\_\_\_\_  
Widowed \_\_\_\_\_ Other (please specify): \_\_\_\_\_

## Vita

Kendra received her Bachelor of Science degree in Psychology and minor in Biology from Boise State University in 2002. While attending Boise State, Kendra assisted in the development and validation a new body image assessment, Body Happiness Questionnaire (BHQ). When Kendra arrived at University of Texas at El Paso in 2002 she validated the psychometric properties of the BHQ among Hispanic college students. Kendra received a student award at the Society of Behavioral Medicine annual conference for her analysis of the BHQ.

While pursuing her doctoral degree at University of Texas- El Paso, Kendra was also dually enrolled in the University of Texas School of Public Health. Kendra received her Masters of Public Health degree with an emphasis in Health Promotion and Behavioral Sciences in 2005. Kendra's thesis evaluated elderly individual's willingness to use mosquito repellent before and after the outbreak of West Nile Virus in Southwestern Idaho. Kendra presented her thesis results to the Idaho Department of Health and Welfare and also at the Society of Behavioral Medicine annual conference.

While attending the University of Texas at El Paso, Kendra served as a research assistant (2005 and 2006), coordinating the data collection for the Student Health Project, which was funded by the Paso del Norte Health Foundation. The Student Health Project assessed the efficacy of two drinking and driving prevention programs. Results from the evaluation have been presented at the Society of Behavioral Medicine annual conference. Additionally, as a doctoral student at the University of Texas-El Paso Kendra conducted program evaluations for the U.S./Mexico Border Health Commission and the Idaho Tar Wars program.

Kendra's dissertation titled 'Evaluation of a Nutrition Program Targeting Child Care Centers' was conducted for a larger evaluation with the Blue Cross of Idaho Foundation for Health. Her doctoral advisor was Lawrence D. Cohn. Results from Kendra's dissertation have been presented to Idaho State Legislators and Government officials. In addition, she presented results from her dissertation at the 2008 American Public Health Association annual conference. Kendra is currently a program manager with the Blue Cross of Idaho Foundation for Health located in Meridian, Idaho. Kendra is currently working on multiple health improvement initiatives throughout the state of Idaho. She currently has a grant from the American Legacy Foundation to develop an innovative tobacco cessation program for hospitalized patients.

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This thesis/dissertation was typed by Kendra E. Witt